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ABSTRACT The number of older adults (age fifty-five or older) incarcerated in US prisons reached an all-time high just as COVID-19 entered correctional facilities in 2020. However, little is known about COVID-19's impact on incarcerated older adults. We compared COVID-19 outcomes between older and younger adults in California state prisons from March 1, 2020, to October 9, 2021. Adjusted odds ratios (aORs) revealed an increasing risk for adverse COVID-19 outcomes among older age groups (ages 55–64, 65–74, and 75 or older) compared with younger adults, including for documented infection (aOR, 1.3, 1.4, and 1.4, respectively) and hospitalization with COVID-19 (aOR, 4.6, 8.7, and 15.1, respectively). Moreover, although accounting for 17.3 percent of the California state prison population, older adults represented 85.8 percent of this population's COVID-19-related deaths. Yet a smaller percentage of older adults than younger adults were released from prison during the pandemic. The differential rates of morbidity and mortality experienced by incarcerated older adults should be considered in future pandemic response strategies regarding prisons.

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Just as the number of incarcerated older Americans reached an all-time high, the COVID-19 pandemic entered US prisons.[1,2] The first COVID-19 cases in US correctional facilities were reported March 20, 2020.[2] Although advanced age poses a risk for severe COVID-19 illness in the community and incarceration is a profound risk factor for COVID-19, little is known about the health-related impacts of COVID-19 on incarcerated older adults.[3,4]

Many people who are incarcerated experience "accelerated aging," a term used to describe the high prevalence of disease and disability that develops at relatively young ages in prison populations. As a result, incarcerated people are considered to be "older adults" when they are in their fifties.[5–7] In 2009, when the US prison population reached its peak, 5.1 percent of adults in US prisons were age fifty-five or older.[8,9] By 2020 increasingly long sentences—including mandatory minimums and reductions in parole eligibility—had driven the proportion of older adults in US prisons to an all-time high of 13.8 percent, even as the overall US prison population fell to 1.8 million, the lowest it had been in decades.[1,6,10] Given the demographic shift inside US prisons and the outsize impact that COVID-19 has had on the health of community-dwelling older adults,[11] we explored the impact of COVID-19 on incarcerated older adults in California, which has the second most populous state prison system in the US. This article presents our study findings and discusses associated implications for health policy.

COVID-19 prison outbreaks have accounted for many of the nation's largest COVID-19 clusters, with case rates in state prisons reaching three to sixteen times the general population's rate in more than half of the US states.[12] Rapid

COVID-19 transmission in US prisons, which house people who have higher burdens of medical conditions than their age-matched counterparts in the community,[13,14] has been facilitated by the high number of people living and sharing airspace inside the unique physical environments of these institutions (for example, rows of cells with open-barred doors and housing with antiquated ventilation systems).[15] Altogether, as of June 16, 2022, nearly 600,000 people incarcerated in US prisons had had a documented COVID-19 infection, and at least 2,890 had died of the disease.[16] In California as of this date, at least 76,522 incarcerated people had had confirmed COVID-19 infections, and 254 had died of the disease.[17]

Studies have documented the epidemiology of COVID-19 among incarcerated people of all ages,[18–23] including overall COVID-19 outcomes in California state prisons.[18,24] Yet understanding the impact of COVID-19 on incarcerated older adults in particular is crucial for identifying ways to target care and inform policy to protect those at highest risk, such as expansions of public health–focused decarceration efforts and improving vaccination outreach. This article describes COVID-19 outcomes among older adults in California state prisons, their differential risk for adverse health outcomes, and the degree to which vaccination and decarceration measures have successfully targeted this population.

Study Data And Methods

STUDY DESIGN AND DATA SOURCES In this cross-sectional study we analyzed deidentified, resident-level administrative data provided by the California Correctional Health Care Services (CCHCS), which were abstracted from electronic health records (EHRs) and internal registries of incarcerated people at the California Department of Corrections and Rehabilitation's (CDCR's) thirty-five adult institutions. We included all people who were incarcerated at a CDCR prison for any duration between March 1, 2020, and October 9, 2021. To address any differential exposure or treatment by age resulting from different durations of incarceration at CDCR prisons during this period, we repeated all analyses in a second analytic cohort that was restricted to include those who were incarcerated at a CDCR prison every day or who died because of COVID-19 during the study period, assuming that they would have been incarcerated every day had they not died. Analytic cohorts are further detailed in online appendix A.[25]

MEASURES

▶ **DEMOGRAPHIC CHARACTERISTICS:** We defined "older adults" as those age fifty-five or older, to be consistent with the literature.[5] We compared incarcerated older adults with those younger than age fifty-five across demographic characteristics, including sex and race and ethnicity (Asian or Pacific Islander, Black, Hispanic or Latino/a, American Indian or Alaska Native, White, and unknown or other).

▶ **MEDICAL CONDITIONS:** Using data derived from EHRs, we characterized common medical conditions: advanced liver disease (cirrhosis or end-stage liver disease), asthma, chronic kidney disease, chronic lung disease (including chronic obstructive pulmonary disease), cardiovascular disease, hypertension, cancer, dementia or Parkinson disease, diabetes, end-stage renal disease on dialysis, HIV, obesity (body mass index of 30 kg/m^2 or greater), and mental health diagnoses (including serious mental illness and ever having required short- or long-term inpatient or outpatient mental health treatment).

