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Effects of the COVID-19 pandemic on people experiencing incarceration: a systematic review

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ABSTRACT

Objective To assess the effect of the COVID-19 pandemic on people experiencing incarceration (PEI), focusing particularly on clinical outcomes compared with the general population.

Design Systematic review with narrative synthesis in accordance with the Centre for Reviews and Dissemination's good practice guidelines.

Data sources Medline, Social Policy and Practice, Criminology Connection, ASSIA, EMBASE, SCOPUS, Web Of Science, CINAHL, Cochrane Library, Cochrane COVID-19 reviews, COVID-19 Evidence Reviews and L*OVE COVID-19 Evidence databases were searched up to 21 October 2022.

Eligibility criteria for selecting studies We included studies presenting data specific to adults ≥18 years experiencing incarceration, with exposure to SARS-CoV-2 infection. All studies with a comparison group, regardless of study design and country were included. Studies with no comparison group data or not measuring clinical outcomes/health inequalities were excluded. Studies focussing on detained migrants, forensic hospitals, prison staff and those not in English were also excluded.

Data extraction and synthesis Two reviewers extracted data and assessed risk of bias. Data underwent narrative synthesis using a framework analysis based on the objectives, for infection rates, testing, hospitalisation, mortality, vaccine uptake rates and mental health outcomes. There was no scope for meta-analysis, due to the heterogeneity of evidence available.

Results 4516 references were exported from the databases and grey literature searched, of which 55 met the inclusion criteria. Most were from the USA and were retrospective analyses. Compared with the general population, PEI were usually found to have higher rates of SARS-CoV-2 infection and poorer clinical outcomes. Conflicting data were found regarding vaccine uptake and testing rates compared with the general population. The mental health of PEI declined during the pandemic. Certain subgroups were more adversely affected by the COVID-19 pandemic, such as ethnic minorities and older PEI.

Conclusion PEI have poorer COVID-19 clinical outcomes than the general public, as shown by largely low-quality heterogenous evidence. Further high-quality research of continuing clinical outcomes and appropriate mitigating interventions is required to assess downstream effects of the pandemic on PEI. However, performing such research in the context of incarceration facilities is highly complex and potentially challenging. Prioritisation of resources for this vulnerable group should be a focus of national policy in the event of future pandemics.

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STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Systematic review presenting evidence published during the first 30 months of the COVID-19 pandemic for outcomes in people experiencing incarceration (PEI) worldwide.
⇒ The study used comprehensive search terms applied to 12 databases to collate evidence from both high-income and low/middle-income countries and focussed on objective data relating to clinical outcomes making comparisons, both within incarceration facilities and with the general population.
⇒ High-quality evidence was lacking about the COVID-19 outcomes of PEI—many studies were of low quality, relying on third-party observational data and prone to bias.
⇒ Published data were heterogeneous with varying statistical measures, meaning meta-analysis was not feasible.
⇒ Studies were excluded if not published in English, potentially leading to some selection bias.

INTRODUCTION

People experiencing incarceration (PEI) were particularly likely to be impacted by the COVID-19 pandemic but the extent and range of impacts and effects on pre-existing inequalities in health compared with the general population are not fully understood.[1 2] Health inequalities are unequal and disadvantageous differences in the health of different populations, such as life expectancy or access to healthcare, which are socially determined.[3] PEI have a high prevalence of physical and psychiatric morbidity, with many coming from marginalised backgrounds, experiencing homelessness or with limited educational backgrounds.[1 4–6] There are complex social problems, including being deprived of liberties, a lack of social and

familial support and violence, each contributing to ill health.[2 5]

When the COVID-19 pandemic began, high transmission rates were seen in incarceration facilities.[7] PEI are susceptible to infectious diseases due to many factors, including living in confined crowded spaces.[1 2] Incarceration facilities raise difficulties with social distancing and lesser access to hygiene products and personal protective equipment.[8] Prolonged isolation in cells contributed to declines in mental health of PEI during the pandemic.[9–11] Family visits were also suspended, court hearings delayed and educational programmes cancelled.[9 12]

The pre-existing health inequalities and increased risk of transmission suggest a greater risk for PEI from COVID-19. High prison COVID-19 death rates were seen in the UK—3.3 times greater than for the same age and sex in the public.[13] Internationally, data from the USA show that PEI are more likely to require vasopressors when hospitalised with COVID-19 and have a higher in-hospital mortality rate than the general population.[14] It is possible that rates of long COVID, a condition characterised by a range of manifestations across organ systems, including fatigue, shortness of breath and cognitive impairment persisting 12 weeks after onset of COVID-19 symptoms, may be more prevalent in PEI.[15 16] However, comprehensive research on this population is lacking.

An earlier systematic and scoping review were undertaken assessing the effect of COVID-19 in PEI.[17 18] These reviews appraise the evidence base regarding COVID-19 outcomes worldwide, published up to mid-October 2021 and in the USA only, up to February 2022, respectively. An up-to-date review of the cumulative literature base in this field is needed, to understand the impact and identify lessons for further pandemics or cycles of COVID-19.

This systematic review aimed to assess the effect of the COVID-19 pandemic on PEI. The objectives were to assess the following clinical outcomes of the COVID-19 pandemic, comparing them to the general population: infection rates of SARS-CoV-2/COVID-19, testing rates, hospitalisation, mortality, COVID-19 vaccine uptake and mental health outcomes. We also sought to evaluate whether inequalities between PEI and the general population widened during the pandemic and, if identified, to investigate potential reasons for this in relation to mediators of COVID-19 and risk factors faced in prisons.

METHODS

This systematic review was conducted in accordance with the Centre for Reviews and Dissemination's good practice guidelines.[19] Guidance from stakeholders assisted with developing the eligibility criteria. We excluded studies focussing on detained migrants, forensic hospitals and staff; also studies published pre-pandemic, not in English or lacking comparison groups. The inclusion and exclusion criteria for selecting eligible studies are shown in table 1.

12 databases were searched, including health, criminology, sociology and COVID-19 specific databases (Medline via OVID, Social Policy and Practice via OVID, Criminology Connection via ProQuest, ASSIA via ProQuest, EMBASE via OVID, SCOPUS, Web Of Science, CINAHL, Cochrane Library, Cochrane COVID-19 reviews, COVID-19 Evidence Reviews, L*OVE COVID-19 Evidence). Preprints were searched via the online EMBASE database to minimise publication bias.

A 'COVID-19' search string, developed for use by the Wales COVID-19 Evidence Centre, and a 'people experiencing incarceration' search string, developed by the authors, were combined. The full search strategy is provided in online supplemental appendix 1. Grey literature suggested by stakeholders was screened to reduce publication bias and gain early insight from unpublished work. Databases were searched up to 21 October 2022.

Search outputs were exported onto a reference management software, Endnote,[20] and screened for eligibility by DBW and BS (table 1). Approximately 10% of the screening was duplicated by other reviewers (FB and AE), with differences in outcomes discussed, to ensure consistency. Disagreements occurred in approximately 2% of the screening process and were resolved through consensus discussion.

Full texts of references selected based on title and abstract were retrieved for analysis by DBW and BS. Assessment by a second reviewer (AE) was completed for 5% of full texts with disagreements occurring in approximately 1% and resolved through consensus discussion.

Data were extracted into Microsoft Excel. Headings included: Study Title and Authors, Country of Study, Study Type, Aim of Study, Participants and Setting, Data Collection, Exposure, Study Outcomes and Methodological Appraisal (online supplemental appendix 2).

Critical appraisals of included studies were conducted using a Joanna Briggs Institute checklist based on study design.[21–23] From an initial literature scoping exercise it was hypothesised that most studies would be low-quality. All studies meeting the inclusion criteria were included, rather than excluding low-quality evidence.

External validity assessment was undertaken by commenting on study limitations. An overall quality of evidence assessment was done for each study, through analysis of critical appraisals, the methodology and key limitations. The assessment graded the studies as low-quality, medium-quality or high-quality evidence. Where preprint articles were found, efforts were made to access subsequent peer-reviewed published versions, used the latter's data in preference to preprint data.

A narrative synthesis of the results was conducted. There was no scope for meta-analysis, due to low-quality heterogeneous evidence available. Data were synthesised using a framework analysis,[24] based on the objectives, for infection rates, testing, hospitalisation, mortality, vaccine uptake rates and mental health outcomes. We analysed potential mediators of COVID-19 outcomes, such as age or ethnicity, if the data were available.

Table 1 Criteria for including and excluding studies in this review

	Inclusion	Exclusion
Population	Adults experiencing incarceration, aged 18 and over, worldwide, during the COVID-19 pandemic	Studies not based on people experiencing incarceration (eg, forensic hospitals, migrants in detention centres People experiencing incarceration under the age of 18, in juvenile or youth prisons Studies on people after release from incarceration Studies on the families of people experiencing incarceration Studies on staff working in prisons
Exposure	SARS-CoV-2/COVID-19	Studies based on other pandemics or infectious diseases Studies covering the judicial process for example, trial, bail, parole
Comparators/Controls	Comparison to the public Comparison to other minoritised groups Comparing from during to before the pandemic Comparators between prison population subgroups	Studies with no comparison
Outcomes	Clinical outcomes of COVID-19: Incidence/prevalence/transmission rate Hospitalisation rate Mortality rate Vaccine uptake Long term effects of COVID-19, for example, long COVID and mental health outcomes Secondary outcomes: Health inequalities during the pandemic	Clinical outcomes not measured or health inequalities not reported
Study design	Hierarchy of evidence with no restriction on study design; prioritising primary evidence, observational studies (such as surveys, case studies and cohort studies)	Systematic or scoping reviews Opinion pieces News reports

Patient and public involvement

None.

RESULTS

A total of 4516 references were exported from the databases searched. After de-duplication, 2684 references remained. Following screening of titles and abstracts, 182 articles were retrieved for full-text analysis, from which 51 studies were included. Six resources from grey literature were identified of which four were included. Reasons for exclusion were documented (see figure 1).[25] Therefore, 55 studies were included (see online supplemental appendix 2).

Studies were included from USA (36, 65.4%), UK (5, 9%), Canada (3, 5.4%), Italy (3, 5.4%), Denmark (2, 3.6%), Brazil (2, 3.6%), China (1, 1.8%), Ethiopia (1, 1.8%), France (1, 1.8%) and Switzerland (1, 1.8%). Study designs included were 29 retrospective analyses of data (52.7%), 8 retrospective cohort studies (14.5%), 7 longitudinal studies (12.7%), 6 cross-sectional studies (10.9%), 3 outbreak reports (5.5%), 1 matched case–control study (1.8%) and 1 policy analysis (1.8%).

Infection rates of COVID-19/SARS-CoV-2 in PEI

Incidence of COVID-19/SARS-CoV-2 varied significantly across countries and prison facilities. Crude incidence rates were mostly higher in prisons than in the general population.[26–36] Relative risk of COVID-19 positivity versus the general population was increased by 4.32 times[37] and 5.29 times.[36] However, a UK study documented a crude incidence rate in prisons which was not statistically different to the general population[38] and four studies, from the UK, USA, Italy and Denmark, respectively, showed a lower incidence rate in the incarcerated population.[39–42] Testing strategies were not clearly documented in these studies, so results must be interpreted with care. Analysis often used population estimates, which are not accurate.

Conflicting evidence was found about the seropositivity levels of PEI compared with the general population. A study in Paris, France found 18.4% positivity rates compared with 20.6% in the general Parisian population.[43] However, in Montreal, Canada 22% of participants were seropositive over the study period compared with 13.75% in a comparator general population sample of Montreal blood donors.[44]

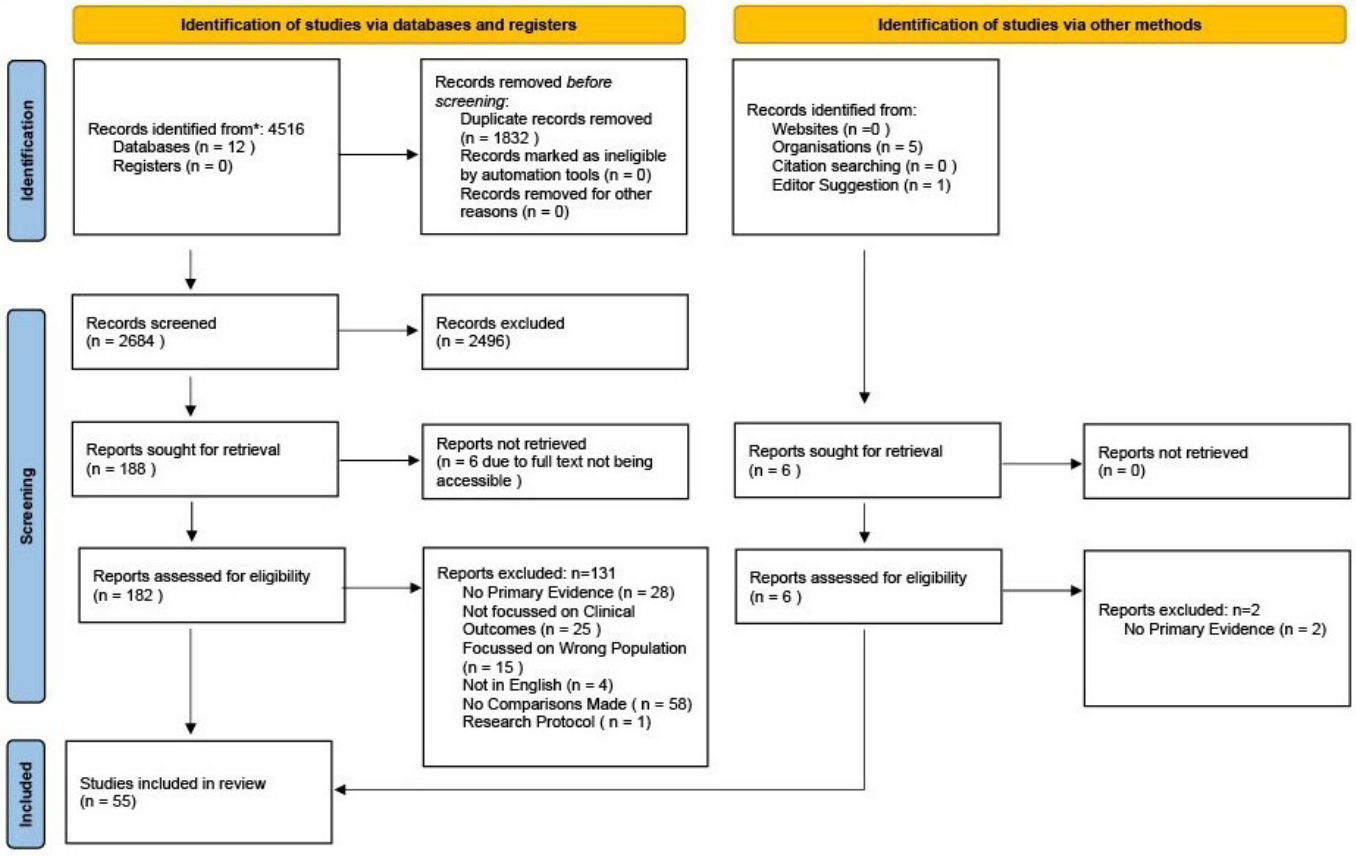

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses chart of included studies.

Although the incidence of COVID-19 was greater among PEI than in the community, some subgroups of incarcerated residents were at greater risk of seropositivity and COVID-19 incidence. Risk factors for contracting COVID-19 in PEI included Hispanic ethnicity,[36 45–47] being of non-Hispanic black ethnicity,[36 38 44 46–48] Asian ethnicity,[38] partaking in prison labour,[44 49] being in high occupancy prisons,[32] unstable housing prior to incarceration[44] shared meal consumption[44] and older age.[47 50] Higher security prisons had lower per capita rates of infection.[37] There was conflicting evidence about type of accommodation and risk factors for COVID-19. Some studies found dormitory housing was a risk factor,[32 45 49] while another found no differences compared with single cells.[44] Working or residing in a prison also increased the risk of secondary detection of COVID-19, 90 days after primary infection, by almost five times compared with the public.[51]

Correlations were seen between case rates in staff, incarcerated residents and in the wider community.[34 37 52] A US study demonstrated that once community rates reached a threshold case rate of >50 per 100 000, there was an immediate increase in the COVID-19 case rate in prisons by 118.55 cases per 100 000 (95% CI −3.71 to 240.81).[34] A rise in staff cases was associated with a rise in cases among PEI.[52] Areas of rurality and with higher economic distress scores had higher rates of COVID-19 outbreaks in local prisons.[48] One study noted time lagged an average of 1–2 weeks between peaks of infection rates in the general population and the prison population.[40]

The overall quality of evidence about infection rates of COVID-19 in the prison population was low. See table 2 for a summary of key papers comparing outcomes of PEI versus the general population.

Testing for COVID-19 in PEI

Testing for COVID-19 in prisons varied, even within countries. In the USA and Canada prisons tested on average more than the general population, but this varied between states and provinces.[29 31 53] Blair *et al* presented conflicting Canadian data relating to comparatively high testing rates in a few prisons with COVID-19 outbreaks.[29] Some facilities had no access to testing early in the pandemic, but this improved as the pandemic continued.[29 53] One study in Lombardy, Italy noted higher mean weekly testing rates per 1000 individuals in PEI compared with the general population through both first and second waves (61.09 vs 6.11 and 258.43 vs 19.73, respectively).[35] Conflicting data was found in a whole population Danish study which noted lower testing rates in PEI compared with the general population (OR 0.47 95% CI 0.46 to 0.48, p<.0001).[42]

Older PEI (age ≥55 years) had higher testing rates than younger counterparts.[50] Screening of people newly experiencing incarceration increased during the pandemic.[46] Test positivity (percentage of tests that were positive) was

Table 2 Key papers comparing infection rates of COVID-19/SARS-CoV-2 in PEI versus the general population

Study	Key results	Overall assessment of the quality of evidence	Infection rates in PEI vs general population
A large outbreak of COVID-19 in a UK prison, October 2020 to April 2021. Adamson *et al*[41]	Crude attack rate in residents 12% (95% CI 9% to 15%). Period-incidence of 60.4 cases per 1000 population for residents, lower than that of general population	Low	↓
A study of SARS-CoV-2 outbreaks in US federal prisons: the linkage between staff, incarcerated populations and community transmission. Towers *et al*[37]	Incarcerated population showed a comparative 4.32 risk ratio of per capita COVID-19 rates vs the general population (p≤.001). Significant correlation demonstrated between per capita rates in the outbreaks among the incarcerated population and the community, despite stoppage of visitation over the time period of the study. Significant difference in per capita rate demonstrated between levels of facility security level: high<minimum<medium<low Decarceration was significantly associated with a decrease in incarcerated per capita rates during the winter wave (p=.015) but not during the summer wave	Medium	↑
A time-series analysis of testing and COVID-19 outbreaks in Canadian federal prisons to inform prevention and surveillance efforts. Blair *et al*[29]	3% prevalence COVID-19 of total incarcerated population in comparison to 0.2% in general population	Low	↑
Adverse SARS-CoV-2-associated outcomes among people experiencing social marginalisation and psychiatric vulnerability: a population-based cohort study among 4,4 million people. Nilsson *et al*[42]	Reduced risk of positive SARS-CoV-2 PCR test in PEI vs general population: aIRR 0.84 (95% CI 0.80 to 0.88) p<.0001. Reduced rate of testing in PEI OR 0.47 (0.46–0.48) p<.0001	Medium	↓
Association between prison crowding and COVID-19 incidence rates in Massachusetts prisons, April 2020–January 2021. Leibowitz *et al*[32]	COVID-19 incidence rate in incarceration facilities was 965/100 000 compared with 150/100 0000 person weeks in general population during study period, incidence lower in facilities that were less full and had higher percentage of people in single cells	Low	↑
Characteristics of persons with secondary detection of severe acute respiratory syndrome coronavirus ≥90 days after first detection, New Mexico. Hicks *et al*[51]	When adjusted in multivariable model, staff or residents of incarceration facilities had higher rates of secondary SARS-CoV-2 detection (aOR 4.7 CI 1.8 to 12.1)	Low	↑
COVID-19 case and mortality rates in the Federal Bureau of Prisons. Toblin and Hagan[26]	Crude case rate for BOP 11 710 per 100 000 and 2484 for general USA. Ratio of 4.7× more cases in incarceration facilities	Medium	↑
COVID-19 cases and deaths in federal and state prisons. Saloner *et al*[27]	Case rate for PEI was 5.5× higher than in general population	Low	↑
COVID-19 cases and testing in 53 prison systems. Lemasters *et al*[31]	34 prison systems had higher case rates per thousand than general population	Low	↑

Continued

Table 2 Continued

Study	Key results	Overall assessment of the quality of evidence	Infection rates in PEI vs general population
COVID-19 community spread and consequences for prison case rates. LeMasters *et al*[34]	Mean active case rate of 427 per 100 000 in the incarcerated population compared with a rate of 215 per 100 000 in the general population. When community rates reached the threshold case rate of at least 50 per 100 000, there was an immediate increase in the COVID-19 case rate in incarceration facilities by 118.55 cases per 100 000 (95% CI –3.71 to 240.81). No significant difference between community COVID-19 rates in counties with and without an incarceration facility	Low	↑
COVID-19 in prisons: state health care contracting and the pandemic behind bars. Smith and Glidden[39]	Lower mean COVID-19 diagnoses per 10 000 (333.20, range 0–1640) compared with the general population (COVID-19 diagnoses per 100 000 1255.32, range, 74.48–20 617.31). Incarcerated residents in states who provide at least some healthcare from Department of Correction staff (as opposed to purely privately contracted healthcare) showed significantly reduced COVID-19 diagnosis rate per 10 000 (b=–448.70, p=.01). Average expenditure on healthcare per incarcerated resident had no significant effect on COVID-19 rates or mortality	Low	↓
COVID-19 incidence and mortality in federal and state prisons compared with the US population, April 5, 2020, to April 3, 2021. Marquez *et al*[28]	Crude case rate was 30 780/100 000 for PEI and 9350/100 000 for general population, incident ratio of 3.3 (95% CI 3.3 to 3.3) for incarcerated population	Low	↑
COVID-19 infection among incarcerated individuals and prison staff in Lombardy, Italy, March 2020 to February 2021. Mazzilli *et al*[35]	The study demonstrated a higher relative risk of COVID-19 infection in incarcerated residents than the general population (first wave: RR 1.30; 95% CI 1.06 to 1.58 second wave RR 3.91; 95% CI 3.73 to 4.09). A lower average weekly positivity rate per 100 individuals was noted in incarcerated individuals vs the general population however (first wave: 1.76 range, 0.00–10.68 vs 9.55 range, 1.21–37.50 second wave: 4.46 range, 0.00–17.92 vs 8.71 range, 1.16–20.71	Low	↑
COVID-19 outbreak in a large penitentiary complex, April-June 2020, Brazil. Gouvea-Reis *et al*[33]	Higher COVID-19 incidence rate in the case study incarcerated population vs the general population of the Brasilia region (1832 cases/100 000 persons vs 47 cases/100 000) Shorter mean serial case interval at 2.51 days (SD 1.21) in case study facility vs general Brazil population (figures for comparison not documented)	Low	↑
Epidemiology of coronavirus disease 2019 at a County Jail-Alameda County, California, March 2020–March 2021. Marusinec *et al*[36]	Total incidence rate during the investigation period was 280/1000 which was 5.29× (95% CI 4.87 to 5.75) higher than Alameda county, younger, Hispanic/Latino and black people had higher percentage of positive tests	Low	↑
Epidemiology of COVID-19 among incarcerated individuals and staff in Massachusetts jails and prisons. Jiménez *et al*[80]	Incidence of COVID-19 was 44.3/1000 for PEI, 2.91 times higher than Massachusetts general population and 4.8 times greater than USA general population, systems with higher testing rates had higher case rates, case incidents were higher among systems that released a lower proportion of their baseline population	Low	↑

Continued

Table 2 Continued

Study	Key results	Overall assessment of the quality of evidence	Infection rates in PEI vs general population
Epidemiology of COVID-19 in prisons, England, 2020. Rice *et al*[38]	Crude incidence in PEI in England was 988/100 000, compared with 935/100 000 in general population (not statistically different). Higher percentage of positive tests for black (6.4% vs 3.3%) and Asian (7.8% vs 7.5%) ethnic groups compared with the general population	Low	⇆
Health management in Italian prisons during COVID-19 outbreak: a focus on the second and third wave. Vella *et al*[40]	Prevalence of SARS-CoV-2 infection among PEIranging from 0.19% to 1.94% (mean 1.02%, SD 0.51%). Authors state lower prevalence than Italian general population but data supporting this not presented. Time lag on average of 1–2 weeks between peaks of infection rates in the general population and the incarcerated population on cross-correlation time lag plot	Low	↓
SARS-CoV-2 seroprevalence in the adult detainees of the Paris area in 2021: a multicenter cross-sectional study. Mellon *et al*[43]	18.2% (95% CI 16.9 to 19.4) of incarcerated population, adjusted for age/sex, were seropositive over the entire study period. Over the week 08–14 February 2021 incarcerated population seropositivity was 18.4% (95% CI 16.8 to 20.1) compared with 20.6% (95% CI 16.6 to 24.9) in the general Paris population. Statistically significant factors independently associated with seropositivity in males=lower number of cigarettes per day (p<.0001) and higher number of inmates per cell (p=.0008. In females=younger age (p=.0002) and lower number of cigarettes per day (p=.0216)	Low	↓
Seroprevalence and risk factors for SARS-CoV-2 among incarcerated adult men in Quebec, Canada 2021: a cross-sectional study. Kronfli *et al*[44]	22% of participants were seropositive over the study period. This compared with 13.75% in the comparative general population sample of Montreal blood donors. Factors with a statistically significant association with seropositivity=time spent incarcerated ('most time': aPR, 1.47; 95% CI 1.01 to 2.12; 'all time': aPR, 2.17; 95% CI 1.53 to 3.07), employment during incarceration (aPR, 1.64; 95% CI 1.28 to 2.11), shared meal consumption during incarceration ('with cellmates': aPR, 1.46; 95% CI 1.08 to 1.97; 'with sector': aPR, 1.34; 95% CI 1.03 to 1.74), and incarceration post in-prison outbreak (aPR, 2.32; 95% CI 1.69 to 3.18)	Low	↑
Testing lags and emerging COVID-19 outbreaks in federal penitentiaries: a view from Canada. Blair *et al*[53]	COVID-19 prevalence was 1.2% in incarceration facilities compared with 0.1% in general population, COVID-19 prevalence higher among women's incarceration facilities	Low	↑

aIRR, adjusted Incidence Rate Ratio; aOR, adjusted Odds Ratio; aPR, adjusted prevalence ratio; BOP, Bureau of Prisons; PCR, Polymerase Chain Reaction; PEI, people experiencing incarceration.

also greater in prisons than public settings.[31 46] Thus the more testing was undertaken, the more COVID-19 cases were identified, with higher incidence rates.[30 53] Testing strategies (eg, asymptomatic testing at defined intervals vs symptomatic testing) were generally not documented so results should be interpreted with caution.

Evidence was graded low-quality or medium-quality, with most studies reporting retrospective publicly available data, with comment on testing strategies limited. See table 3 for a summary of key papers comparing outcomes of PEI versus the general population.

Hospitalisation from COVID-19 in PEI

PEI had worse hospitalisation outcomes than the general population. A whole population Danish study found that PEI were nearly two times as likely to be hospitalised with COVID-19 (adjusted incidence rate ratio (aIRR) of hospitalisation within 14 days diagnosis 1.99, 1.64–2.40) and over twice as likely to be admitted to intensive care (aIRR of intensive care admission within 14 days 2.41, 1.56–3.72).[42] A large US study also found higher rates of hospitalisation, mechanical ventilation requirement, readmission for

Table 3 Key papers comparing testing of COVID-19/SARS-CoV-2 in people experiencing incarceration (PEI) versus the general population

Study	Key results	Overall assessment of the quality of evidence	Testing rates vs general population
A time-series analysis of testing and COVID-19 outbreaks in Canadian federal prisons to inform prevention and surveillance efforts. Blair *et al*[29]	On average, incarceration facilities tested more than the general population (88 per 1000 population compared with 40 per 1000 in public) however figures may be affected by six facilities which experienced outbreaks and far higher testing rates over the study period—64% of facilities recorded fewer tests per 1000 compared with general population. Six facilities recorded no testing at all	Low	↑
Adverse SARS-CoV-2-associated outcomes among people experiencing social marginalisation and psychiatric vulnerability: a population-based cohort study among 4,4 million people. Nilsson *et al*[42]	Reduced rate of testing in PEI vs Danish national population OR 0.47 (0.46–0.48) p<.0001	Medium	↓
COVID-19 cases and testing in 53 prison systems. Lemasters *et al*[31]	10 states and Puerto Rico reported no testing information, testing numbers varied across states from 6/1000 to 1531/1000 incarcerated people. Majority of prison systems tested more than the public, test positivity on average higher in prison systems	Low	↑
COVID-19 infection among incarcerated individuals and prison staff in Lombardy, Italy, March 2020 to February 2021. Mazzilli *et al*[35]	The study demonstrated a higher mean weekly testing rate per 1000 individuals vs the general population (first wave: 61.09 range, 0–115.44 vs 6.11 range, 1.16–10.41 second wave: 258.43 range, 123.92–573.08 vs 19.73 range, 11.68–30.09)	Low	↑
Testing lags and emerging COVID-19 outbreaks in federal penitentiaries: a view from Canada. Blair *et al*[53]	12/50 had no testing at all, 36/50 had fewer tests than the general population, those with higher testing levels tended to be those who had a high COVID-19 prevalence. Overall, number of tests in incarceration facilities 34/1000 compared with 16/1000 in general population	Low	↓

OR, Odds Ratio.

COVID-19 within 30 days of hospital discharge and longer stays following admission for COVID-19.[54] Overall, PEI presented later with more severe disease than the general population.[14]

However, two US studies found conflicting results with no significant differences in admission to intensive care or intubation rates.[14 55] This evidence was weaker, though, with a combined sample size of approximately 800 individuals from three hospital sites for both studies, compared with a total cohort of 4 412 382 individuals encompassing the entirety of the general population and prison population in the Danish study and a total cohort of 1 257 250 encompassing 3415 incarcerated people in the US study.[42 54] There was conflicting evidence on whether COVID-19 positive PEI required greater use of vasopressors than the general population.[14 55]

Certain subgroups of PEI were more likely to be admitted to hospital. Risk factors for being hospitalised with COVID-19 in PEI included heart disease[53] and older age.[45 54 56] Risk factors for admission to intensive care included autoimmune diseases and older age.[45]

Access to healthcare for PEI potentially decreased during the pandemic, with fewer admissions to hospital than usual.[57] The reduction in elective procedures was greater among PEI than in the public, widening health inequalities.[57] Only urgent cases in PEI, such as cancer and dialysis, were prioritised, potentially leading to a backlog in other medical problems.[57]

Evidence was graded low-quality or medium-quality, with most studies reporting retrospective publicly available observational data prone to inaccuracy.

Table 4 Key papers comparing hospitalisation from COVID-19 in PEI versus the general population

Study	Key results	Overall assessment of the quality of evidence	Severity of hospital related outcomes vs general population
Adverse SARS-CoV-2-associated outcomes among people experiencing social marginalisation and psychiatric vulnerability: a population-based cohort study among 4,4 million people. Nilsson *et al*[42]	aIRR (vs general population) hospitalisation within 14 days of COVID-19 diagnosis 1.99 (1.65–2.40 p≤.0001), intensive care admission within 14 days of COVID-19 diagnosis 2.41 (1.56–3.72, p=.00050)	Medium	↑
Characteristics and comparative clinical outcomes of prisoner vs non-prisoner populations hospitalized with COVID-19. Altibi *et al*[14]	PEI significantly more likely to require high flow nasal cannula O2, require vasopressor therapy and have a respiratory rate >24 on admission (p<.001) and require intubation (p=.01) vs general population	Low	↑
Characteristics and outcomes of prisoners hospitalized due to COVID-19 disease. Abdalbary *et al*[55]	No difference in need for ICU care/vasopressors/ inotropes/mechanical ventilation/ECMO support	Low	⇆
Hospitalizations for COVID-19 among US people experiencing incarceration or homelessness. Montgomery *et al*[54]	People experiencing incarceration vs general population: higher rate of hospitalisation (63.5% versus 49.7%; p<.001), more likely to be hospitalised at a younger age (median age: 56 years (IQR, 44–65) versus 65 years (IQR 52-77), more likely to require invasive mechanical ventilation (aRR 1.16; 95% CI 1.04 to 1.30), more likely to be readmitted to hospital for COVID-19 within 30 days of hospital discharge (aRR 1.45; 95% CI 1.18 to 1.78), more likely to have a longer stay in hospital following admission (aRR 1.11; 95% CI 1.06 to 1.16)	Medium	↑

aIRR, adjusted Incidence Rate Ratio; aRR, adjusted risk ratio; ECMO, Extra Corporeal Membrane Oxygenation; ICU, Intensive Care Unit; PEI, people experiencing incarceration.

See table 4 for a summary of key papers comparing outcomes of PEI versus the general population.

Mortality from COVID-19 in PEI

Standardised morality rates (SMR) from COVID-19 were higher in PEI than in the public, though this varied between and within countries.[13 26–28 58] In England and Wales, PEI had an SMR of 3.3, that is, a 3.3 times increase in COVID-19 deaths in prisoners compared with the public.[13] Two US studies noted SMRs of 4.45 and 2.89 in PEI.[59 60] Death within 60 days of COVID-19 diagnosis was over three times more likely in the Danish prison population population compared with the general population (aIRR 3.11, 95% CI 1.93 to 5.03).[42] COVID-19 contributed to a reduced life expectancy among PEI,[61 62] quantified at 4.2 years versus 1.5 years in the general population in one US study.[59]

PEI admitted to hospital had a higher in-hospital mortality rate compared with the general population.[14 54] Crude mortality rates in prisons were often equal to, or less than the community,[26 29 38 39 53 55 58 63] although these were not standardised (eg, for age). Deaths from COVID-19 disproportionately affected non-Hispanic black, Hispanic and older PEI.[45 50 62 64] All-cause mortality in PEI increased compared to pre-pandemic.[61 62]

Evidence was graded as low-quality or medium-quality, due to many reporting crude mortality rates, rather than standardised rates. See table 5 for a summary of key papers comparing outcomes of PEI versus the general population.

Vaccine uptake among PEI

Evidence regarding vaccination uptake was conflicting. A large US study of 126 413 PEI reported a slightly higher rate of full vaccination (33.4%) compared with the general population (29.5%).[65] Incarcerated residents also had more time eligible for vaccination in the community (79 days, IQR: 41–183) than in jail (14 days IQR: 3–31) and were 12.5 times (95% CI 10.2 to 15.3) more likely to consent to and receive vaccination while incarcerated than before incarceration.[66] Conversely, a Public Health Scotland report found that uptake of a full course of COVID-19 vaccine in PEI was lower than in the public.[67] This finding was

Table 5 Key papers comparing mortality from COVID-19 in PEI versus the general population

Study	Key results	Overall assessment of the quality of evidence	Mortality outcomes in PEI vs general population
A time-series analysis of testing and COVID-19 outbreaks in Canadian federal prisons to inform prevention and surveillance efforts. Blair *et al*[29]	Case fatality was 0.6% in prisons compared with estimated 10% in general population	Low	↓
Adverse SARS-CoV-2-associated outcomes among people experiencing social marginalisation and psychiatric vulnerability: a population-based cohort study among 4,4 million people. Nilsson *et al*[42]	aIRR Death within 60 days of COVID-19 diagnosis 3.11 (95% CI 1.93 to 5.03, p≤.0001). Rate of all cause mortality rate ratio over study period 9.44 (95% CI 6.43 to 13.88, p≤.0001) in prison residents with COVID-19 infection vs 4.00 (95% CI 3.87 to 4.13, p≤.0001) in the general population with COVID-19 infection	Medium	↑
Age and COVID-19 mortality in the United States: a comparison of the prison and general population. Nowotny *et al*[60]	Increased standardised mortality ratio of 2.89 (95% CI 2.78 to 3.00) in the prison population vs general population. Prison residents died at younger ages than the general population	Low	↑
Assessing the mortality impact of the COVID-19 pandemic in Florida state prisons. Marquez *et al*[61]	Increase in mortality in 2020 when compared with 2019 for prisoners (aRR 1.56 (95% CI 1.39 to 1.76) compared to 2019 when using bootstrapping), Monthly median posterior estimates of excess mortality were found to be strongly and significantly correlated with monthly reported deaths related to COVID-19 (80.4%, p<.01), life expectancy decreased by 4.12 years between 2019 and 2020	Medium	↑
Characteristics and comparative clinical outcomes of prisoner vs non-prisoner populations hospitalized with COVID-19. Altibi *et al*[14]	In-hospital mortality was higher for prisoners with an adjusted OR of 2.32 (95% CI 1.33 to 4.05 statistically significant) (adjusted for age, sex, race, CCI and obesity)	Medium	↑
Characteristics and outcomes of prisoners hospitalized due to COVID-19 disease. Abdalbary *et al*[55]	No significant difference in mortality of hospitalised patients with kidney involvement compared with the general population	Low	⇆
COVID-19 case and mortality rates in the Federal Bureau of Prisons. Toblin and Hagan[26]	SMR for age and sex was 2.6 for prisoners compared with general population	Medium	↑
COVID-19 cases and deaths in federal and state prisons. Saloner *et al*[27]	Crude death rate not statistically different, SMR in PEI adjusted for age and sex = 3.0 versus general population	Low	↑
COVID-19 in prisons: state health care contracting and the pandemic behind bars. Smith and Glidden[39]	Lower mean COVID-19 deaths per 10 000 (3.67, range 0–25) in the incarcerated population compared with the general population (COVID-19 deaths per 100 000 66.04 1.34–1646.11) Incarcerated residents in states who provide at least some healthcare from Department of Correction staff (as opposed to purely privately contracted healthcare) showed significantly reduced COVID-19 deaths per 100 000 (b=–3.47, p=.04) Average expenditure on healthcare per incarcerated resident had no significant effect on COVID-19 rates or mortality	Low	↓
COVID-19 incidence and mortality in federal and state prisons compared with the US population, April 5, 2020 to April 3, 2021. Marquez *et al*[28]	SMR was 2.5 (95% CI, 2.3 to 2.7) in PEI versus general population	Medium	↑

Continued

Table 5 Continued

Study	Key results	Overall assessment of the quality of evidence	Mortality outcomes in PEI vs general population
Disparities in COVID-19 related mortality in U.S. prisons and the general population. Nowotny *et al*[58]	adjusted SMR (for age and sex) was 2.75 in comparison to the general public, crude mortality rate of 50/10 000 in prisons compared with 40/10 000 in general public, SMR varied hugely between states, with some states going up to 10.56 that of the general population	Low	↑
Epidemiology of COVID-19 in prisons, England. 2020 Rice *et al*[38]	CFR= 3.13% (95% CI 2 to 4.67) in prisons compared with in 8% in England over study time, CFR for over 66 in prison was 15.5% but no comparison to the over 66s in the general public	Low	↓
Hospitalizations for COVID-19 among US people experiencing incarceration or homelessness. Montgomery *et al*[54]	People experiencing incarceration more likely to die in hospital than general population following COVID-19 related admission (aRR, 1.28; 95% CI 1.11 to 1.47)	Medium	↑
Indirect age- and sex-standardisation of COVID-19-related mortality rates for the prison population of England and Wales. Braithwaite *et al*[13]	SMR = 3.3 (95% CI 2.77 to 3.98) in PEI versus general population	Medium	↑
Life expectancy and COVID-19 in Florida state prisons. Marquez *et al*[59]	Standardised COVID-19 mortality rate for the incarcerated population was 4.45 times that of the general population (203.9 deaths per 100 000—IRR=4.45, 95% CI 3.85 to 5.15, p<.001). COVID-19 contributed to a reduction of life expectancy in the incarcerated population of 4.2 years vs 1.5 years in the general population. In 2020, the standardised mortality rate of the incarcerated population was 626.9 deaths per 100 000 individuals vs 597.3 deaths per 100 000 individuals in the general population	Low	↑
SARS-CoV-2 among inmates aged over 60 during a COVID-19 outbreak in a penitentiary complex in Brazil: positive health outcomes despite high prevalence. Gouvea-Reis *et al*[63]	0% mortality rate in the sampled population (159 residents with 90.6% test positivity rate). Per reported general population data for the Federal District of Brazil, mortality rate is lower than expected—per reported positive test numbers in the penitentiary, the following numbers of deaths per age group would be expected: 60–69=6.032 deaths, 70–79=2.875 deaths, 80+=1.38 deaths	Low	↓
Testing lags and emerging COVID-19 outbreaks in federal penitentiaries: a view from Canada. Blair *et al*[53]	Case fatality estimates of 0.5% in prisons compared with 0.3% in general population	Low	↑

aIRR, adjusted incidence rate ratio; aRR, adjusted risk ratio; CCI, Charlson Comorbidity Index; CFR, Case Fatality Ratio ; IRR, incidence rate ratio; PEI, people experiencing incarceration; RR, risk ratio; SMR, standardised morality rates.

echoed by a Danish whole population study demonstrating that PEI during 2020 in Denmark were half as likely to complete a full course of COVID-19 vaccination as the general population (aIRR 0.5 95% CI 0.5 to 0.5).[68]

Two studies highlighted the importance of re-offering vaccines to PEI with significant numbers accepting the second time, after having previously declined a dose.[69 70] PEI were more likely to accept vaccination if they were older, had comorbidities associated with severe COVID-19 illness, a higher level of education, identified as white or Hispanic ethnicity, were not born in the USA, had experienced prior SARS-CoV-2 infection, were involved in working activities in the prison or resided in shared rooms.[50 65 69–71]

Factors correlating with lower vaccine uptake included declining additional information about COVID-19 vaccine, non-Hispanic black or Asian ethnicity.[65 71] Worrying about side-effects and wanting more information were reasons why vaccines were not accepted by some.[72]

Table 6 Key papers comparing COVID-19 vaccine uptake among PEI versus the general population

Study	Key results	Overall assessment of the quality of evidence	Vaccination uptake in PEI vs general population
Association of state COVID-19 vaccination prioritization with vaccination rates among incarcerated persons. Biondi *et al*[73]	21 of the sampled states prioritised vaccination of incarcerated residents. States with policies that prioritised vaccination of incarcerated people had significant increases in vaccination rates compared with other states over time. In states with no prioritisation policy, vaccination rates in the general population were higher than in incarcerated people	Low	↓
COVID-19 vaccination in the Federal Bureau of Prisons, December 2020—April 2021. Hagan *et al*[65]	Median of 33.4% (range 12.6%–59.3%) of incarcerated residents and staff had received a full course of vaccinations by the end of the study vs a median of 29.5% (range 20.3%–37.8%) of the general adult population. COVID-19 vaccination was offered to 100% of staff and 69.8% of incarcerated residents over the study period. Acceptance rates were 50.2% for staff and 64.2% for residents. Factors increasing odds of vaccine acceptance include: Increasing age compared with the <40 years age group (≥75 years aOR=2.71, 95% CI 2.09 to 3.52), higher number of medical conditions associated with severe COVID-19 illness (six conditions aOR=2.99, 95% CI 2.46 to 3.63), having a prior SARS-CoV-2 infection (aOR=1.08, 95% CI 1.05 to 1.12), place of birth outside of the USA (aOR=1.42, 95% CI 1.34 to 1.51), unknown country of birth (aOR=1.42, 95% CI 1.14 to 1.77). Factors decreasing odds of vaccine acceptance include: female sex vs male (aOR=0.60, 95% CI 0.53 to 0.67) non-Hispanic black race (aOR=0.43, 95% CI 0.41 to 0.44) or Asian race (aOR=0.79, 95% CI 0.68 to 0.91) vs non-Hispanic white race	Low	↑
Vaccination against SARS-CoV-2 infection among vulnerable and marginalised population groups in Denmark: a nationwide population-based study. Nilsson *et al*[68]	Incarcerated population half as likely to complete full course of COVID-19 vaccination than the general population (aIRR 0.5 95% CI 0.5 to 0.5)	Medium	↓
Vaccination for SARS-CoV-2 and risk of COVID disease among those in prison care in Scotland, public health Scotland. Unpublished work Wilkinson *et al*[67]	74% of PEI had first dose compared with 72% in general population, 63% of PEI had two doses of the vaccine compared with 68% in the general population, 31% PEI had booster compared with 38% in general population	Medium	↓

aIRR, adjusted incidence rate ratio; aOR, adjusted OR; PEI, people experiencing incarceration.

Conflicting evidence was noted around the role of female sex in vaccine uptake: one study[71] reporting increased uptake of vaccination but another US study noting lower uptake.[65]

Vaccination policy, which varied significantly between US states, appeared to affect uptake.[72] Facilities with similar risk factors, such as long-term care facilities, were prioritised in 'phase 1' in all vaccine plans. State plans did not usually specify in which phase PEI should be vaccinated, and only 22% of plans included them in 'phase 1'.[72] One study showed that US states with policies that prioritised vaccination for PEI had higher vaccination rates compared with other states over time. In states with no prioritisation policy, vaccination rates were lower among PEI than for the general population.[73]

Evidence on vaccine uptake was low-quality, with limited comparisons to the general population and may not be generalisable to other prison populations. See table 6 for a summary of key papers comparing outcomes of PEI versus the general population.

Mental health outcomes of PEI during the COVID-19 pandemic

Overall, deteriorating mental health of PEI during the pandemic was reported. Depression and anxiety scores worsened from pre-pandemic comparisons.[10 74 75] There was a significant increase in suicide attempts and self-harm events in a Swiss prison comparing 2020 to 2016–2019.[76] One study from China noted worsening levels of anxiety in those with no pre-pandemic mental health diagnoses but an improvement in anxiety scores in those with a pre-pandemic diagnosis.[77] An Ethiopian study reported high rates of major depressive disorder (66.4% vs 41.9%–56.4%) and generalised anxiety disorder (66.9% vs 36.1%) among PEI compared with pre-pandemic studies.[75]

Evidence about the mental health was low-quality, due to small sample sizes with limited demographics noted. Instruments to measure mental health outcomes were often heterogeneous between studies and self-reported. Studies lacked general population comparison groups. See table 7 for a summary of key

Table 7 Key papers comparing mental health outcomes among people experiencing incarceration (PEI) during the COVID-19 pandemic

Study	Key results	Overall assessment of the quality of evidence	Mental health outcomes in PEI pre-/post-pandemic
Older incarcerated persons' mental health before and during the COVID-19 pandemic. DePalma *et al*[10]	PHQ-8 depression scores (5.5±6.0 vs 8.1±6.5; p<.001) and GAD-7 scores (6.4±5.7 vs 7.8±6.6; p<.001) both increased (more severe symptoms) during the COVID-19 pandemic compared with prior to it. A greater proportion of respondents scored a clinically significant PHQ-8 score (≥10) during the COVID-19 pandemic compared with prior (38.2% vs 22.4%). Average SRH score worsened by −0.31 (p<.001). Causal mediation model results demonstrated that worsening PHQ-8 scores predicted worsening SRH rating (β=−0.040; p<.05)	Low	↑
Suicide attempts and COVID-19 in prison: empirical findings from 2016 to 2020 in a Swiss prison. Gétaz *et al*[76]	57% statistically significant increase in suicides RR 1.57 (95% CI 1.10 to 2.04 $p < .001$) and self-harm events RR 1.57 (95% CI 1.23 to 1.92 $p < .001$) during the pandemic compared with pre-pandemic	Low	↑
Anxiety during the COVID-19 pandemic in prisoners who had high risks to suffer from mood disorders: a longitudinal study before and during the COVID-19. Zhang *et al*[77]	Significant trend of anxiety scores improving during the pandemic compared with prior to it (p≤.001). Significantly worsened anxiety scores during the pandemic in those who did not have anxiety prior to the pandemic (p≤.001, n=480). Improved anxiety scores for those who were suffering from anxiety pre-pandemic (p≤.001, n = 323)	Low	↑
County jails' responses to COVID-19: practices, procedures, and provisions of behavioural health services. Comartin *et al*[74]	Rates of significant mental illness in residents significantly higher during the early pandemic 'spring' period (40.5%, n=34) compared with the pre-pandemic 'winter' period (29.7%, n=33), with the lowest proportion found in summer (22.5%, n=43) (p<.01). The same relationship was noted in the proportion of residents who confirmed having taken psychotropic medication in the last year—highest during the spring (40.5%, n=34), compared with winter (36.7%, n=40) and summer (18.8%, n=36; p<.001)	Low	↑
Depressive, anxiety symptom frequency and related factors among prisoners during the COVID-19 pandemic in Northeastern Ethiopia, a cross-sectional study. Birkie *et al*[75]	279 (66.4%; 95% CI 61.4 to 70.6) of incarcerated residents met the threshold score for major depressive disorder (PHQ-9 score ≥10). 281 (66.9%; 95% CI 61.9 to 71.9) met the threshold for generalised anxiety disorder (GAD-7 score >10). This contrasts with pre-pandemic studies in the Ethiopian incarcerated population quoted by the authors where depression prevalence rates ranged from 41.9% to 56.4% and anxiety prevalence rate was 36.1%	Low	↑

GAD-7, Generalised Anxiety Disorder 7-item Questionnaire; PHQ-9, Patient Health Questionnaire 9; RR, Relative Risk; SRH, Self Rated Health.

papers comparing outcomes of PEI versus the general population.

DISCUSSION

Principal findings

PEI had higher infection rates and worse COVID-19 clinical outcomes, including hospitalisation, mortality and mental health outcomes, compared with the general population. People with black and Hispanic ethnicity had worse COVID-19 outcomes overall compared with their white counterparts. Older PEI showed poorer outcomes across several domains including higher COVID-19 incidence, testing rates, hospitalisation and mortality related to COVID-19. Testing rates varied greatly between institutions and countries.

Evidence regarding vaccine uptake was conflicting. Prioritisation of incarcerated populations for vaccination varied between countries and regions. Poorer access to healthcare and not always being prioritised for vaccination contributed to widening of health inequalities in an already under-served population.[57 72]

Significant health inequalities have been demonstrated. There is a suggestion that health inequalities may have widened—several studies demonstrated worsened mental health outcomes and all-cause mortality rates compared with pre-pandemic data in PEI.[10 61 62 74–77] However, there are insufficient longitudinal studies comparing outcomes pre-/post-pandemic with the general population to confidently determine whether pre-existing inequalities between PEI and the general population widened during the pandemic.

Context of other literature

This review supports other literature showing that PEI have poor outcomes and high transmission rates from infectious disease, and specifically COVID-19. Incarceration facilities and pre-existing conditions suffered by many PEI facilitate spread of infectious diseases.[2] The pre-pandemic infectious disease burden in prisons was high including tuberculosis, hepatitis and other communicable disease, now exacerbated by COVID-19.[78 79]

The reasons behind poorer outcomes from COVID-19 in PEI are likely to be complex and multi-factorial. Evidence suggests an interplay of overcrowding, limited healthcare access, pre-existing health conditions and higher respiratory illness risk factors, lack of continuity of care and reduced preventative measures such as lower vaccination rates and poorer health education.[1 40 49 62 80–85]

Prevalence of long COVID in PEI remains a notable absence from published literature. A lack of long-duration longitudinal/cohort studies is a contributory reason for this. A systematic review of long COVID prevalence in the general population noted a pooled estimate of prevalence between 13.6% and 43.9%, depending on definition and method of measurement.[86] The review also noted increased prevalence in hospitalised patients.[86] Given the increased hospitalisation rates and poorer COVID-19 outcomes evident in PEI, long COVID burden in PEI is likely to be substantial.

Two prior systematic reviews assessed the impact of COVID-19 in PEI, with evidence up to October 2021,[17] and February 2022.[18] Findings from the more recently published data included in our review are consistent with those of the previous reviews, suggesting that the disparities in outcomes (infection rates, hospitalisation rates and outcomes and mortality) have persisted and not been mitigated. A prior scoping review specifically assessed mental health outcomes of PEI during the COVID-19 pandemic, also showing worsening mental health outcomes.[11] Data from a whole population Danish study, however, found comparable rates of self-harm among PEI who tested positive for SARS-CoV-2 compared with those who did not.[87]

The present review's findings appear consistent with other systematic reviews in minoritised groups. Ogbonna *et al* reviewed COVID-19 outcomes in people experiencing homelessness, demonstrating higher rates of hospitalisation, increased mortality rates, lower vaccination rates and poorer mental health outcomes compared with the general population.[88] Several authors have noted a higher COVID-19-related mortality rate in residents of long-term care facilities.[89 90] Though these two groups are clinically and epidemiologically distinct from PEI, there are multiple common factors evident. A whole population Danish study also demonstrated higher rates of adverse outcomes such as hospitalisation, intensive care admission and mortality in subjects with a low educational level, and those with a history of substance misuse, psychiatric admission or severe mental health illness.[42]

Implications for policy and practice

PEI are a vulnerable population who could benefit from implementation of mitigating interventions and better access to healthcare. Given the poorer outcomes shown, this vulnerable group should be prioritised in national policy in the event of further waves of COVID-19 or for different potential future pandemics. Where vaccines exist, vaccination is essential to improving COVID-19 outcomes in PEI. Prioritisation for vaccination in this vulnerable group significantly increased vaccine uptake to levels above that of the general population and should be integral to future vaccine policy.[73] Education about vaccine importance and re-offering vaccines to people who previously declined are also warranted.[69 70]

Certain minoritised groups including non-Hispanic black, black ethnic minority groups and older PEI had poorer outcomes following COVID-19 infection.[47 48 50 64] The burden of COVID-19 in prisons in rural and socioeconomically disadvantaged areas was also higher.[48] Mitigation strategies are required for these vulnerable groups and areas.

Mental health outcomes deteriorated during the COVID-19 pandemic for PEI. Further support is necessary, considering the high baseline psychiatric morbidity in prisoners, and the decline seen during the pandemic.[11]

Further research

High-quality evidence was lacking about the COVID-19 outcomes of PEI. Many studies were of low quality, relying on third-party observational data, and prone to bias. No research on longer-term outcomes such as long COVID was identified but this is needed to assess the full effect of the pandemic on PEI. Longer-term data will also help to quantify whether health inequalities have grown further as a result of the pandemic. Again, in the event of further waves of COVID-19 or for different potential future pandemics, higher quality evidence documenting incidence and testing rates/strategies together and further analysis of different prison subgroups is necessary. More international data are required to assess transferability of results from this systematic review to other incarceration systems. Higher-quality studies from nations with comparative incarceration and healthcare systems may have more generalisable and transferable findings.

Data assessing mental health outcomes in more detail with control groups from the general population should also be prioritised. The effectiveness of any mitigating interventions should be evaluated by high-quality randomised controlled trials. We recognise that performing such studies in the context of incarceration facilities is highly complex and potentially challenging. Quality of studies could be improved with better pandemic readiness allowing prison teams to immediately liaise with researchers so that prospective verifiable data could be collected rather than relying on third party (eg, governments/prisons, unconnected with the research teams themselves) retrospective data.

Strengths and limitations

Our review is the most current assessment of COVID-19 outcomes in PEI worldwide. The study focuses on objective data relating to clinical outcomes and makes comparisons, both within incarceration facilities and with the general population, highlighting significant health inequalities. The protocol was registered on PROSPERO and Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed.[25] Comprehensive search terms generated evidence from both high-income and low/middle-income countries.

Incidence rates were often reported without testing rate documentation and outcomes without standardisation for age or comorbidity. Heterogenous testing strategies across countries, regions and institutions between the general population and PEI mean comparisons between data should be interpreted with caution. Crude mortality rates between the general and prison population were often reported and should also be interpreted with care. Other confounders, such as pre-existing conditions, which could impact mortality, were often not identified.

Study limitations include that only 10% of the eligibility assessment was duplicated. Studies were excluded if not published in English, potentially leading to some selection bias. Most studies (~65%) were based in the USA which may limit transferability of overall findings to other nations with different prison systems and COVID-19 burdens.

The included studies varied greatly in terms of their measured outcomes, testing strategies, data collection time, comorbidities of subjects (variably reported), vaccination coverage of subjects (often unreported) and epidemiology of COVID-19 conditions both within and between included countries. This heterogeneity was considered too great to allow for meaningful meta-analysis. The limitations of inappropriate use of random-effects model meta-analysis in systematic reviews of highly heterogeneous studies have been highlighted.[91–93] Nevertheless, the lack of meta-analysis is a limitation of this study and a common issue faced by systematic reviews looking to assess impacts of the COVID-19 pandemic on small population groups in differing regions/countries, for example, long-term care facility residents and people experiencing homelessness.[88 90]

CONCLUSION

PEI had poor COVID-19 clinical outcomes such as higher incidence and rates of hospitalisation, poorer hospital outcomes, higher mortality and worsening mental health outcomes. However, the true and lasting impact of COVID-19 on PEI cannot be assessed due to research gaps, low-quality evidence and heterogeneous results. Outcomes, especially the long-term effects of COVID-19, and the effectiveness of mitigating COVID-19 interventions should be assessed, so that management of this pandemic (if there are further waves) or any potential future pandemics, is evidence-based.

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Appendix 1: Search Strategy of Databases and Results Yielded

Appendix 1a – COVID-19 Search String

Developed by Mala Mann and Elizabeth Gillin for the Wales COVID-19 Evidence Centre

exp Coronavirus/
COVID-19/
((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw
(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab,kw
((outbreak* or pandemic* or epidemic*) adj10 (wuhan or hubei or china or Chinese or Huanan)).ti,ab,kw

Appendix 1b – Database Search String & Results

SEARCH ROUND 2

Medline via OVID

Searched 21/10/22

Search Number	Search String	Number of results yielded
#1	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw.	4969
#2	(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab,kw.	309682
#3	((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).ti,ab,kw.	10968
#4	Exp Coronavirus/	152809
#5	Exp COVID-19/	192613
#6	#1 OR #2 OR #3 OR #4 OR #5	326642
#7	(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").ti,ab,kw.	72651
#8	Exp Prisons/	11465
#9	Exp Prisoners/	18259
#10	#7 OR #8 OR #9	79586
#11	**#10 AND #6**	**982**
#12	**limit 11 to dt=20211217-20221021**	**297**

Social Policy and Practice via OVID DONE

Search Number	Search String	Number of results yielded
#1	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab.	11
#2	(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab.	5121
#3	((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).ti,ab.	19
#4	#1 OR #2 OR #3	5126
#5	(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").ti,ab.	19148
#6	**#4 AND #5**	**150**
#7	**limit 6 to yr="2021 -Current"**	**81**

Criminology Connection DONE
From after 17.12.21

Search Number	Search String	Number of results yielded
#1	ab(((corona* or corono*) N/1 (virus* or viral* or virinae*)))	2
#2	ti(((corona* OR corono*) NEAR/1 (virus* OR viral* OR virinae*)))	0
#3	ti((coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS- CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome))	895
#4	ab((coronavirus* OR coronovirus* OR coronaviri* OR 2019-nCoV OR 2019nCoV OR nCoV2019 OR nCoV-2019 OR covid-19* OR covid19* OR ncov* OR n-cov* OR HCoV* OR SARS-CoV-2 OR SARSCoV-2 OR SARSCov2 OR SARS-CoV2 OR severe acute respiratory syndrome))	918
#5	ab(((outbreak* OR pandemic* OR epidemic*) N/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan)))	9
#6	ti(((outbreak* OR pandemic* OR epidemic*) NEAR/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan)))	6
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	1217
#8	ti((Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"))	5798
#9	ab((Prison* OR incarcerat* OR "detention* center*" OR jail* OR penal OR gaol* OR inmate* OR "youth* offender*" OR "penal system*" OR detain* OR offender* OR criminal* OR perpetrator* OR "correction* facilit*"))	2506
#10	#8 OR #9	7373
#11	**#10 AND #7**	**144**

Assia via Proquest DONE

Search number	Search Strategy	Number of results yielded
#1	ab(((corona* or corono*) N/1 (virus* or viral* or virinae*)))	10
#2	ti(((corona* OR corono*) NEAR/1 (virus* OR viral* OR virinae*)))	1
#3	ti((coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS- CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome))	2546
#4	ab((coronavirus* OR coronovirus* OR coronaviri* OR 2019-nCoV OR 2019nCoV OR nCoV2019 OR nCoV-2019 OR covid-19* OR covid19* OR ncov* OR n-cov* OR HCoV* OR SARS-CoV-2 OR SARSCoV-2 OR SARSCov2 OR SARS-CoV2 OR severe acute respiratory syndrome))	3100
#5	ab(((outbreak* or pandemic* or epidemic*) N/10 (Wuhan or Hubei or China or Chinese or Huanan)))	63
#6	ti(((outbreak* OR pandemic* OR epidemic*) NEAR/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan)))	40
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	3373

#8	ti((Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"))	436
#9	ab((Prison* OR incarcerat* OR "detention* center*" OR jail* OR penal OR gaol* OR inmate* OR "youth* offender*" OR "penal system*" OR detain* OR offender* OR criminal* OR perpetrator* OR "correction* facilit*"))	1025
#10	#8 OR #9	1070
#11	**#10 AND #7**	**49**

Embase via OVID
DONE

Search Number	**Search String**	**Number of results yielded**
#1	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw.	5371
#2	(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab,kw.	336,580
#3	((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).ti,ab,kw.	10,793
#4	Exp Coronavirus/	99,740
#5	Exp COVID-19/	268,335
#6	#1 OR #2 OR #3 OR #4 OR #5	371,977
#7	(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").ti,ab,kw.	94,353
#8	Exp Prisons/	2,355
#9	Exp Prisoners/	19,956
#10	#7 OR #8 OR #9	99,081
#11	**#10 AND #6**	**1,063**
#12	**limit 11 to dd=20211217-20221021**	**148**

SCOPUS
DONE

Search Number	**Search String**	**Number of results yielded**
#1	TITLE-ABS ((corona* or corono*) W/1 (virus* or viral* or virinae*)).	4,527
#2	TITLE-ABS((coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome))	54,569
#3	TITLE-ABS((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).	7,162
#4	#3 OR #4 OR #5	28,048
#5	TITLE-ABS(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").	63,848
#6	**#4 AND #5**	**118**

WEB SCIENCE DONE

Search number	**Search Strategy**	**Number of results yielded**
#1	TI=((corona* or corono*) NEAR/1 (virus* or viral* or virinae*))	45
#2	AB=((corona* OR corono*) NEAR/1 (virus* OR viral* OR virinae*))	256
#3	AB=(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS- CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome)	22,282
#4	TI=(coronavirus* OR coronovirus* OR coronaviri* OR 2019-nCoV OR 2019nCoV OR nCoV2019 OR nCoV-2019 OR covid-19* OR covid19* OR ncov* OR n-cov* OR HCoV* OR SARS-CoV-2 OR SARSCoV-2 OR SARSCov2 OR SARS-CoV2 OR severe acute respiratory syndrome)	19,277
#5	TI=((outbreak* or pandemic* or epidemic*) NEAR/10 (Wuhan or Hubei or China or Chinese or Huanan))	185

#6	AB=((outbreak* OR pandemic* OR epidemic*) NEAR/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan))	420
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	27,008
#8	AB=((Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"))	1,717
#9	TI=((Prison* OR incarcerat* OR "detention* center*" OR jail* OR penal OR gaol* OR inmate* OR "youth* offender*" OR "penal system*" OR detain* OR offender* OR criminal* OR perpetrator* OR "correction* facilit*"))	764
#10	#8 OR #9	1,955
#11	**#10 AND #7**	**96**

CINAHL DONE
From Dec 21- Oct 22

Search number	**Search Strategy**	**Number of results yielded**
#1	TI (corona* or corono*) w1 (virus* or viral* or virinae*)	23
#2	AB (corona* or corono*) w1 (virus* or viral* or virinae*)	118
#3	TI (coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome)	25,258
#4	AB (coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome)	20,774
#5	TI (outbreak* or pandemic* or epidemic*) w10 (Wuhan or Hubei or China or Chinese or Huanan)	105
#6	AB (outbreak* or pandemic* or epidemic*) w10 (Wuhan or Hubei or China or Chinese or Huanan)	156
#7	(MH “COVID-19”)	7,246
#8	(MH “Coronavirus+”)	474
#9	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8	32,174
#10	TI (Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*")	756
#11	AB (Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*")	1,700
#12	(MH “Prisoners”)	338
#13	(MH “Correctional Facilities”)	305
#14	#10 OR #11 OR #12 OR #13	1,952
#15	**#9 AND #14**	**120**

COCHRANE REVIEW
Limited to last year DONE

Search Number	**Search Strategy**	**Number of results yielded**
#1	(coronavirus or coronavirus or covid* or SARSCoV2):ti,ab,kw.	0
#2	(prison* or incarcerat* or ‘detention* center*’ or jail* or penal or gaol* or inmate* or ‘youth offender*’ or ‘penal system*’ or detain* or offender* or criminal* or perpetrator* or ‘correction* facilit*’):ti,ab,kw.	284
#3	MeSH descriptor: [COVID-19] explode all trees	2317
#4	MeSH descriptor: [Coronavirus] explode all trees	1141
#5	MeSH descriptor: [Prisons] in all MeSH products	348
#6	#1 or #3 or #4	1571
#7	#2 or #5	284
#8	#6 AND #7	**3**

Cochrane COVID-19 Reviews
Hand searched 0

COVID-19 Evidence Reviews
Hand Searched 0

L*OVE COVID-19 Evidence
From Dec 17 2021 DONE

Search Number	Search Strategy	Number of results yielded
#1	Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"	**358**

SEARCH ROUND 1

Medline via OVID

Searched 17/12/21

Search Number	Search String	Number of results yielded
#1	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw.	4,029
#2	(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab,kw.	216,665
#3	((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).ti,ab,kw.	9,306
#4	Exp Coronavirus/	112,908
#5	Exp COVID-19/	126,653
#6	#1 OR #2 OR #3 OR #4 OR #5	231,152
#7	(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").ti,ab,kw.	69,211
#8	Exp Prisons/	11,089
#9	Exp Prisoners/	17,815
#10	#7 OR #8 OR #9	76,125
#11	**#10 AND #6**	**691**

Social Policy and Practice via OVID

Searched 17/12/21

Search Number	Search String	Number of results yielded
#1	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab.	12
#2	(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab.	2,952
#3	((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).ti,ab.	14
#4	#1 OR #2 OR #3	2,957
#5	(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").ti,ab.	16,051
#6	**#4 AND #5**	**98**

Criminology Connection via ProQuest

Searched 17/12/21

Search Number	Search String	Number of results yielded
#1	ab(((corona* or corono*) N/1 (virus* or viral* or virinae*)))	10
#2	ti(((corona* OR corono*) NEAR/1 (virus* OR viral* OR virinae*)))	1

#3	ti((coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS- CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome))	2264
#4	ab((coronavirus* OR coronovirus* OR coronaviri* OR 2019-nCoV OR 2019nCoV OR nCoV2019 OR nCoV-2019 OR covid-19* OR covid19* OR ncov* OR n-cov* OR HCoV* OR SARS-CoV-2 OR SARSCoV-2 OR SARSCov2 OR SARS-CoV2 OR severe acute respiratory syndrome))	1944
#5	ab(((outbreak* OR pandemic* OR epidemic*) N/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan)))	65
#6	ti(((outbreak* OR pandemic* OR epidemic*) NEAR/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan)))	18
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	3184
#8	ti((Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"))	141,936
#9	ab((Prison* OR incarcerat* OR "detention* center*" OR jail* OR penal OR gaol* OR inmate* OR "youth* offender*" OR "penal system*" OR detain* OR offender* OR criminal* OR perpetrator* OR "correction* facilit*"))	206,694
#10	#8 OR #9	271,816
#11	**#10 AND #7**	**526**

ASSIA via ProQuest

Searched 17/12/21

Search number	**Search Strategy**	**Number of results yielded**
#1	ab(((corona* or corono*) N/1 (virus* or viral* or virinae*)))	45
#2	ti(((corona* OR corono*) NEAR/1 (virus* OR viral* OR virinae*)))	9
#3	ti((coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS- CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome))	4,705
#4	ab((coronavirus* OR coronovirus* OR coronaviri* OR 2019-nCoV OR 2019nCoV OR nCoV2019 OR nCoV-2019 OR covid-19* OR covid19* OR ncov* OR n-cov* OR HCoV* OR SARS-CoV-2 OR SARSCoV-2 OR SARSCov2 OR SARS-CoV2 OR severe acute respiratory syndrome))	5,340
#5	ab(((outbreak* or pandemic* or epidemic*) N/10 (Wuhan or Hubei or China or Chinese or Huanan)))	320
#6	ti(((outbreak* OR pandemic* OR epidemic*) NEAR/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan)))	134
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	6,375
#8	ti((Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"))	21,923
#9	ab((Prison* OR incarcerat* OR "detention* center*" OR jail* OR penal OR gaol* OR inmate* OR "youth* offender*" OR "penal system*" OR detain* OR offender* OR criminal* OR perpetrator* OR "correction* facilit*"))	43,603
#10	#8 OR #9	48,127
#11	**#10 AND #7**	**138**

EMBASE via OVID

Searched 17/12/21

Search Number	**Search String**	**Number of results yielded**
#1	((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw.	4,104
#2	(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome).ti,ab,kw.	216,882
#3	((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).ti,ab,kw.	9,148
#4	Exp Coronavirus/	71,390
#5	Exp COVID-19/	168,527
#6	#1 OR #2 OR #3 OR #4 OR #5	242,020
#7	(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").ti,ab,kw.	90,051

#8	Exp Prisons/	1,407
#9	Exp Prisoners/	19,303
#10	#7 OR #8 OR #9	94,620
#11	**#10 AND #6**	**675**

SCOPUS

Searched 17/12/21

Search Number	Search String	Number of results yielded
#1	TITLE-ABS ((corona* or corono*) W/1 (virus* or viral* or virinae*)).	4,954
#2	TITLE-ABS((coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome))	36,854
#3	TITLE-ABS((outbreak* or pandemic* or epidemic*) adj10 (Wuhan or Hubei or China or Chinese or Huanan)).	12,645
#4	#3 OR #4 OR #5	51,846
#5	TITLE-ABS(Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*").	224,652
#6	**#4 AND #5**	**78**

Web Of Science

Searched 17/12/21

Search number	Search Strategy	Number of results yielded
#1	TI=((corona* or corono*) NEAR/1 (virus* or viral* or virinae*))	790
#2	AB=((corona* OR corono*) NEAR/1 (virus* OR viral* OR virinae*))	3,290
#3	AB=(coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS- CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome)	171,102
#4	TI=(coronavirus* OR coronovirus* OR coronaviri* OR 2019-nCoV OR 2019nCoV OR nCoV2019 OR nCoV-2019 OR covid-19* OR covid19* OR ncov* OR n-cov* OR HCoV* OR SARS-CoV-2 OR SARSCoV-2 OR SARSCov2 OR SARS-CoV2 OR severe acute respiratory syndrome)	202,346
#5	TI=((outbreak* or pandemic* or epidemic*) NEAR/10 (Wuhan or Hubei or China or Chinese or Huanan))	3,274
#6	AB=((outbreak* OR pandemic* OR epidemic*) NEAR/10 (Wuhan OR Hubei OR China OR Chinese OR Huanan))	8,896
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	246,600
#8	AB=((Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"))	119,228
#9	TI=((Prison* OR incarcerat* OR "detention* center*" OR jail* OR penal OR gaol* OR inmate* OR "youth* offender*" OR "penal system*" OR detain* OR offender* OR criminal* OR perpetrator* OR "correction* facilit*"))	88,525
#10	#8 OR #9	169,719
#11	**#10 AND #7**	**911**

CINAHL

Searched 17/12/21

Search number	Search Strategy	Number of results yielded
#1	TI (corona* or corono*) w1 (virus* or viral* or virinae*)	164
#2	AB (corona* or corono*) w1 (virus* or viral* or virinae*)	408
#3	TI coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov* or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome	59,014
#4	AB coronavirus* or coronovirus* or coronaviri* or 2019-nCoV or 2019nCoV or nCoV2019 or nCoV-2019 or covid-19* or covid19* or ncov*	47,661

	or n-cov* or HCoV* or SARS-CoV-2 or SARSCoV-2 or SARSCov2 or SARS-CoV2 or severe acute respiratory syndrome	
#5	TI (outbreak* or pandemic* or epidemic*) w10 (Wuhan or Hubei or China or Chinese or Huanan)	600
#6	AB (outbreak* or pandemic* or epidemic*) w10 (Wuhan or Hubei or China or Chinese or Huanan)	1,111
#7	(MH "COVID-19")	21,116
#8	(MH "Coronavirus+")	2,424
#9	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8	77,051
#10	TI (Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*")	17,233
#11	AB (Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*")	25,939
#12	(MH "Prisoners")	9,833
#13	(MH "Correctional Facilities")	6,646
#14	#10 OR #11 OR #12 OR #13	37,334
#15	**#9 AND #14**	**335**

Cochrane Library

Searched 21/12/21

Search Number	**Search Strategy**	**Number of results yielded**
#1	(coronavirus or coronavirus or covid* or SARSCoV2):ti,ab,kw.	8906
#2	(prison* or incarcerat* or 'detention* center*' or jail* or penal or gaol* or inmate* or 'youth offender*' or 'penal system*' or detain* or offender* or criminal* or perpetrator* or 'correction* facilit*'):ti,ab,kw.	3596
#3	MeSH descriptor: (Abdalbary, Kakani et al.) explode all trees	918
#4	MeSH descriptor: (Birkie, Necho et al.) explode all trees	612
#5	MeSH descriptor: [Prisons] in all MeSH products	136
#6	#1 or #3 or #4	8912
#7	#2 or #5	3597
#8	#6 AND #7	**15**

COVID-19 Databases

Cochrane COVID-19 reviews

Hand searched 66 reviews
0 relevant

COVID-19 Evidence Reviews

Hand searched
2 articles exported

L*OVE COVID-19 Evidence

Searched 17/12/21

Search Number	**Search Strategy**	**Number of results yielded**
#1	Prison* or incarcerat* or "detention* center*" or jail* or penal or gaol* or inmate* or "youth* offender*" or "penal system*" or detain* or offender* or criminal* or perpetrator* or "correction* facilit*"	**858**

Appendix 2: Data Extraction Table of All Included Studies

Study (Title/Author/Year)	Country	Design	Aim	Setting, Participants and Study Dates	Data Collection	Exposure	Results and Main Outcomes	Methodological Appraisal
A large outbreak of COVID-19 in a UK prison, October 2020 to April 2021. Adamson, J. P. ;Smith, C. ;Pacchiarini, N. ;Connor, T. R. ;Wallsgrove, J. ;Coles, I. ;Frost, C. ;Edwards, A. ;Moore, C. ;Sinha, J. ;Perrett, S. ;Craddock, C. ;Sawyer, C. ;Waldram, A. ;Barrasa, A. ;Thomas, D. R. ;Daniels, P. ;Lewis, H. 2022 (41)	UK	Report, retrospective analysis of data	Inferred aim: to describe an outbreak investigation of COVID-19 and infection control measures implemented to limit COVID-19 transmission, morbidity and mortality) in a large male prison in Wales, UK, October 2020 to April 2021	Large male prison in Wales, UK. (1700 male residents, 850 staff, 453 total COVID-19 cases) October 2020 to April 2021	Exact method of data collection not documented. Inferred that data collected in-house for appraisal by Outbreak Control Team on weekly basis. Case data were managed using an Excel line list containing demographic information (age, sex), staff residence postcode, resident cell number, work areas/dates, laboratory results (test dates, result status, laboratory IDs, whole-genome sequencing (WGS links), interview dates/notes and resident prison-transfer dates Line list management was performed by a single member of staff, in frequent contact with prison, 'Test, Trace, Protect' (TTP – contact tracing) and laboratory colleagues	Being in prison during the COVID-19 pandemic	Crude attack rate in residents 12% (95% CI 9–15%). Period-incidence of 60.4 cases per 1000 population for residents, lower than that of general population. Case hospitalisation ratio was 0.06 for residents.	Small sample size. Only male residents therefore not generalisable over all populations. No detailed information on testing rates within the institution, attack rates could have been affected by testing policy - residents had to report symptoms and request a test. No information regarding uptake rates of asymptomatic testing. Residents might also have been reluctant to report symptoms knowing this would incur cell-isolation. No detailed description of data collection.
A study of SARS-COV-2 outbreaks in US federal prisons: the linkage between staff, incarcerated populations, and community transmission Towers, S. ;Wallace, D. ;Walker, J. ;Eason, J. M. ;Nelson, J. R. ;Grubesic, T. H. 2022 (37)	USA	Retrospective analysis of data	To examine rates of SARS-COV-2 in prisons to those in the communities that directly surround them and effects that decarceration has on community transmission of SARS-COV-2	Data on SARS-COV-2 incidence among incarcerated populations in 101 federal prisons 18/05/2020 to 31/01/2021 Comparative County level data on SARS-COV-2 incidence in the general population 22/01/2020 to 31/01/2021	Data on SARS-COV-2 incidence among incarcerated populations obtained from the US Federal Bureau of Prisons website. Comparative County level data on SARS-COV-2 incidence in the general population obtained from the Johns Hopkins University Coronavirus Resource Centre	Being in prison during the COVID-19 pandemic	Incarcerated population showed a comparative 4.42 risk ratio of per capita COVID rates versus the general population (p=<0.001). Significant correlation demonstrated between per capita rates in the outbreaks among the incarcerated population and the community, despite stoppage of visitation over the time period of the study Significant difference in per capita rate demonstrated between levels of Prison security level. Decarceration was significantly associated with a decrease in incarcerated per capita rates during the winter wave (p=0.015) but not during the summer wave	Large sample size, varied samples of socio-economic areas sampled thus data more generalisable. Qualitatively different statistics compared – daily incidence reported in Community data, Serial prevalence noted in Prison data, therefore results extrapolated – caution in interpreting this. No information about testing rates in the incarcerated population reported. Caution in interpretation of results warranted because of potential differing degree of testing protocols between different prisons e.g. – asymptomatic surveillance versus symptomatic. No data on ethnicity/race in incidence/prevalence data documented
A time-series analysis of testing and COVID-19 outbreaks in Canadian federal prisons to inform prevention and surveillance efforts, A. Blair, A. Parnia and A. Siddiqi 2021 (29)	Canada	Report, retrospective analysis of data	To compare data from 50 Canadian prisons facilities on positive tests, case recovery, and death and the general population in each jurisdiction	Estimations of prisoner counts in Canadian prisoners, estimated population to be 13,996 at 85% occupancy, analysis of 50 Canadian facilities between 30 March 2020 and 9 May 2020	Exact prisoner counts not available, so estimations made, data extracted from Correctional Service of Canada website, general population data from statistics Canada population estimates for first quarter of 2020	Being in prison during the COVID-19 pandemic	On average, prisons tested more than the general population (88 per 1000 population compared to 40 per 1000 in public), 64% of prisons recorded fewer tests per 1,000 compared to general population, 6 facilities recorded no testing at all, those who tested more had higher prevalence of COVID-19 (reactive testing), 3% of prison population contracted COVID compared to 0.2% general population estimate,	Does not state whether the prisons which had no testing records did not test, or if they were just not recorded, no documentation of how case fatalities were measured, fatality rates not standardised, total sample size not known as estimations done, confidence intervals not reported, average testing for Canada vs general prison population not reported clearly, seemed to only want to

							case fatality was 0.6% in prisons compared to estimated 10% in general population	report statistics that showed poor testing in prisons (reporting bias)
Adverse SARS-CoV-2-associated outcomes among people experiencing social marginalisation and psychiatric vulnerability: A population-based cohort study among 4,4 million people . Nilsson, Sandra Feodor ;Laursen, Thomas Munk ;Osler, Merete ;Hjorthoj, Carsten ;Benros, Michael E. ;Ethelberg, Steen ;Molbak, Kare ;Nordentoft, Merete 2022 (42)	Denmark	Population based Cohort study using retrospective analysis of data	The study aimed to assess whether being a part of a socially marginalised group was associated with SARS-CoV-2 infection-related adverse outcomes	Study assessed people experiencing incarceration, as part of a 4,412,382 total population cohort size assessing individuals in marginalised groups over the period 27/02/2020 to 15/10/2021	Data on imprisonments was obtained from the Danish Central Criminal Register, 1991-2020, and information on imprisonment was included for the period 2018-2020. PCR-test data were provided through the National Danish Microbiology Database (MiBa). Information on follow-up mortality was provided from the Civil Registration System	Being in prison during the COVID-19 pandemic	The study demonstrated increased risks of adverse outcomes over all assessed domains: aIRR (versus general population) Hospitalisation within 14 days of COVID diagnosis 1.99 (1.65-2.40 p=<0.0001), Intensive Care Admission within 14 days of COVID diagnosis 2.41 (1.56-3.72 p=0.00050) Death within 60 days of COVID diagnosis 3.11 (1.93-5.03 p=<0.0001) Rate of All Cause Mortality over study period 9.44 (95% CI 6.43-13.88 p=<.0001) in prison residents with COVID-19 infection versus 4.00 (95% CI 3.87-4.13 p=<.0001) in the general population with COVID-19 infection. Study noted reduced risk of positive PCR test in PEI versus general population: aIRR 0.84 (95% CI 0.80-0.88) p <0.0001, as well as reduced rate of testing in PEI OR 0.47 (0.46-0.48) <0.0001	Large sample size including the entirety of the Danish Prison population. Data on imprisonment included for 2018-2020 period, whereas study period extended into 2021 therefore some caution in interpretation of data required here. Multiple regression adjustment models described including unadjusted, adjustment for country of birth, living area and vaccination against SARS-CoV-2 infection and further additional adjustment for other included marginalised groups. Note population data may include some citizens aged 15-18 but prison population aged 15-18 likely to be negligible based on separately reported prison demographics. No information as to the screening protocols within Danish prison institutions, therefore testing rates/asymptomatic versus symptomatic testing protocols may affect the rates of COVID-19 infection detected and thus affect outcome risks. Reduced positive PCR rate may be artefact of reduced testing rate in prison, rather than reduced burden of disease within prison facilities. No demographic data of the prison population documented.
Age and COVID-19 mortality in the United States: a comparison of the prison and general population. Nowotny, K. ;Metheny, H. ;LeMasters, K. ;Brinkley-Rubinstein, L 2022 (60)	USA	Retrospective analysis of data	The study aims to compare COVID-19 mortality trends in the US prison population and the general population to see how mortality risk changed over the course of the pandemic	Study assessed COVID-19 data for 53 prison systems including the 50 states totalling 1,414,200 individuals. Study duration was 25/04/2020 to 05/06/2021	Data sourced from publicly available sets (Covid Prison Project for aggregate data set examining COVID-19 in correctional facilities, CDC and National Center for Health Statistics morbidity and mortality weekly reports [MMWR] for COVID-19 death counts by age, sex and week, Bureau of Justice Statistics (BJS) for prisoner data, US Census used for general population demographic information) Texas state specific information sourced from TX Department of Criminal Justice, TX Population Estimates Program and The Texas Tribune	Being in prison during the COVID-19 pandemic	Study demonstrated an increased standardized mortality ratio of 2.89 (95%CI 2.78, 3.00) in the prison population versus general population and that prison residents died at younger ages than the general population. In the Texas state case study, the overall adjusted mortality rate for the prison population was 11.18 per 1,000 versus 6.03 in the general	Large sample covering prison population of 50 US states. Mortality data reported from the Departments of Correction – deaths may be under-reported. No demographic data included in mortality statistics. Age stratification differed between data sources so artificial aggregation performed by study team

Anxiety during the COVID-19 pandemic in prisoners who had high risks to suffer from mood disorders: A longitudinal study before and during the COVID-19 Zhang, S. ;He, J. ;Yang, Q. ;Du, Y. ;Xiao, W. ;Gao, J. ;Li, H. 2022 (77)	China	Longitudinal study via survey	The study aimed to compare the anxiety levels in prisoners before and after the COVID-19 outbreak and analyse the causes of the changes in anxiety	The study included a longitudinal cohort consisted of 803 prison residents, at an unspecified all-male Chinese prison. There were two survey time points October 2019 to November 2019 (T0) and March 2020 to April 2020 (T1)	Data came from a two time point survey (T1&T0) assessing PHQ-9, GAD-7 and Insomnia Severity Index as well as basic demographics collected at the first time point.	Being in prison during the COVID-19 pandemic	The study overall found a significant trend of anxiety scores improving during the pandemic compared with prior to it (p=<0.001). Of the 803 prisoners, 28.6% showed improved GAD-7, 15.9% showed worsened scores. The study also demonstrated significantly increased anxiety levels during the pandemic in those who did not have anxiety prior to the pandemic (p=<0.001 n = 480) whilst showing improved anxiety scores for those who were suffering from anxiety pre-pandemic (p=<0.001 n = 323).	Longitudinal study.Good response rate to survey - 88.6% prison population completing T0 survey and 93.2% of subsequent cohort completing follow up T1 survey. Validated mental health score instruments used. Study Pandemic time point (T1) very early on (March – April 2020) in the pandemic time course, therefore unclear whether trend of improved anxiety is true reflection of whole pandemic period. Very small sample size, based at one prison only therefore not generalisable to entire country or worldwide population. Only male prison residents surveyed. Only pre/during pandemic comparison, no general population comparison. Patients with “severe mental illnesses (e.g., schizophrenia and mental retardation “ excluded – unclear the exact definitions and basis of this exclusion PHQ-9, GAD-7 and ISI PROs prone to repeat testing bias
Assessing the Mortality Impact of the COVID-19 Pandemic in Florida State Prisons, N. M. Marquez, A. Littman, V. Rossi, M. Everett, E. Tyagi, H. Johnson, et al. 2021 (61)	USA	Retrospective cohort study (pre-print)	1) document demographic changes that occurred in Florida state prisons during the COVID-19 pandemic 2) assess excess deaths that occurred during the months of the COVID-19 pandemic in 2020 and their temporal relationship to reported COVID 19 deaths 3) quantify changes in overall mortality rate of Florida state prisons	Includes 50 institutions in Florida state prisons with a daily population of over 80,000, administered by Florida department of corrections (FLDOC), 6,830,581 person-months of data was analysed, analysis from 2015-2020	Monthly population counts back to January 15 using publicly available inmate population records, mortality is reported by FLDOC but is not standardised to uniform causes of death so are unable to be analysed, covid 19 deaths calculated by taking the difference of cumulative totals month by month, age specific monthly mortality done by collecting monthly data 2015-2019 to build baseline expected mortality rate	Being in prison during the COVID-19 pandemic	Total of 2,567 deaths in Florida state prison population over study period, 2020 highest CMR of 654 deaths per 100,000 person-years, 1.56 RR compared to 2019 when using bootstrapping, Monthly median posterior estimates of excess mortality were found to be strongly and significantly correlated with monthly reported deaths related to COVID-19 (80.4%, p <.01), life expectancy decreased by 4.12 years between 2019 and 2020	Causes of death are not documented, ie due to COVID? Due to suicide? Aging population? Less likely to receive healthcare because of the pandemic so malignancies/other conditions go unnoticed? also includes data from all of 2020, ie before the covid-19 pandemic hit, mistakes in headings of Table 1
Association Between Prison Crowding and COVID-19 Incidence Rates in Massachusetts Prisons, April 2020-January 2021, A. I. Leibowitz, M. J. Siedner, A. C. Tsai and A. M. Mohareb (32)	USA	Longitudinal ecological study	To estimate the association between prison crowding, community COVID-19 transmission, and prison incidence rates of COVID-19	Looked at 14/16 Massachusetts state prisons, 2 excluded due to unique turnover levels/availability of on-site medical facilities, the 14 prisons had an average of 6878 people housed during the study period, between 21 April 2020 and 11 January 2020	Analysis conducted using deidentified, publicly available data sets, Massachusetts department of corrections data for average population for each prison and assess positive COVID tests, Institution Cell Housing reports for data on prisoners in single cells and total number in prison, quarterly reports for design capacity, security level and sex of individuals, novel coronavirus visual dashboard for data on county covid cases, US census bureau for estimates of Massachusetts population	Prison crowding during the pandemic	Prisons median crowding levels ranged from 25%-155%, COVID-19 incidence was significantly greater in prisons at higher percent of design capacity, IRR 1.14 per 10 percentage point difference, those above 100% capacity, IRR 4.86 compared to those with less than 70%, COVID-19 incidence lower in prisons with higher percent of people in single cell units (IRR 0.82 per 10 percent point difference in single cell occupancy, COVID incidence rate in prisons was 965/100,000 compared to 150/100,0000 person weeks in general population during study period	Crude incidence was not standardised when calculated therefore must be interpreted with caution, no demographic data available and confounders not documented, COVID incidence relied on public testing, asymptomatic and untested COVID cases not reported, no comparison of testing levels in the community

Association of State COVID-19 Vaccination Prioritization With Vaccination Rates Among Incarcerated Persons Biondi, B. E. ;Leifheit, K. M. ;Mitchell, C. R. ;Skinner, A. ;Brinkley-Rubinstein, L. ;Raifman, J. 2022 (73)	USA	Longitudinal study using weekly reported public data	The stated aim of the study was to assess the effect of state vaccination prioritisation policy regarding incarcerated people on the percentage of incarcerated people fully vaccinated for COVID-19	The study presented data representing a mean population of 690,343 incarcerated residents within 36 US states, collected from 20/10/2020 to 20/06/2021	Vaccination data was collected from the publicly available Marshall Project and Associated Press sources. COVID-19 US State Policy database was used to source vaccination phase data and dates of incarcerated persons' vaccination eligibility.	Being in prison during the COVID-19 pandemic	21 of the sampled states prioritised vaccination of incarcerated residents. States with policies that prioritised vaccination of incarcerated people had significant increases in vaccination rates compared with other states over time. In states with no prioritisation policy, vaccination rates in the general population were higher than in incarcerated people.	Large sample size in large geographical area. Results reliant on accuracy of publicly available source data. Data represented graphically only in published paper. Data not included for 14 states due to limited publicly reported data and specific to US, therefore conclusions should be extrapolated to other areas with caution. Varied vaccination dosing schedules between states which may effect vaccination rates (single dose versus 2-dose full course vaccines)
Characteristics and comparative clinical outcomes of prisoner versus non-prisoner populations hospitalized with COVID-19, Altibi et al 2021 (14)	USA	Retrospective observational cohort study	To report on the characteristics and clinical outcomes of prisoners hospitalised with COVID-19 as compared to non-prisoners	Looked at 706 hospitalised COVID-19 patients, 598 were non-prisoners and 108 were prisoners, study took place at 2 Henry Ford Health Systems in Michigan, people who went to A+E but were not admitted were not included in the study, similar admission criteria for both hospitals, between 10 March and 10 May 2020	Patient level data collected about imprisonment status, demographic characteristics (age, sex, race), chronic medical conditions, smoking status and obesity, COVID-19 symptoms from patient hospital records, follow up information obtained by contacting patients, families or nursing homes or healthcare staff at prison	Being in prison during the COVID-19 pandemic	Primary outcomes were intubation rates, in-hospital mortality and 30-day mortality, prisoners had a higher Charlson co-morbidity Index (CCI), higher prevalence of COPD and underlying malignancies, non-prisoners were older, higher prevalence of CKD, obesity and dementia, prisoners had worse clinical signs and later presentation to hospital, higher inflammatory markers at presentation, in hospital mortality was higher for prisoners with an adjusted odds ratio of 2.32 (CI 1.33-4.05 statistically significant) (adjusted for age, sex, race, CCI and obesity), more prisoners required intubation with an OR of 1.86 (CI 1.14-3.03) in multivariable logistic regression was not statistically significant, more prisoners needed vasopressors (statistically significant), higher percentage of prisoners admitted to ICU (not significant)	Full demographic details noted, 2 groups not similar at baseline (prisoners much younger), selection bias as it is an observational study, especially with discrepancy in referral and admission thresholds, potential confounders identified and controlled during analysis, limited to one healthcare system in Michigan, may not be reproducible, findings based on data extraction from hospital records, accuracy down to the reporting from HCP
Characteristics and outcomes of prisoners hospitalized due to COVID-19 disease, M. Abdalbary, E. Kakani, Y. Ahmed, M. Shea, J. A. Neyra and A. El-Husseini, 2021 (55)	USA	Retrospective comparative cohort study	To examine clinical outcome characteristics of prisoners vs non prisoners admitted to hospital due to COVID-19 disease	Analysis of consecutive COVID-19 patients admitted to the University of Kentucky Medical Center, adult patients who tested positive for COVID-19 on PCR, total cohort = 86 people, inmates n=37, non-inmates n=49, between 1 March and 1 June 2020 (when there was a high level of prisoners in the hospital)	Electronic health records used to obtain clinical details and demographic information, comorbid symptoms, covid signs and symptoms, therapies/interventions, laboratory results and prevalence of CKD judged by eGFR. Collected outcomes of incident AKI, hospital mortality and major adverse kidney events at time of discharge,	Being in prison during the COVID-19 pandemic	Similar symptom presentation except prisoners more likely to present with a fever, length of stay similar across cohort, no difference in need for ICU care/vasopressors/inotropes/mechanical ventilation/ECMO support, incidence of AKI greater in inmates than in the general population but not analysed due to confounders, no significant difference in mortality	Significant differences at baseline across 2 groups, high proportion of black people in the study in comparison to the local Kentucky population, and tended to have higher incidence of AKI, ?eGFR not as accurate in black people than in white people. selection bias, specific period measured when there was a surge of prisoners in the hospital, small sample size
Characteristics of Persons with Secondary Detection of Severe Acute Respiratory Syndrome Coronavirus >=90 days after first detection, New Mexico 2020, J. T. Hicks, S. Das, A. Matanock, A. Griego-Fisher and D. Sosin (51)	USA	Matched case control study	Inferred aim: to assess characteristics and testing frequency of persons with secondary COVID-19 detection	Compared 315 cases with a positive COVID test >= 90 days post first detection with 945 controls without a positive 2nd test, cases defined as people who had a positive RNA or antigen test after 90 days after symptom onset or first positive test, controls defined as people with a negative COVID test or NO COVID test 90 days after	Conducted by New Mexico Department of Health (NMDOH) using surveillance data, controls randomly selected in a 3:1 ratio, matched on region and collection date of first positive test	Secondary detection of COVID-19 after 90 days	When adjusted in multivariable model, staff or residents of detention/correction facilities had higher rates of secondary detection (aOR 4.7 CI 1.8-12.1), adjusted for number of COVID-19 tests since positive test, sex, race, DM, could either be re-infection or prolonged positive test however these were not quantified	A negative COVID-19 test was NOT needed to determine that people were not still positive after 90 days, therefore some people still could be positive, however as they were not tested it cannot be quantified

				first covid test, extracted on 10 December 2020				
County jails' responses to COVID-19: Practices, procedures, and provisions of behavioural health services Comartin, E. B. ;Victor, G. ;Ray, B. ;Nelson, V. ;Whitehead, T. ;Kubiak, S. 2022 (74)	USA	Longitudinal study using surveys on admission to facility	The inferred aim of the relevant part of the study was to present the demographics and mental health outcomes in the population of the case-study jail and how these evolved from pre-pandemic and throughout the pandemic itself	The relevant data presented by the study was collected as part of a larger ongoing study, at one rural county jail located in Michigan, USA representing a total of 386 individuals over three time periods - Immediately prior to the pandemic "Winter" (15/02/2020 to 14/03/2020), "Spring" (15/03/2020 to 30/05/2020) and "Summer" (31/05/2020 to 01/08/2020)	Data was collected via information captured by prison staff on booking and a survey completed by residents at that time. Significant mental illness was defined by a score of ≥9/24 on the Kessler-6 (K6) scale, a screening tool for significant mental illness validated in a prison context	Being in jail during the COVID-19 pandemic	The study demonstrated that the rates of significant mental illness in residents were significantly higher during the early pandemic "spring" period (40.5%, n = 34) compared to the pre-pandemic "winter" period (29.7%, n = 33), with the lowest proportion found in summer (22.5%, n = 43) ($p < .01$). The same relationship was noted in the proportion of residents who confirmed having taken psychotropic medication in the last year - highest during the spring (40.5%, n = 34), compared to winter (36.7%, n = 40) and summer (18.8%, n = 36; $p < .001$)	Very small sample size at one incarceration facility – therefore findings may relate to this facility/region alone – caution should be used in extrapolating results. Kessler-6 a screening tool and not diagnostic of significant mental health diagnosis per se. Data taken at booking therefore may be more indicative of community mental health issues rather than in incarcerated people per se. Mental health status may be at its worst at time of booking into jail so results should be interpreted with caution when extrapolating to long term residents. No comparative general population figures therefore unclear if general population effect or specific to incarcerated population. The authors note that they did not control for confounding variables when assessing trends in significant mental illness
COVID-19 Case and Mortality Rates in the Federal Bureau of Prisons, Toblin R and Hagan LM , 2021. (26)	USA	Report, retrospective analysis of data	Inferred aim: to characterise the burden from COVID-19 by calculating the testing, case, and mortality rate in comparison to the general population	Prison population compared to the general population, sample size not documented, from 29 February 2020 to 23 September 2020	Data for prison population from federal bureau of prison and COVID specific database, US population data from US census and centres for disease control and prevention (CDC)	Being in prison during the COVID-19 pandemic	Crude case rate 4.7x higher in prisons than in general population, testing rate was greater in prisons than in the general population, crude mortality rate was not statistically different between prisons and community, SMR for age and sex was 2.6 for prisoners compared to general population	SMR standardised for age and sex, no other confounders identified, 2 groups were not comparable demographic wise, (38.9% black population in prison compared to 12.3% in general population), US data contained data on children, tests given to prisoners in hospitals were excluded
COVID-19 Cases and Deaths in Federal and State Prisons, Saloner et al, 2020 (27)	USA	Report, retrospective analysis of data	Inferred aim: To calculate death and case rate in prisons comparing to general population in US	USA prison population containing data from all states, sample size of 1,295,285 prisoners retrospectively analysed, data collected from 31 February 2020 to 6 June 2020	Data collected from UCLA law COVID-19 behind bars data project, supplemented with news reports and press releases, and department of corrections for age and sex data to adjust the SMR, general population data from US centres for disease control and prevention	Being in prison during the COVID-19 pandemic	Crude case rate for prisoners 5.5x higher than general population, crude death rate not statistically different, SMR when adjusted for age and sex was 3.0 in prisons compared to the general population, daily COVID-19 case growth rate was 8.3% in prisons compared to 3.4% in USA	SMR standardised to age and sex only, not pre-existing conditions, not appraised in full due to being the first half of the study below
COVID-19 cases and testing in 53 prison systems, K. Lemasters, E. McCauley, K. Nowotny and L. Brinkley-Rubinstein 2020 (31)	USA	Retrospective analysis of data	Inferred aim: to present testing, infection, and fatality data on incarcerated populations in the early stage of the pandemic	53 prison systems (50 states, Puerto Rico, Federal Bureau of prisons and immigration and customs enforcement (ICE), total sample size of all prisoners not	Publicly accessible data from the COVID Prison Project (CPP) for COVID prison data, each day counts extracted from department of corrections websites, prison population data from vera institute of justice, data from general population of cases and fatalities from John Hopkins Coronavirus Resource Centre, testing numbers	Being in prison during the COVID-19 pandemic	10 states and Puerto Rico reported no testing information, testing numbers varied across places from 6/1000 to 1531/1000 incarcerated people. Majority of prison systems tested MORE than the general public, test positivity on average higher in prison systems, 34 prison systems have higher case rates per thousand than general population,	CPP collects data from immigration and customs enforcement, migrants are a sub population and another vulnerable population and may have different outcomes to the prison population, prison population data from vera institute of justice some data collected from pre pandemic (due to being

				documented, data collected up to 15 July 2020	from COVID Tracking Project, data presented at state level due to large differences in testing strategies,		however, most have higher testing rates, 37 states reported no fatalities	most recent information available), analysis done at state level, none of the data is standardised, so is probably unreliable and must be interpreted with caution, standardised estimates not done as demographic information and covid-19 deaths at state level is not reported, most recent data from Puerto Rico is from 2012, no confidence intervals reported, no statistical analysis of the data
COVID-19 community spread and consequences for prison case rates LeMasters, K. ;Ranapurwala, S. ;Maner, M. ;Nowotny, K. M. ;Peterson, M. ;Brinkley-Rubinstein, L. 2022 (34)	U S A	Retrospective analysis of data	The study's stated aim was to understand "how the rates of COVID-19 transmission in the communities surrounding prisons affect COVID-19 spread within prisons"	The study presented data representing 55,196 individuals, both residents and staff, at facilities within North Carolina, USA between June 01/06/2020 and 31/08/2020. This was compared with general population data from the counties containing each prison.	Data concerning positive test results was captured from de-identified publicly available data from the North Carolina (NC) Department of Health and Human Services. Community population numbers were captured from American Community Survey 2019 data and prison population data from The Vera Institute of Justice and a report from the North Carolina Department of Public Safety on staff at NC state prisons.	Being incarcerated in a facility located in a North Carolina county whose general population had a case rate of at least 50 per 100,000 residents in the preceding seven days	Over the study period a mean active case rate of 427 per 100,000 was noted in the incarcerated population compared with a rate of 215 per 100,000 in the general population. When community rates reached the threshold case rate of at least 50 per 100,000, there was an immediate increase in the COVID-19 case rate in prisons by 118.55 cases per 100,000 (95% CI: -3.71, 240.81). The study authors also noted that there was no significant difference between community COVID-19 rates in counties with and without an incarceration facility.	Large total sample size including general population and incarcerated residents in North Carolina state. Authors note that staff testing information included with resident testing information – they note 35 ordered tests were confirmed as ordered for staff, 29,605 for residents, and 1,045 were unknown. Difference in case rate may be artefactual of differing testing rates between incarcerated populations (who were mandated to perform asymptomatic testing during the study period) and general populations. Results reliant on accuracy of prison reported testing results
COVID-19 in Prisons: State Health Care Contracting and the Pandemic Behind Bars Smith, M. ;Glidden, M. D. 2022 (39)	U S A	Retrospective analysis of data	The study's stated aim was to assess whether a state average healthcare expenditure per incarcerated person or provision of healthcare services (private contracted staff versus state department of correction staff) had any impact on COVID-19 diagnosis rate and mortality rate.	The study presented a cross-section of data from on 10/07/2020 covering incarceration facilities in 45 US states (Federal Bureau of Prisons, and Alaska, Massachusetts, Mississippi, Tennessee, and West Virginia excluded due to lack of data) – No information is documented with regard to the number of incarcerated individuals covered in the data	Data was collected from publicly available sources: National Survey of Prison Health Care 2021, The Pew Report 2017, National Prisoner Statistics 2018	Being in prison during the COVID-19 pandemic on 10/07/2020	The study noted a lower mean COVID-19 diagnoses per 10,000 (333.20, range 0–1,640) and COVID-19 deaths per 10,000 (3.67, range 0–25) in the incarcerated population compared with the general population (COVID-19 diagnoses per 100,000 1,255.32, range, 74.48–20,617.31; COVID-19 deaths per 100,000 66.04 1.34–1,646.11) Incarcerated residents in states who provide at least some healthcare from Department of Correction staff (as opposed to purely privately contracted healthcare) showed significantly better outcomes in the measured variables: COVID-19 deaths per 100,000 were reduced by 3.47 (b = 3.47, p = .04) and COVID-19 diagnosis rate per 10,000 was reduced by 448.70 (b = 448.70, p = .01) Average expenditure on healthcare per incarcerated resident had no significant effect on COVID-19 rates or mortality.	Large sample size over large geographical region. Isolated snapshot of covid rates and mortality on one day. Limited validity of a one day sample -results may change based on period of pandemic chosen eg with availability of new vaccines and therapeutics. No clear explanation of why this particular data chosen for sample. Results reliant upon accuracy of multiple external sources. . Some of data sources measured pre-pandemic therefore not necessarily accurate at time of COVID mortality/rate snapshot – eg. State medical expenditure data from 2017
COVID-19 in the California State Prison System: an Observational Study of Decarceration, Ongoing, E. T. Chin, T. Ryckman, L. Prince, D. Leidner, F. Alarid-Escudero, J. R.	U S A	Retrospective observational study	To quantify changes to California's prison population since the pandemic began and identify risk factors for COVID-19 infection	All Californian state prisons were included, analysis of 119,401 prisoners who were in prison between 1 March and 10 October 2020	Californian department of corrections and rehabilitation (CDCR) provided data on all prisoners over 18 who resided in prison during study date, data included variables on demographics (sex, age, race), health characteristics, location, participation in prison labour, education and COVID-19 testing history	Being in prison during the COVID-19 pandemic	162/96,440 residents were positive, 3.2% hospitalised, 0.3% ICU, 0.5% died, COVID infection rates in dormitory residents (more than 3 in a room) had an adjusted hazard ratio of 2.49 when compared to residents of cells, those with prisoners taking part in out-of-room labour also had higher rates of infection AHR of 1.56, adjusted to include age, sex, ethnicity, pre-existing conditions,	Survival analysis was done, 7 prisons having an outbreak were excluded from analysis due to not having enough time for follow up, 3 were excluded due to an outbreak caused by mass introduction of cases and 1 was exclude due to having testing rates that differed substantially between dormitories

Andrews, et al. Risks, and Risk Factors 2021 (49)							reduction of prison capacity by 19.1% during study period	and cells, no comparisons to the general population
COVID-19 in the New York City Jail System: Epidemiology and Health Care Response, March-April 2020, J. Chan, K. Burke, R. Bedard, J. Grigg, J. Winters, C. Vessell, et al. 2021 (56)	USA	Retrospective observational cohort study	Inferred aim: to describe the COVID-19 pandemic in NYC jails from mid-March to April, including demographic characteristics and signs/symptoms of people tested for COVID-19, with risk factors for COVID-19	Study of patients aged 18 and over in New York City jails/hospital units with people from jail who were tested for COVID-19, out of 978 had been tested for COVID 19, with 568 positive results, from 11 March to 28 April 2020	Demographic, clinical, lab and hospitalisation data from electronic medical records, does not state where data from the general population is from	Being in prison during the COVID-19 pandemic	978 nasopharyngeal swabs done, 568 positive (58%), of 257 who were asymptomatic, 58 (23%) were positive. Median age was 36 in symptomatic testing and 46 in asymptomatic testing cohort, of the people who received positive tests 45 people (8%) were hospitalised, of which 7% of these were asymptomatic at diagnosis. Of the 45 people hospitalised 8% were admitted to ICU and 7% died in custody, older age (over 35 compared to 18-34), high BMI, smoking, DM, HTN, CVD, pulmonary disease (excluding asthma) in univariate analysis were significate risks, in multivariable analysis, just older age was significant (very wide CI),	Testing cohort significantly older than overall jail population, small sample of people hospitalised n=45, therefore very wide CI and many RF were not proven to increase the risk of hospitalisation when doing multivariable regression, Data on COVID-19 outcomes censored for people released from jail before study ended, may underestimate true risk of certain FR eg age and DM as lots of these people were decarcerated from prison, symptom driven testing - most patients who were hospitalised were diagnosed very close to when they were hospitalised, therefore missing the early progression of disease
COVID-19 Incidence and Mortality in Federal and State Prisons Compared with the US population, April 5, 2020 to April 3, 2021, Marquez et al, 2021 (28)	USA	Report, retrospective analysis of data	Inferred aim: to assess the first 52 weeks of the pandemic, comparing cases and deaths in prisons and the general population, to calculate adjusted SMR for prisoners versus general population	Prisoners from the USA across 50 states, sample size not mentioned and was an estimation, data collected from 5 April 2020 to 3 April 2020	Data collected from UCLA law COVID-19 behind bars project, Marshall Project and Associated Press, prison population data from Vera institute, general population data from Census and CDC and prevention	Being in prison during the COVID-19 pandemic	crude case rate 3.3x higher in prisons than in the general population, SMR was 2.5 for the prison population compared to the general population	SMR standardised to age and sex, no other confounders noted, no details about how the SMR was calculated, limited to publicly available data,
COVID-19 Infection Among Incarcerated Individuals and Prison Staff in Lombardy, Italy, March 2020 to February 2021 Mazzilli, S. ;Tavoschi, L. ;Soria, A. ;Fornili, M. ;Cocca, G. ;Sebastiani, T. ;Scardina, G. ;Cairone, C. ;Arzilli, G. ;Lapadula, G. ;Ceccarelli, L. ;Cocco, N. ;Bartolotti, R. ;De Vecchi, S. ;Placidi, G. ;Rezzonico, L. ;Baglietto, L. ;Giuliani, R. ;Ranieri, R. 2022 (35)	Italy	Repeated cross-sectional study	The stated aim was to report the extent/dynamics of the COVID-19 pandemic within the Lombardy prison system	The study presented data representing a mean of 7599 incarcerated residents in 18 facilities within the Lombardy region of Italy taken from 01/03/2020 to 28/02/2021. The study assigned two discrete periods – first wave (March-June 2020) and second wave (October 2020-February 2021)	COVID-19 related data was collated from daily reports provided by individual prisons as a regional mandated requirement to Prison Superintendence of the Lombardy region. Prison population data was estimated as the number of residents in each facility on the last day of the month. General population data was collated from publicly available sources: Italy National Institute of Statistics and GitHub repositories developed by the Italian Presidency of the Council of Ministers and the Italian Department of Civil Protection.	Being in prison during the COVID-19 pandemic	The study demonstrated a higher relative risk of COVID-19 infection in incarcerated residents than the general population (first wave: RR 1.30; 95% CI, 1.06-1.58 second wave RR3.91; 95% CI, 3.73-4.09), higher mean weekly testing rate per 1000 individuals versus the general population(first wave: 61.09 range, 0-115.44 versus 6.11 range, 1.16-10.41 second wave: 258.43 range, 123.92-573.08 versus 19.73 range, 11.68-30.09).. A lower average weekly positivity rate per 100 individuals was noted in incarcerated individuals versus the general population however (first wave: 1.76 range, 0.00-10.68 versus 9.55 range, 1.21-37.50 second wave: 4.46 range, 0.00-17.92 versus 8.71 range, 1.16-20.71	Small sample size in small geographical area. Authors note unable to calculate numbers of patients admitted/moved/released from prison therefore population numbers are an estimation.. Different testing regimes enforced in incarceration facilities compared to general population likely contributed to under testing in community and underestimation of general population prevalence, therefore relative risk of covid positivity should be interpreted with caution. Results rely upon accuracy of prison data reports
COVID-19 Outbreak in a Large Penitentiary Complex, April-June 2020, Brazil Gouvea-Reis, F. A. ;Oliveira, P. D. ;Silva, D. C. S. ;Borja, L. S. ;Percio, J. ;Souza, F. S. ;Peterka, C. ;Feres, C. ;de Oliveira, J. ;Sodré,	Brazil	Outbreak Report – retrospective analysis of data	The study's stated aim is to describe an outbreak of COVID-19 at a single prison complex and estimate disease transmissibility	The study presented data from a single prison complex in the Brasilia region of Brazil, between 01/04/2020 and 12/06/2020 representing in excess of 13,000 incarcerated males	Data were collected from secondary sources: prison reported COVID-19 information, prison records and monitoring resources of the healthcare system	Being in case study's prison during the COVID-19 pandemic	The study notes a higher COVID-19 incidence rate in the case study prison population versus the general population of the Brasilia region (1,832 cases/100,000 persons versus 47 cases/100,000). The study demonstrated a mean serial case interval at 2.51 days (SD 1.21) - this was noted to be shorter than the figure for the general population of Brazil, however the figures for comparison are not documented.	Very small sample size in single prison complex. Data specific to single prison, thus not generalisable to other facilities/countries. Results rely upon the accuracy if prison reported data. No documentation of testing policies or rates within the prison – elevated incidence rate may be artefactual of testing rates. Male only prison therefore results not necessarily generalisable

G. ;Dos Santos, W. ;de Moraes, C 2021 (33)								
COVID-19 vaccination in the Federal Bureau of Prisons, December 2020—April 2021 Hagan, L. M. ;Dusseau, C. ;Crockett, M. ;Rodriguez, T. ;Long, M. J. 2021 (65)	USA	Retrospective analysis of data	The stated aim of the study was "to describe COVID-19 vaccine distribution operations in United States Federal Bureau of Prisons institutions and offices from December 16, 2020—April 14, 2021, report vaccination coverage among staff and incarcerated people, and identify factors associated with vaccination acceptance among incarcerated people"	The study presented data from 122 Federal Bureau of Prisons managed institutions, 8 administrative offices and 2 staff training centres across 36 states, Washington, DC, and Puerto Rico representing 126,413 incarcerated residents and 37,870 members of staff taken from December 16/12/2020 - 14/04/2021	Data were collated for incarcerated residents and staff from Federal Bureau of Presentations records. Data concerning the general population vaccine rates were collected from the CDC COVID Data Tracker website	Being resident or staff member in a Federal Bureau of Prisons facility during the COVID-19 pandemic	A median of 33.4% (range 12.6–59.3%) of incarcerated residents and staff had received a full course of vaccinations by the end of the study versus a median of 29.5% (range 20.3-37.8%) of the general adult population. COVID-19 vaccination was offered to 100% of staff and 69.8% of incarcerated residents over the study period. Acceptance rates were 50.2% for staff and 64.2% for residents.. Factors increasing odds of vaccine acceptance include: Increasing age compared with the <40 years age group (≥75 years aOR = 2.71, 95% CI = 2.09, 3.52), higher number of medical conditions associated with severe COVID-19 illness (6 conditions aOR = 2.99, 95% CI = 2.46, 3.63) , having a prior SARS-CoV-2 infection (aOR = 1.08, 95% CI = 1.05, 1.12), place of birth outside of the United States (aOR = 1.42, 95% CI = 1.34, 1.51), unknown country of birth (aOR = 1.42, 95% CI = 1.14, 1.77) Factors decreasing odds of vaccine acceptance include: female sex versus male (aOR = 0.60, 95% CI = 0.53, 0.67) non-Hispanic Black race (aOR = 0.43, 95% CI = 0.41, 0.44) or Asian race (aOR = 0.79, 95% CI = 0.68, 0.91) versus non-Hispanic white race.	Large sample over multiple institutions in large geographical area. Detailed demographic data for population documented. Results depend upon accuracy of publicly reported CDC data. Bureau of Prisons data could not be separated from CDC general population data. Staff vaccination data is likely to be underestimated given vaccinations in the community were not captured in the Federal Department of Prison's dataset.
COVID-19 Vaccination Uptake and Related Determinants in Detained Subjects in Italy Di Giuseppe, G. ;Pelullo, C. P. ;Lanzano, R. ;Lombardi, C. ;Nese, G. ;Pavia, M. 2022 (71)	Italy	Cross-sectional study via self-reported survey	The stated aim of the study was to "to explore the extent of COVID-19 vaccination coverage and to investigate drivers and barriers to COVID-19 vaccine uptake among people in prison in Italy"	The study presented data collected from 3 incarceration facilities in the Campagnia region of Italy, representing 517 incarcerated residents between July 2021 and October 2021 as part of a larger project investigating health outcomes in the incarcerated population.	Data were collected using a self-reported survey given to incarcerated residents to complete. It collected data regarding demographics, vaccine uptake and attitudes and behaviours surrounding vaccination.	Being resident in prison during the COVID-19 pandemic	An overall response rate of 79.5% was noted. 89.7% respondents reported vaccine uptake.. Comparative vaccination uptake in incarcerated populations from other countries ranged from 36.7% (Moldova) to 90% (Poland). Factors affecting COVID-19 vaccination uptake included: Female sex (OR = 15.94; 95% CI = 1.67–152.7), influenza vaccination uptake in the 2020–2021 season (OR = 6.21; 95% CI = 1.88–20.52), vaccine information sourced from media and newspapers (OR = 4.37; 95% CI= 1.6–11.9), declining additional information about COVID-19 vaccine (OR = 0.29; 95% CI = 0.1–0.81), belief that COVID-19 vaccine is safe (OR = 1.23; 95% CI = 1.03–1.47), involvement in working activities in the prison (OR = 3.1; 95% CI = 1.03–9.36), higher level of education - primary school education versus secondary school/university education (OR = 0.31; 95% CI = 0.1–0.93)	Small sample size in small geographic location. Survey used to collect data – prone to bias as subjects may record responses felt to be desirable rather than truth, particularly regarding vaccine uptake. High response rate increases validity of findings and sample size calculation response level met. Voluntary survey – responders may show differing behaviours to non-responders. Unclear what proportion of entire 3 facilities population represented by sample size. Unclear if vaccine reporting constitutes full course or single dose. Comparative country incarcerated resident vaccination rates not necessarily compatible due to heterogenous reporting mechanisms and vaccination strategies

Covid-19 Vaccine Acceptance Among People Incarcerated in Connecticut State Jails Margaret, Lind ;Byron, S. Kennedy ;Murilo Dorion, Nieto ;Amy, J. Houde ;Peri, Sosensky ;Ryan, Borg ;Derek, A. T. Cummings ;Albert, Ko ;Robert, P. Richeson 2023 (66)	USA	Retrospective cohort study	The stated aim was to evaluate the success of Connecticut department of Correction's vaccination programme within jails by comparing vaccination rates among newly incarcerated people before and after incarceration	The study presented data collated from 5 jail facilities in Connecticut state, USA representing a total of 6,522 people who stayed ≥1 night in a jail facility whilst vaccine eligible between February 02/02/2021 and 08/11/2021	Data were collated from the Connecticut Department of Corrections database	Spending ≥1 night in a Connecticut department of Corrections jail facility whilst vaccine eligible between February 02/02/2021 and 08/11/2021	Of 3,716 residents who were eligible for vaccination at intake 2,265 (61.0%) had a recorded offer and 476 (12.8%) consented to and received vaccination whilst in jail. Incarcerated residents spent more time eligible for vaccination in the community (79 days, IQR: 41-183) than in jail (14 days IQR: 3-31) and were 12.5 (95% CI = 10.2-15.3) times more likely consent to and receive vaccination while incarcerated than prior to incarceration.	Small sample size in small geographical location. Results reliant on accuracy of Connecticut Department of Corrections dataset. Authors note that their jail vaccine acceptance rates were based upon recorded offers and not all offers would be recorded. The authors note that the selection of residents and at-risk time for the survival analysis may have introduced bias
COVID-19 Vaccine Acceptance in California State Prison, E. T. Chin, D. Leidner, T. Ryckman, Y. E. Liu, L. Prince, F. Alarid-Escudero, et al. 2021 (69)	USA	Retrospectively analysis of data (pre-print)	To calculate the percentage of residents who accepted at least one dose among the residents who were offered doses and to use multivariable logistic regression analysis to estimate the probability of the acceptance of at least one dose according to race, age, medical vulnerability, and history of COVID 19. Acceptance after initial decline of vaccination was also assessed	Two thirds of the 97,779 incarcerated residents in California were offered a vaccine, from 22 December 2020 to 4 March 2021	Californian department of corrections and rehabilitation (CDCR) provided anonymised data for all Californian prison residence.	Being offered a COVID-19 vaccine whilst in prison	66.5% of those offered accepted at least one dose, adjusted analysis shows that uptake was highest in Hispanic and White residence and lowest amongst Black residents, adjusted for room type, participation in penal labour, security level and prison, also adjusted for age/co-morbidities using COVID-19 risk score, younger and healthy residents (based on COVID-19 risk score - identifies 17 risk factors and scores them accordingly) were less likely to accept vaccines (statistically significant), lots of residents who had re-offered a vaccine then was accepted	Stated that prisoners were re-offered vaccines and many accepted, however no documentation on statistics of this. Interaction terms for COVID risk score and race, and age and race were included
COVID-19 vaccine prioritization of incarcerated people relative to other vulnerable groups: An analysis of state plans, R. Strodel, L. Dayton, H. M. Garrison-Desany, G. Eber, C. Beyrer, J. Arscott, et al. 2021 (72)	USA	Analysis of policies	Inferred aim: to understand the inclusion of prisoners in vaccination plans and to describe if the most recent publicly available state COVID-19 vaccine distribution plans explicitly include incarcerated individuals, and if so, how are they prioritised relative to other populations	Analysis included all 50 states and the district of Columbia, analysis of plans up to 31 December 2020	Publicly available data from the COVID 19 vaccination program interim playbook for jurisdiction operations (CDC playbook), analysis of plans and revisions up to December 31 2020, CDC implemented a 3 stage plan for vaccine prioritisation, supplemental information in vaccine prioritization available from state health departments also analysed	Being in prison in COVID 19 times	92% of plans mentioned correctional facilities as critical populations, 47% did not mention which phase prisoners were planned for, 22% in phase 1, 29% in phase 2, 2% in phase 3, prison workers (49%) and law enforcement officers (63%) more likely included in phase 1, variation per state, all plans included residents of care homes in phase 1, over 65s were prioritised in phase 1 for 59% of plans, does not state what happens if someone is over 65 and in prison	Used triple coding strategy to ensure appropriate data analysis, plans only up to dec 2020 were included, meaning different groups may have been prioritised by the time the vaccine roll out happened, not all covid-19 plans were publicly available, not very relevant to WCEC

Depressive, Anxiety Symptom Frequency and Related Factors Among Prisoners During the COVID-19 Pandemic in Northeastern Ethiopia, a Cross-Sectional Study Birkie, M. ;Necho, M. ;Tsehay, M. ;Gelaye, H. ;Beyene, A. ;Belete, A. ;Asmamaw, A. ;Tessema, Z. T. ;Bogale, K. ;Adane, M. 2022 (75)	Ethiopia	Cross sectional study	The stated aim was "to assess depression, anxiety, and associated factors among Dessie City prisoners during the 2020 COVID-19 outbreak"	The study presented data from an incarceration facility in Dessie, Amhara State, Ethiopia collected during October 2020 representing 1,550 total incarcerated residents of whom 420 were included in the study	Data were collected from a survey, performed by qualified mental health nurses, comprising multiple mental health instruments including PHQ-9, GAD-7 and Insomnia Severity Score	Being resident in prison during the COVID-19 pandemic	279 (66.4%; 95% CI 61.4, 70.6) of incarcerated residents met the threshold score for major depressive disorder (PHQ-9 score ≥10). 281 (66.9%; 95% CI 61.9, 71.9) met the threshold for generalized anxiety disorder (GADs-7 score >10). . This contrasts with pre-pandemic studies in the Ethiopian incarcerated population quoted by the authors where depression prevalence rates ranged from 41.9%-56.4 and anxiety prevalence rate was 36.1%.	Small sample size in small geographical area. Validated mental health instruments used although translation of these tools may lead to errors and reduce validity. High response rate (99.2%) increases validity of findings. . Study sample size calculation assumes a 50% prevalence of conditions – unclear why this value chosen. Selection of cross sampling may introduce bias. Little details given of comparative pre-[pandemic mental health outcome studied therefore comparison should be interpreted with caution. No concurrent general population data documented so unclear if this is a population effect rather than specific to incarcerated population
Disparities in COVID-19 Related Mortality in U.S. Prisons and the General Population, Nowotny K M et al, 2020 (58)	USA	Retrospective analysis of data	Inferred aim: to provide an analysis of COVID-19 mortality data to assess the potential magnitude of COVID-19 amongst prison residents and to contextualise COVID-19 deaths in prisons	32/50 state departments included who had reported at least one COVID-19 death, total sample size not documented, dates of study from 22 April 2020 to 15 July 2020	Primary data from the COVID Prison Project (CPP) which tracks 53 prison systems, prison systems reporting at least 1 death were included, data also collected from a variety of sources e.g. CDC, bureaus of justice statistics but does not state what kind of data	Being in prison during the COVID-19 pandemic	By July 15 there had been 683 covid deaths, averaging 48 a week by July 11, Standardised (for age and sex) mortality rate was 2.75 in comparison to the public, crude mortality rate of 50/10,000 in prisons compared to 40/10,000 in general public, SMR varied hugely between states, with some states going up to 10.56 that of the general population	14 states were excluded from analysis, not clear whether this is because they had no deaths or they reported no deaths, additional national data also collected from other sources, does not state which kind of data this is, and they use the 'latest year that has data publicly available' presumably then not including COVID data?, no confidence intervals for SMR, does not give denominators or how this is calculated, a previous critical appraisal of this recommends that the paper has 'major revise', those prisons who had not had any deaths were not included in analysis therefore skewing the SMR and the results to higher than they might be
Epidemiology of Coronavirus Disease 2019 at a County Jail—Alameda County, California, March 2020-March 2021 Marusinec, Rachel ;Brodie, Daniel ;Buhain, Sonal ;Chawla, Colleen ;Corpuz, John ;Diaz, Jennifer ;Durbin, Michael ;Moss, Nicholas ;Okada, Reiko ;Sanchez, Yesenia ;Watkins-Tartt, Kimi ;Yette, Emily ;Chitnis, Amit S. 2022 (36)	USA	Outbreak investigation, analysis of real-time infection data	The study aimed to describe epidemiology of a COVID-19 outbreak at a jail in Alameda County from 01/03/2020-31/03/2021	The study presented data collection from a jail in Alameda County, California, USA from March 2020 to March 2021, with a population over this time period ranging from 1751-2625 incarcerated people.	The data was collected by a private clinical firm, Wellpath, who kept a daily line-list of all cases among incarcerated persons and all tests conducted at the jail in question. This data was then verified by Alameda County Health Care Services Agency Public Health Department staff who verified all information regarding positive COVID-19 tests by viewing laboratory reports in the California Reportable Disease Information Exchange.. Community rates were calculated by dividing the number of cases in Alameda county's local health jurisdiction each week by the county estimated 2020 population of 1 529 812.	Being in jail during the COVID-19 pandemic	The study reported that COVID-19 incidence rate within the jail over the study period was 280 cases per 1000 population. This was 5.29 times that of the local general population (95% confidence interval, 4.87-5.75) 9/571 were hospitalised with no deaths, peaks in the prison were linked to peaks in the community. Total of 10 494 tests taken in prison, 18 mass testing events happened, 60% of those tested were asymptomatic at the time of testing, those younger, Hispanic or Latino (44%) and black (32%) had a higher percentage of positive tests (however no statistical analysis was performed) in the community 40% of positive tests were Latino and 8% were black,	Very small sample size in very small geographical location. Community rates were not adjusted for age or co-morbidity therefore data needs to be interpreted with caution. Testing strategies within the jail varied over time, so data may be unreliable with regard to case rates earlier in pandemic period. Definition of jail associated cases may have included some community acquired cases, therefore data to be interpreted with caution. Data from jail facility not necessarily generalisable to other incarceration facilities (eg prison) due to the rapid turnover and transient nature of stays in jail facilities. No information about community testing rates so unclear if higher incidence an artefact of testing rates. Limited demographic information given so comparisons between differing population should be made with caution
Epidemiology of COVID-19 Among Incarcerated Individuals and Staff in Massachusetts Jails and	USA	Retrospective	Inferred aim: to describe the covid 19 burden in Massachusetts jails and prisons and its	Looked at the prison population in Massachusetts, at baseline 14 987 people were	Data collected from 16 Massachusetts department of corrections (MA DOC) and 13 county level systems, used publicly available anonymised data, data from general population	Being in prison during the	Incidence of covid was 44.3/1000 for prisoners, 2.91 times higher than Massachusetts general pop and 4.8 times greater than general population, systems with higher testing rates had higher case	Prevalence rates and risk ratio not standardised, no documentation of confounders or demographics of the population, does not document the testing

Prisons, M. C. Jimenez, T. L. Cowger, L. E. Simon, M. Behn, N. Cassarino and M. T. Bassett, 2020 (30)		cohort study	association with de-carceration and testing rates	incarcerated, as of July 8, 664 incarcerated individuals had tested positive for covid, data collected from 5 April to 8 July 2020	from the COVID tracking project and Massachusetts government? Does not specifically state	COVID-19 pandemic	rates, case incidents were higher among systems that released a lower proportion of their baseline population	rates alongside it and higher testing rates accounts for higher case rates, does not state why people were tested eg asymptomatic mass testing or symptomatic testing, does not say which kind of tests were used
Epidemiology of COVID-19 in Prisons, England, 2020, W. M. Rice, D. Y. Chudasama, J. Lewis, F. Senyah, I. Florence, S. Thelwall, et al. (38)	UK	Epidemiological report	Inferred aim: to describe characteristics and outcomes for prison-associated covid-19 cases in England reported to Public Health England	734 incarcerated prisoners had tested positive and 412 prison staff, data collected from 16 March 2020 to 12 October 2020	Using data from PHE reporting system about PCR results, prison residences were identified from the addresses via Locator Hub software and matched against a national database of properties, fuzzy matching was used on failed records and manually matched remaining records, used lab records for key worker testing to identify prison staff	Being in prison during the COVID-19 pandemic	Crude incidence in prisoners in England was 988/100,000, compared to 935/100,000 in general population, therefore not statistically different, higher percentage of positive tests for Black (6.4% vs 3.3%) and Asian (7.8% vs 7.5%) compared to the general population is done however no statistical analysis of this was done, case fatality ratio of 3.13% (CI 2-4.67) in prisons compared to in 8% in England over study time, CFR for over 66 in prison was 15.5% but no comparison to the general public over, not standardised	Does not state how the crude case incidence was calculated, does not say where prison or general population data is gained from, not standardised looked at confounders, the matching of the cases used fuzzy matching or manual matching, means there is a chance of human error when matching or that address data may not be accurate, data collection seems unreliable and not explained coherently,
Examining COVID-19 Mortality Rates by Race and Ethnicity Among Incarcerated People in U.S. State Prisons Mimi Yen, Li ;Shelby, Grebbin ;Ankita, Patil ;Tori, Cowger ;Dennis, Kunichoff ;Justin, M. Feldman ;Monik, Jimenez 2022 (64)	USA	Retrospective analysis of data	The study aimed to estimate COVID-19 mortality rates among individuals incarcerated in U.S. state prisons by race and ethnicity	The study presented publicly available data from 11 US states between 01/03/2020 and 01/10/2020 representing a sample of 309,273 incarcerated individuals. The data analysed 23.35% (272 of 1165) of all COVID-19 related deaths in US prisons over the study time period.	Data was primarily collected from COVID19 data from state-level Departments of Corrections reports. Supplemental data was included from other sources, of which Department of Corrections COVID-19 dashboards and Texas Justice Initiative were specifically named.	Being in prison during the COVID-19 pandemic	The study reported that the age-adjusted rate of COVID-19 mortality was significantly higher among Black compared to White incarcerated individuals (RR = 1.93, 95% CI: 1.25–2.99), among Hispanic compared to White incarcerated individuals (RR = 1.81, 95% CI: 1.10–2.96) and among “other” non-white groups, (RR = 2.60, 95% CI: 1.01–6.67) The study also noted that the average age at COVID-19 mortality was 63 years (SD = 10 years) – this was demonstrated to be significantly lower among Black (60 years, SD = 11 years) versus White adults (66 years, SD = 10 years; $p < 0.001$) but not in Hispanic (65 years, SD = 9 years) or “Other” non-white groups (66 years, SD = 8).	Large sample capturing nearly a quarter of all reported COVID-19 related deaths in USA prison systems over study period. Not all states were included in data for following reasons: reported Hispanic ethnicity without racial classification, requested fees ≥$500, did not provide sufficient data to calculate age-standardized rates – this represents a possible source of bias (11/50 states included in age standardised data for this reason). Data collected in early period of pandemic (pre-vaccine availability), therefore not necessarily generalisable over entire pandemic or post-vaccination periods. Data relies upon the accuracy of measurement and reporting of state reported data, including race/ethnicity and what constitutes a COVID-19 related death.. Data does not adjust for underlying co-morbidity therefore needs to be interpreted with caution
Factors associated with COVID-19 vaccine acceptance and hesitancy among residents of Northern California jails, Liu Y et al, 2021 (70)	USA	Retrospective analysis of data	Inferred aim: to assess reasons for vaccine hesitancy, sources of COVID19 information and medical mistrust, investigated the association between COVID-19 vaccination and age, gender, race/ethnicity, recent flu vaccination, and housing type	Part of a pre-existing survey where 788 incarcerated people were included, 509 prisoners responded, questions about vaccinations added on 15 December 2020, data analysed up to 30 April 2021	Santa Clara country electronic health record (EHR) used to gain information about people vaccinated in custody between 29 Jan 2021 and 30 June 2021, these records were then linked to survey results, part of ongoing survey on perceptions, attitudes and behaviours about COVID-19	Being in prison during the COVID-19 pandemic	2584 prisoners offered vaccine, where 56.7% accepted at least one dose (1,464), acceptance increased with age 50+ (3.5 OR of vaccine acceptance compared to 18-29), men less likely to get covid vaccine (0.6 OR compared to females) , more likely to get vaccine if recent flu vaccine, vaccine uptake lower in black people (OR 0.7 compared to white people) but was not statistically significant, people in shared cells (OR 1.8) /dorms (OR 2.3) more likely to get vaccinated when compared to those in single cells, of those vaccinated in jail 36.7% had previously declined, reasons for refusal, side effects(60%) , wanting to know more (38%), not thinking they needed it (23%),	Pre-print, not peer reviewed, excluded people who were in custody for less than 26 days (those cycling in and out may be a more vulnerable population), 1st/2nd/booster dose not documented, no comparison to the general population, no ethnical approval documented

Health Management in Italian Prisons during COVID-19 Outbreak: A Focus on the Second and Third Wave Vella, R. ;Giuga, G. ;Piizzi, G. ;Alunni Fegatelli, D. ;Petroni, G. ;Tavone, A. M. ;Potenza, S. ;Cammarano, A. ;Mandarelli, G. ;Marella, G. L. 2022 (40)	Italy	Retrospective analysis of data	The stated aim of the study was "to evaluate the spread of the virus and the efficacy of the measures adopted in Italian prisons during the period from November 2020 to July 2021 and to compare the evolution of the pandemic between the Italian population and the Italian correctional system"	The study presented publicly available COVID-19 data covering the entirety of the Italian prison population, between 22/11/2020 and 28/06/2021. This data represented a monthly prison population ranging from 53,637 to 54,368 between these dates.	Data was collected from the publicly available Italian Ministry of Justice Website.	Being in prison during the COVID-19 pandemic	The study reported a prevalence of SARS-CoV-2 infection among prisoners ranging from 0.19% to 1.94% (mean 1.02%, SD 0.51%) over the study period. The authors comment that the prevalence of confirmed COVID-19 cases were consistently lower in the prison population than in the general population, but no specific data surrounding COVID-19 prevalence in the general Italian population is presented. The study also notes a time lag on average of 1-2 weeks between peaks of infection rates in the general population and the prison population on cross-correlation time lag plot	Population level study, with data covering entirety of prison system documented. Unclear how testing availability and policy varied between prison population and general population so lower COVID-19 prevalence described may be artefactual of this. Limited data regarding prevalence rates in general population presented (only for Police and administrative prison staff) so unable to verify authors conclusions of comparative rates. Data relies on accuracy of Italian government statistics. Raw vaccination dose administration numbers presented but no percentage calculation/rates so unable to make conclusions regarding uptake in prisoners versus general population.
Hospitalizations for COVID-19 Among US People Experiencing Incarceration or Homelessness Montgomery, M. P. ;Hong, K. ;Clarke, K. E. N. ;Williams, S. ;Fukunaga, R. ;Fields, V. L. ;Park, J. ;Schieber, L. Z. ;Kompaniyets, L. ;Ray, C. M. ;Lambert, L. A. ;D'Inverno, A. S. ;Ray, T. K. ;Jeffers, A. ;Mosites, E. 2022 (54)	USA	Retrospective analysis of data	The study's relevant stated objective was to compare COVID-19 hospitalisations for people experiencing incarceration with hospitalisations among the general population	The study presented data from a cross section of 892 hospitals, private and public, across the USA between 01/04/2020 and 30/06/2021. The data represented 3415 people experiencing incarceration, and compared their data to 1,257,250 members of the general population.	Data was collected from a discharge summary database (Premier Healthcare Database Special COVID-19 Release) – People experiencing incarceration were defined by the use of specific admission codes and ICD-10 codes within the discharge summary. COVID-19 status was defined by ICD-10 primary or secondary diagnosis coding on the discharge summary.	Emergency Department attendance/ Hospital Admission from incarceration facilities during the pandemic	The study demonstrated a number of adverse outcomes associated with COVID-19 infection for people experiencing incarceration compared with the general population: higher rate of hospitalisation (2170 [63.5%]; P < .001), more likely to be hospitalised at a younger age (median age: 56 years IQR, 44-65 years), more likely to require invasive mechanical ventilation (aRR 1.16; 95% CI, 1.04-1.30) and more likely to die in hospital (aRR, 1.28; 95% CI, 1.11-1.47). People experiencing incarceration were also more likely to be readmitted to hospital for COVID-19 within 30 days of hospital discharge (aRR, 1.45; 95% CI, 1.18-1.78) and more likely to have a longer stay in hospital following admission (incidence rate ratio, 1.11; 95% CI, 1.06-1.16)	Large study covering geographically widespread area of United States, with detailed demographic analysis and comparison with general population. Risk ratios adjusted for multiple factors, including age, sex and underlying co-morbidities. The data relies entirely upon the accuracy of admission and discharge summary coding data. Strategy of specific read codes to identify incarcerated people may under-estimate true numbers. Authors note that duplicated results may occur for patients who have accessed care from multiple hospital facilities, although likely to be offset by large sample size.

Implementation of a COVID-19 Infection Control Plan in a Large Urban Jail System Qureshi, N. ;Cardenas, C. ;Tran, N. D. ;Henderson, S. O. 2022 (47)	USA	Longitudinal study using daily collected testing data	The study aimed to review the cumulative incidence of COVID-19 in a jail system located in Los Angeles, California, USA as well as mitigation strategies put in place by the jail system.	The study presented data collected from the Los Angles jail system representing an average daily population of approximately 17,500 incarcerated residents and 33,921 unique people tested across 6 facilities between 07/03/2020 and 31/12/2020	Data was collected by extracting COVID-19 test data on a daily basis directly from the Correctional Health Services Electronic Health Record into a shared file available to the medical team in the jail system.	Being in jail during the COVID-19 pandemic	The study demonstrated a cumulative COVID-19 incidence of 11.6% over the study period (3933/33921 unique people testing positive) SARS-CoV-2 positivity was significantly associated with the following demographics: Hispanic Ethnicity (aOR 1.67, 1.49-1.86 p=<.001), non-Hispanic Black Ethnicity (aOR 1.26, 1.11-1.42 p=<.001) Ethnicity designated as “other” (aOR 1.27, 1.04-1.56 p=.02), male sex (aOR 2.33, 2.03-2.67 p=<.001), and age ≥65 years (aOR 1.39, 1.08-1.79 p=.01)	Small sample size in a very small geographic location. Regression results were adjusted for age, sex and race but not for underlying co-morbidity which may introduce bias. No comparison to general population, only within jail sex, ethnicity and race comparison documented so findings may be population effect rather than specific to jail facilities. Data from jail facilities not necessarily generalisable to other incarceration facilities (eg prison) due to the rapid turnover and transient nature of stays in jail facilities. Testing strategies within the jail system varied over time with mass asymptomatic testing being introduced as of 11/05/2020, so data may be unreliable with regard to case rates earlier in pandemic period The demographic of the jail system was heavily weighted towards male inhabitants (87.7%). The male inhabitants were also housed in multiple facilities whereas the female inhabitants were located in one facility only. The sex-based regression results therefore need to be interpreted with caution.
Indirect age- and sex-standardisation of COVID-19-related mortality rates for the prison population of England and Wales, 2021, I Braithwaite, C Edge, D Lewer (13)	UK	Report, retrospective analysis of data	Inferred aim: To estimate the standard mortality ratio of COVID-19 deaths among prisoners and to outline why early vaccination is necessary	All data on prisoners in England and Wales, compared to all data from the general population, total sample size not noted, data collected from 1 March 2020 to 26 February 2021	Data for prison population collected from Offender Management Statistics Quarterly, published by HMPPS, community data collected from ONS, standard mortality ratio (SMR) calculated	Being in prison during the COVID-19 pandemic	121 deaths in prisons, expected to be 36.3 given age and sex of the population, means that there is 3.3 SMR (CI 2.77-3.98) (3.3x more deaths in prisons than expected in the general population)	Age and sex standardised, did not account for pre-existing morbidities, sensitivity analysis of the expected deaths calculated by looking at expected deaths in the 70+ age group
Injustice? Towards a better understanding of health care access challenges for prisoners, M. Davies, E. Keeble and R. Hutchings 2021 (57)	UK	Retrospective analysis of data	Inferred aim: to analyse the health care services used by the prison population in England	Continuation on the report published by Nuffield trust in 2020, Locked out: prisoners' use of hospital care, reviews the literature and considers new areas: remote consultations, early impact of COVID-19 pandemic, different ethnic groups use of health services, improve understanding of people’s health needs entering prison, data from 2016/17 to 2019/20	Data from hospital episode statistics (HES) data, used postcode proxy for prison location and associated hospital activity linked to prisoners	Being in prison during the COVID-19 pandemic	Early data suggests COVID has worsened prisoners’ ability to access hospital services, start pandemic March 2020, 1,019 admissions to hospital by prisoners in England, lowest number admissions seen in any month in 2019/2020, cases related to cancer and GU healthcare eg dialysis were seen, only the most urgent cases were seen, the drop in elective activity in hospitals was a lot greater for prisoners than for those in the general population, vast increase in remote consultations	No quantitative comparisons to the general population, no statistically comparative analysis was done, demographics of prisoners were not included, as it was a continuation of a previous report, full methodology was not documented

Is There a Temporal Relationship between COVID-19 Infections among Prison Staff, Incarcerated Persons and the Larger Community in the United States? D. Wallace, J. M. Eason, J. Walker, S. Towers, T. H. Grubesic and J. R. Nelson 2021 (52)	USA	Retrospective analysis of data	Inferred aim: to present statistical evidence of the relationship between incarcerated people and staff infections in the federal bureau of Prisons (BOP) at the start of the pandemic in March to December 2020	63/134 facilities were included in the analysis, data from 27 states, lots were excluded due to data reporting limitations, operational functions beyond incarceration and natural disasters, total number of prison population not documented, between 26 March 2020 and 31 December 2020	Data collected federal bureau of Prisons (BOP) COVID-19 dashboard, weekly populations of incarcerated people and quarterly prisoner-to-staff ratios by prisons, rate of active COVID-19 of incarcerated people, rate of active COVID-19 of staff, incidence rate of COVID-19 in the county surrounding	Being in prison during the COVID-19 pandemic	Spikes in staff prevalence rate precede spikes in prisoners' prevalence rate, which was significant in lagged and logged prevalence rates, staff prevalence rate tends to be higher than the incarcerated people, every 1% increase in staff prevalence, associated 0.24% increase in prisoner prevalence rate, for every 1% increase in county prevalence associated 0.66% increase incarcerate population, when mask mandate came in only 0.84% decline in cases	Some demographic information about the counties prisons are situated in, however no demographic information about the prisoners, staff population was created by dividing population of incarcerated by staff to prisoner ratio so may not be reliable, many facilities excluded
Life Expectancy and COVID-19 in Florida State Prisons Marquez, Neal M. M. P. H. ;Littman, Aaron M. MPhil J. D. ;Rossi, Victoria E. M. S. MPAff ;Everett, Michael C. B. A. ;Tyagi, Erika M. S. ;Johnson, Hope C. B. A. ;Dolovich, Sharon L. J. D. PhD 2022 (59)	USA	Retrospective analysis of data	The study aimed to evaluate COVID-19 related deaths and the effect COVID-19 had on all-cause mortality/life expectancy of the incarcerated population in the state of Florida, USA compared with the general population within the state.	The study presented data from Florida state Department of Corrections (FLDOC), representing a population ranging from 84,086 to 95,769 over the study period (January 2019 to December 2020)	Data regarding the incarcerated population was collected from FLDOC Offender Based Information System (an electronic record system). Incarcerated population mortality data was extracted from FLDOC fiscal-year Inmate Mortality Report, with COVID-19 related deaths defined upon review of Death Certificate data, capturing COVID-19/SARS referenced within the first 5 causes of death.. Demographic information for the general population was taken from 2019 American Community Survey with mortality data and COVID-19 related death information taken from Florida Department of Health and CDC figures respectively.	Being in prison during the COVID-19 pandemic	The study demonstrated that the standardised COVID-19 mortality rate for the incarcerated population was 4.45 times that of the general population (203.9 deaths per 100,000 - IRR=4.45, 95% CI=3.85, 5.15, p<0.001). COVID-19 contributed to a reduction of life expectancy in the incarcerated population of 4.2 years versus 1.5 years in the general population. In 2020, the standardised mortality rate of the incarcerated population was 626.9 deaths per 100,000 individuals versus 597.3 deaths per 100,000 individuals in the general population.	Large sample size restricted to small geographic location. COVID-19 related deaths defined differently within incarcerated population versus general population introducing bias. The demographic of the prison system was heavily weighted towards male inhabitants (94%) therefore data not necessarily generalisable. Testing strategy of varying facilities included in data not documented. No comparison to testing rates in general population therefore results may be artefactual of testing rates. Data relies upon accuracy of publicly available state reported information
NCCHC Survey Yields Insights Into COVID-19 in U.S. Correctional Facilities, B. Gibson, 2020 (46)	USA	Weekly survey of correctional facilities	Inferred aim: to collect data on how COVID-19 affected detention centres	514 facilities reporting data at least once, final survey received responses from 85 facilities, received cumulative data on 296, 574 prisoners, weekly survey sent out from March 2020 to June 2020 (9 weeks)	Data collected by National Commission on Correctional Health Care (NCCHC) and Researchers from Harvard Kennedy school and Harvard law school, data collected on cases and testing, and opportunity to share concerns, policy, procedures, and other info	Being in prison during the COVID-19 pandemic	Intake screening increased from 93-97% during study, screening of those incarcerated also increased from 46-56%, 17% positivity test out of 8127 compared to a positivity of 13% for CDC for general population, access to adequate testing reported only 64% at beginning and then rose to 92%, 3.5x prevalence of cases in black people compared to white people, 5.9x prevalence in Hispanic vs non Hispanic	Also included juvenile detention centres, does not just focus on the adult jail population, positivity rate must be interpreted with caution, does not state why people were tested ie asymptomatic mass testing or symptomatic testing, no documentation about how OR was conducted for white vs black etc, CI not reported, no demographic details reported, no breakdown of results in study or in the appendices
Older incarcerated persons' mental health before and during the COVID-19 pandemic DePalma, Alexandra ;Noujaim, Deborah ;Coman, Emil ;Wakefield, Dorothy ;Barry, Lisa C. 2022 (10)	USA	Longitudinal study as part of larger pre-established study, via self-reported mental/physical health measure survey	The study aimed to determine the impact on mental and physical health of the COVID-19 pandemic on older incarcerated people	The study presented baseline data collected partly from the established AGING INSIDE study collected pre-pandemic between 01/11/2017 and 31/01/2019, and partly from additional surveys taken as part of the AGING INSIDE check-in study collected mid-pandemic between 28/07/2020 and 20/09/2020. This data represented 157 incarcerated adults 50 years of age or older, resident within 8 institutions of the Connecticut Department of Correction (CTDOC). It represents	Surveys were sent out to residents already enrolled in the AGING INSIDE study. The survey measured PHQ-8, GAD-7 and a self-rated health (SRH) score of 1-5 (1=poor, 5= excellent). Results were compared with surveys taken prior to the pandemic as part of the AGEING INSIDE study	Enrolled in the AGING INSIDE study and in prison during the COVID-19 pandemic	The study demonstrated that PHQ-8 depression scores (5.5 ± 6.0 vs 8.1 ± 6.5; p < 0.001) and GAD-7 scores (6.4 ± 5.7 vs 7.8 ± 6.6; p < 0.001) both increased during the COVID-19 pandemic compared to prior to it. A greater proportion of residents scored a clinically significant PHQ-8 score (≥10) during the COVID-19 pandemic compared to prior (38.2% versus 22.4%) Average SRH score worsened by −0.31 (p < 0.001) Causal mediation model results demonstrated that worsening PHQ-8 scores predicted worsening SRH rating (β = −0.040; p < 0.05)	Very small study sample size in a very small geographical area No general population comparison, therefore unable to say if this result is specific to incarcerated adults or a general population effect. Self-reported PROs prone to repeat testing bias. Data only relevant to older adults and heavily weighted towards male residents (96%) therefore not necessarily generalisable to larger prison population.. Nearly 25% of eligible residents failed to respond to the survey. Although 77.7% of the already AGING INSIDE-enrolled patients responded, this in fact only represents 15.7% of the patients initially eligible for the AGING INSIDE study, therefore data should be interpreted with caution as a representation of the older adult population of the 8 Connecticut correctional institutions involved.

				77.7% of the prior enrolees of the AGING INSIDE study.				
Racial and ethnic inequalities in COVID-19 mortality within Texas carceral settings,N. Marquez, D. Moreno, A. Klonsky and S. Dolovich (62)	USA	Retrospective analysis of data (pre-print)	Inferred aim: to investigate whether COVID-19 altered patterns of mortality for Black, Hispanic, and white individuals within the TDCJ population and if so, which groups were most heavily impacted	Prisoners within the Texas department of criminal justice, average monthly population of 131 873, 454 total deaths, with 288 covid deaths, from 1 April 2019 to 31 March 2021	Monthly population data collected from Texas department of criminal justice (TDCJ), where data was missing, linear interpolation was used, mortality data for prisoners taken Texas justice initiative, standardized all cause and covid mortality rates calculated adjusted for sex and age compared to pre-pandemic, model risk of mortality by race/ethnicity using a Bayesian model framework, white 20-34 females were baseline category	Being in prison during the COVID-19 pandemic	During pandemic period, standardised all-cause mortality across all races had increased by 85% over previous 12 months, COVID 19 accounts for more than 39% of deaths, all-cause mortality did not differ statistically between races, statistically significant covid-19 mortality for Black people was 1.6x and for Hispanic people was 2x greater than for White people. Adjusting for age and sex, relative to the White population, 1.67x for Black people and 1.96 times for Hispanic people	Does not state how multiple calculations were made, females were baseline intercept for Bayesian regression models even though 92.15% of people in prison are male, no comprehensive demographic information,
Risk Factors for SARS-CoV-2 in a Statewide Correctional System, B. S. Kennedy, R. P. Richeson and A. J. Houde, 2020 (45)	USA	prevalence study	Inferred aim: to perform multivariate analyses to identify individual and facility-level risk factors associated with COVID 19 prevalence and outcomes in a state-wide correctional population that underwent nearly universal testing	Study based in Connecticut department of corrections (CTDOC), comprised of 17 facilities, by the end of the prevalence survey cumulative testing total 10,304, testing percentage of about 84%, data collection from 13 March 2020 to 26 June 2020	Does not document how data was collected? symptom based and mass testing using PCR to detect covid, clinical outcomes of covid 19 monitored, plus hospitalisation, ICU admission and death, used multilevel multivariate logistic regression analysis used to identify risk factors, total number of people in prison obtained by daily census population at beginning of study	Being in prison during the COVID-19 pandemic	13% men tested positive, no women tested positive, statistically significant RF for infection were dormitory housing, Hispanic or Latino ethnicity (compared to white), and older age, predictors of hospitalisation were heart disease and older age, dormitory housing was statistically protective for hospitalisation (? due to quantity of testing or sick inmates were identified and then housed in cells before testing and hospitalisation) autoimmune conditions, heart disease and age were predictors of ICU admission, Older age was the only predictor of death, 3.3 (CI 1.7-6.3) per decade	Missing prior asymptomatic cases before the mass testing regime may mean more people had COVID, mean age was 38, this may account for why certain RF were not statistically significant at predicting hospitalisation/ICU as prevalence of some chronic conditions were lower than other documented studies about prisoners

SARS-CoV-2 among inmates aged over 60 during a COVID-19 outbreak in a penitentiary complex in Brazil: Positive health outcomes despite high prevalence Gouvea-Reis, F. A. ;Borja, L. S. ;Dias, P. O. ;Silva, D. C. S. ;Percio, J. ;Peterka, C. ;Silva, G. O. ;Adjuto, R. N. P. ;Tavares, G. B. ;Cunha, M. B. ;Feres, C. ;de Oliveira, J. ;Sodré, G. ;dos Santos, W. ;de Moraes, C. 2021 (63)	Brazil	Outbreak Report	The stated aim of the project was "To assess SARS-CoV-2 prevalence and health outcomes among inmates over 60 years during a COVID-19 outbreak in a major penitentiary complex in the Federal District, Brazil."	The study presented data from a single penitentiary complex in the Federal District of Brazil. Result of a mass testing programme of residents aged ≥60 years of age performed on 13/05/2020 are reported along with interviews to ascertain symptom status of the tested patients. The data represented 159 incarcerated subjects.	Data was collected partly from direct testing results (PCR for symptomatic patients, antibody testing for asymptomatic testing) and from direct resident interviews for symptom status.	Being in prison and ≥60 years of age during the COVID-19 pandemic	The study reported 0% mortality rate in the sampled population. Per reported general population data for the Federal District of Brazil, this is lower than expected – per positive test numbers in the penitentiary, the following numbers of deaths per age group would be expected: 60-69 = 6.032 deaths, 70-79 = 2.875 deaths , 80+ = 1.38 deaths	Very small sample size in a very small geographical area. 0% mortality likely to be due to chance given small sample size – no statistical analysis to ascribe statistical significance to the data. No adjustment for underlying co-morbid status.. Mixed testing methods, antibody testing methods less reliable than PCR testing. Unclear with antibody testing when exactly exposure to COVID-19 had occurred. Assumed to be whilst incarcerated. Possible that PCR negative symptomatic patients may have been positive on antibody testing if previously infected, but would be captured as negative test results
SARS-CoV-2 seroprevalence in the adult detainees of the Paris area in 2021: A multicenter cross-sectional study Mellon, Guillaume ;Rouquette, Alexandra ;Fac, Catherine ;Carton, Béatrice ;Cordonnier, François ;David, Emmanuelle ;Goutte, Béatrice ;Heulin, François ;Kanoui, Valérie ;Levasseur, Ludovic ;Racle, Pascale Benjamin ;Nehri, Kawther ;Dulioust, Anne ;Roque-Afonso, Anne-Marie; Silberman, 2022 (43)	France	Multicentre cross-sectional study	The inferred aim was to estimate SARS-CoV-2 seroprevalence in the incarcerated population of Paris	The study presented data from a cross section of 1044 residents (out of 11,413 total incarcerated people) from 12 incarceration facilities in the Paris region of France from 14/01/2021 to 08/07/2021	Data was collected via Elecsys® Anti-SARS-CoV-2 N and Elecsys® Anti-SARS-CoV-2 S immunoassays collected directly from study participants measuring qualitative anti-nucleoprotein antibodies reactivity and quantitative anti-spike protein receptor binding domain antibody levels. General population prevalence in the Paris region collected from publicly available data at Géodonnées en Santé Publique (GEODES) website	Being in prison during the COVID-19 pandemic	18.2% (95% CI, 16.9 to 19.4) of incarcerated population, adjusted for age/sex, were seropositive over the entire study period. Over the week 08-14/02/2021 incarcerated population seropositivity was 18.4% (95% CI, 16.8 to 20.1) compared with 20.6% (95% CI, 16.6 to 24.9) in the general Paris population. Amongst male residents statistically significant factors independently associated with seropositivity were lower number of cigarettes per day ($p < 0.0001$) and higher number of inmates per cell ($p=0.0008$) In female residents, factors were younger age ($p=0.0002$) and lower number of cigarettes per day ($p=0.0216$)	Small sample size over small geographical area. Cross sectional sample of 9.1% of incarcerated population may lead to bias in extrapolating to entire incarcerated population. Low proportion of females involved compared to males (198v816) therefore results not necessarily generalisable. Seroprevalence positivity not necessarily related to within prison infection – initial infection may have occurred whilst in community. Unclear how effective antibody measurement alone is in assessing true previous infection and unclear how previous vaccination might affect results (although only 6.5% participants reported prior vaccination) Study voluntary with high number of refusals to participate (920/3545), therefore results may be biased by differing behaviours in residents choosing to participate. Not documented how seroprevalence measured in community – also likely differing demographics in community so comparison data should be interpreted with caution

Seroprevalence And Risk Factors For Sars-Cov-2 Among Incarcerated Adult Men In Quebec Kronfli, N. ;Dussault, C. ;Maheu-Giroux, M. ;Halavrezos, A. ;Chalifoux, S. ;Sherman, J. P. ;Park, H. ;Balso, L. D. ;Cheng, M. P. ;Poulin, S. ;Cox, J. 2022 (44)	Canada	Multi-centre cross sectional study	The stated aim was to assess "the seroprevalence of SARS-CoV-2 antibodies among people incarcerated in Quebec provincial prisons and determine the effects of carceral exposures on SARS-CoV-2 seropositivity"	The study presents data from a cross section of 1100 residents (out of 2170 incarcerated people invited to participate with a total documented capacity of 2528 over the three facilities) from 12 incarceration facilities in the Quebec region of Canada from 19/01/2021 to 15/09/2021	Demographic data collected via self-completed questionnaire. Seroprevalence data collected Roche Elecsys anti–SARS-CoV-2 serology test detecting immunoglobulin G antibodies. Comparison data from general population sourced from publicly available data at Hema-Quebec website	Being in prison/jail during the COVID-19 pandemic	22% of participants were seropositive over the study period. This compared with 13.75% in the comparative general population sample of Montreal blood donors.. Factors with a statistically significant association with seropositivity were: time spent incarcerated ("most time": aPR, 1.47; 95% CI, 1.01–2.12; "all time": aPR, 2.17; 95% CI, 1.53–3.07), employment during incarceration (aPR, 1.64; 95% CI, 1.28–2.11), shared meal consumption during incarceration ("with cellmates": aPR, 1.46; 95% CI, 1.08–1.97; "with sector": aPR, 1.34; 95% CI, 1.03–1.74), and incarceration post in-prison outbreak (aPR, 2.32; 95% CI, 1.69–3.18) (aPR = adjusted prevalence ratio)	Small sample size over small geographical area. Study presents data for males only, Unclear how effective antibody measurement alone is in assessing true previous infection as duration of measurable antibody levels unclear and liable to vary between individuals. Seroprevalence positivity not necessarily related to within prison infection – initial infection may have occurred whilst in community. Both Prison and Jail type facilities included in sample – so data not necessarily comparable to other facilities given due to the rapid turnover and transient nature of stays in jail facilities. Comparison data for general population taken from Montreal blood donors, therefore comparison results should be interpreted with caution – unclear method of detection of seroprevalence in this group. Outbreaks of COVID-19 occurred within all included prisons during the study period - results should therefore be interpreted with caution.. 49% of invited individuals declined, introducing potential selection bias. Self-completed question may introduce response bias. Convenience sampling – not randomised
Suicide attempts and Covid-19 in prison: Empirical findings from 2016 to 2020 in a Swiss prison, L. Getaz, H. Wolff, D. Golay, P. Heller and S. Baggio, 2021 (76)	Switzerland	Report, retrospective analysis of data	To investigate whether the occurrence of suicide attempts had increase during the pandemic compared to pre-pandemic	Prisoners in Switzerland and documented suicide attempts, sample size not documented data collected from 2016-2019 (pre-pandemic) and then in 2020 (pandemic period)	Retrospective data collection from nursing records of self-harm events, trained physician reviewed these to identify suicide attempts,	Being in prison during the COVID-19 pandemic	1.57 RR of suicide attempts in 'pandemic period' compared to 'pre pandemic', 1.57 RR of self-harm events in 'pandemic period' compared to 'pre-pandemic' period, even though the prison population had decreased in this time which normally correlates to a reduction in suicide attempts	'Pandemic period' included some data from pre pandemic as data was collected annually, no documentation of how calculations were calculated or crude numbers, no demographic data, reasons for suicide attempts not documented
Surveillance of COVID-19 outbreaks in prisons in the US South: The role of economic distress in the communities surrounding prison facilities Gu, M. ;Pro, G. ;Zaller, N. 2022 (48)	USA	Retrospective review of data	The stated aim was "to assess the association between county economic distress and prison COVID-19 outbreaks in southern US states"	The study presents data from 570 prisons within the US states of Alabama, Florida, Georgia, Kentucky, Louisiana, Missouri, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, and West Virginia collected between May 2019 and May 2020. Total number of incarcerated residents was not reported.	Data was collected from The Covid Prison Project, a publicly available source aggregated daily from prison systems and media reports. Economic Distress was demonstrated via the DCI score, a composite county-level score from 2015-2019 data corresponding to counties surrounding prison facilities	Being in prison during the COVID-19 pandemic	The study demonstrated significant associations between COVID-19 prison outbreaks and rurality (aRR, 1.35 CI, 1.06-1.73) p=0.02), increased DCI score i.e. higher economic distress (1.02 CI, 1.01-1.03 p <0.0001), % African American (0.069 CI, 0.011-0.42 P=0.004), %), Hispanic/Latino (0.11 CI, 0.013-0.94 p=0.04) (aRR = adjusted rate ratio)	Large geographical area with probable large sample size (although exact number not documented). Short, early period of pandemic period captured in data. Little data on individual facilities themselves or documentation of number of incarcerated residents captured by data. Results dependent on quality of prison level COVID reporting – testing strategies likely not uniform and may have changed over study period. Authors note that if 0 documented as number of daily cases in data, unclear whether this was a lack of reporting or a lack of cases – as such older cases reported in summation on a single day may have met criteria for an outbreak, when in reality this is an artefact of delayed reporting. COVID Prison project uses automatic data capture techniques

Testing lags and emerging COVID-19 outbreaks in federal penitentiaries: A view from Canada, Blair, A. Parnia, A. Siddiqi, A. 2020 (53)	Canada	Retrospective analysis of data (pre-print)	To summarise and compare the prevalence of testing, test positivity, COVID-19 prevalence, case fatality and proportion of recovered cases within prisons in Canada, by province and for Canada overall and to contrast them within the general provincial jurisdiction	51 facilities in Canada were analysed (after grouping of some systems), data analysed from 50 of these, total sample size not documented, 189 confirmed cases, data analysed up to 21 April 2020	Using publicly available data from Correctional Service of Canada for prison population, population numbers were estimates, general population data from COVID-19 Canada outbreak tracker resource hub and Statistics Canada estimates 2020 for first quarter	Being in prison during the COVID-19 pandemic	12/50 had no testing at all, 36/50 had fewer tests than the general population, those with higher testing levels tended to be those who had a high COVID-19 prevalence, overall had 34/1000 number of tests in prisons compared to 16/1000 in general population, COVID-19 prevalence 1.2% in prisons compared to 0.1% in general population, case fatality estimate of 0.5% in prisons compared to 0.3% in general population, again must be interpreted with caution due to underestimation of true case numbers, COVID-19 prevalence higher among women's prisons	Clear documentation of how outcomes were measured, breakdown in comparison to provinces in Canada, not particularly useful for WCEC, denominators for prison population likely to be inaccurate due to it being an estimate based on maximum occupancy, only 2 months of data looking at beginning of pandemic, case fatality estimate not standardised
The Impact Of COVID-19 On The Health Of Incarcerated Older Adults In California State Prisons Kwan, A. ;Garcia-Grossman, I. ;Sears, D. ;Bertozzi, S. M. ;Williams, B. A. 2022 (50)	USA	Retrospective review of data	The stated aim was to describe COVID-19 outcomes in older adults within the California State Prisons and compare their risk of adverse health outcomes with the general prison population	The study presents data representing 148,488 incarcerated residents from 35 prison institutions within California state, USA taken from 01/03/2020 to 09/10/2021	Data was collected from California Correctional Health Care Services (CCHCS) electronic records, a source aggregated from electronic health records and the prisons' internal registries.	Being in prison and >55 years of age during the COVID-19 pandemic	The study noted that, relative to adults <55 years old), older adults had a higher rate of confirmed cases of COVID-19 (aOR: 1.25 ages 55–64, 1.39 ages 65–74, 1.40 age ≥75) and a higher rate of COVID-19 testing (aOR: 1.21 ages 55–64, 1.36 ages 65–74, 1.93 age ≥75). Of incarcerated residents with confirmed COVID-19 cases, older adults had higher rates of hospitalization with COVID-19 (aOR: 4.59 ages 55–64, 8.67 ages 65–74, and 15.10 age ≥75), higher rates of Emergency Department attendance (aOR: 3.44 ages 55–64, 5.95 ages 65–74, and 11.69 age ≥75), higher rates of ITU admission (aOR: 8.09 ages 55–64, 15.47 ages 65–74, 19.48 age ≥75) and higher rates of COVID-19-related death (aOR: 9.61 ages 55–64, 26.40 ages 65–74, 61.89 age ≥75) Older adults were also found to have higher rates of vaccination compared with adults <55 years (aOR: 1.73 ages 55–64, 2.01 ages 65–741.93, age ≥75) (aOR = adjusted odds ratio, p < 0:001)	Large sample size in single US state. Results reliant on accuracy of electronic health documents and Prison internal registries. High proportion of males compared to females in study data (95.29%) Little data on individual facilities themselves, and testing strategies within prisons e.g. - whether older residents were prioritised for testing – results may be artefactual of such policies. No documented general population comparison, therefore unable to say if this result is specific to incarcerated older adults or a general population effect
Vaccination against SARS-CoV-2 infection among vulnerable and marginalised population groups in Denmark: A nationwide population-based study. Nilsson SF, Laursen TM, Osler M, Hjorthøj C, Benros ME, Thelberg S, Nordentoft M. 2022 (68)	Denmark	Population based Cohort study using retrospective analysis of data	to study the rates of SARS-CoV-2 vaccination in among vulnerable and marginalised high-risk groups	Study assessed (in addition to other high risk groups groups) total national prison population of Denmark, as part of a 4,277,380 total cohort size between 27/02/2020 to 15/10/2021	Third party data on imprisonments was obtained from the Danish Central Criminal Register, 1991-2020, and information on imprisonment was included for the period 2018-2020. Vaccination data accessed from The Danish Vaccination Register	Being in prison during the COVID-19 pandemic	Prison population half as likely to complete full course of COVID19 vaccination than the general population (aIRR 0.5 95% CI 0.5-0.5)	Large sample size including the entirety of the Danish general and prison population. Third party data only. Appropriate statistical analysis with IRRs calculated using poisson regression analysis adjusted for calendar year, age and sex stratified by sex and additionally for nationality. Note population data may include some citizens aged 15-18 but prison population aged 15-18 likely to be negligible based on separately reported prison demographics. Demographics including country of origin, age, and SARS-CoV-2 and sex of the prison population documented. Discussion focussed on homeless population, very limited discussion around prison population. No data/discussion exploring reasons behind reduced uptake in prison population so minimal generalisable takeaways to inform policy – accepted however that this is likely outside the scope of this study

Vaccination for SARS-CoV-2 and risk of COVID disease among those in prison care in Scotland, Public health Scotland, 2021, Wilkinson M, Yeung A, Hutchinson S. Unpublished work (67)	UK	Unpublished report by Public Health Scotland	No specific aim mentioned, contains vaccination data of prisoners in Scotland	7348 adult prisoners in Scotland were matched with up to 10 controls from the general population, data collected from beginning of pandemic up to 11 January 2022	Information sourced from Scottish Prison Service (SPS), data for controls sourced from Community Health Index Database	Being in prison during the COVID-19 pandemic	74% of prisoners had first dose compared to 72% in general population, 63% of prisoners had 2 doses of the vaccine compared to 68% in the general population, 31% prisoners had booster compared to 38% in general population,	Up to ten controls were sampled from the CHI database matched for the age, sex, Scottish Index of Multiple Deprivation (SIMD) quintile and past SARS-CoV-2 diagnosis of individuals in prison, did not include pre-existing conditions, did not state what priority group the prisoners or matched controls were in