▶ **HOUSING STATUS:** For its potential contribution to SARS-CoV-2 infection risks, we described the percentage of days each person spent incarcerated in celled or dormitory housing at any institution within the study period.[18] "Celled housing" included one- or two-person-capacity cells. "Dormitories" included rooms with the capacity to house up to 200 people and multifloor buildings with one room per floor (all of which share airspace).

▶ **COVID-19-RELATED OUTCOMES:** Our dichotomous COVID-19-related outcomes included ever quarantined, ever medically isolated, ever tested for COVID-19, and ever having had a confirmed COVID-19 case (that is, any positive antigen test, positive polymerase chain reaction [PCR] test, or death attributed to COVID-19), as detailed in appendix A.[25] "Quarantine" is used for those with exposure or likely exposure to COVID-19, and "medical isolation" is used for those with symptoms or known infection.[26]

Among those ever diagnosed with COVID-19, we examined COVID-19-related health care use, including visiting a community emergency department (ED) or being admitted to a community hospital, including the intensive care unit (ICU). COVID-19-related ED visits or hospital admissions were defined as having visited an ED or having been admitted between two days before and fourteen days after a positive COVID-19 test (antigen or PCR). Given that ICU admission may occur as a late sequela of COVID-19, we considered any ICU admission to be COVID-19 related if it occurred between two days before and twenty-one days after a positive COVID-19 test for those with confirmed COVID-19 (by either testing or death attributed to COVID-19).

▶ **VACCINATION AND RELEASE FROM PRISON:** We then examined two mitigation measures

Older adults were far more likely to experience severe COVID-19 health outcomes in prison just as they were in the community.

across age groups to understand the potential impact of pandemic-related public health interventions. First, we measured vaccination rates as of October 9, 2021. We defined "being at least fully vaccinated" as having had two or more doses of the mRNA-1273 (Moderna) or BNT162b2 (Pfizer) vaccines or one or more doses of the Ad26.COV2.S (Janssen/Johnson & Johnson) vaccine. Second, we measured CDCR release patterns over time to understand the extent to which the state's COVID-19 decarceration efforts targeted older adults.

ANALYTIC APPROACH We describe demographic, health, and housing characteristics and COVID-19 outcomes of our study cohort by age group (younger than age fifty-five versus age fifty-five or older), using paired t-tests for dichotomous variables and analysis of variance for categorical variables (race and ethnicity and prison security levels).

Next, we examined the differential impact of older age on COVID-19-related outcomes, using logistic regression to compute unadjusted odds ratios. We stratified outcomes across four age groups (younger than age 55 as group reference, ages 55–64, ages 65–74, and age 75 or older) to examine outcomes according to advancing age. We also computed adjusted odds ratios, controlling for prison fixed effects to account for potential prison-level confounders of age-related risk (binary indicators for every CDCR prison at which each person was housed during the study period) and adjusting for sex, race and ethnicity, percentage of days incarcerated in a cell or dormitory during the study period, and security level (from I for the lowest security level to IV for the highest). We used an indicator to account for people who did not die from COVID-19 but who were not incarcerated for all days during the study period to control for potential differential exposures or treatments resulting from total time incarcerated at CDCR prisons during this period. See appendix A for variable descriptions.[25] We then compared the percentage of different age groups who were released before and throughout the study period.

ETHICAL CLEARANCE This study was approved by the University of California San Francisco Human Research Protection Program's Institutional Review Board.

LIMITATIONS Several limitations should be considered when interpreting our findings. First, hospital visits were derived from CCHCS data, which required manual entry of admissions to community hospitals; these findings might reflect an underestimation, particularly of brief hospitalizations and ICU admissions, although underestimation would not favor reporting in any age group. Similarly, quarantine estimates were likely underrepresented because documenting quarantine orders required time-consuming manual processes. In addition, our findings were based on quantitative data; future studies should describe the range of experiences that incarcerated older adults had during the pandemic.[27] We also were unable to assess the health of people before incarceration or after release, and we did not analyze the role of staff testing, infection, or vaccination in transmission, or the infrastructural drivers of infection (for example, poor ventilation). These are important topics for future studies.

Study Results

DEMOGRAPHICS Overall, 148,488 people were incarcerated at CDCR institutions during the 588-day study period (March 1, 2020–October 9, 2021), of whom 25,697 (17.3 percent) were age fifty-five or older (exhibit 1). The average age was 41.1 (range, 18–97). Compared with those younger than age fifty-five, older adults were more likely to be male (96.8 percent versus 95.0 percent), White (33.9 percent versus 19.0 percent), Black (32.2 percent versus 26.1 percent), or American Indian or Alaska Native (1.4 percent versus 1.1 percent; all $p < 0.001$).

MEDICAL CONDITIONS Older adults had higher rates of most medical conditions than younger adults (exhibit 1), including advanced liver disease (8.9 percent versus 1.4 percent), chronic kidney disease (39.9 percent versus 6.9 percent), diabetes (23.7 percent versus 4.1 percent), hypertension (49.1 percent versus 14.3 percent), a mental health diagnosis (59.5 percent versus 47.1 percent), and obesity (42.7 percent versus 41.4 percent; all $p < 0.001$).

HOUSING STATUS The 148,488 people were incarcerated at an average of 1.4 institutions for an

EXHIBIT 1

Descriptive statistics among all people incarcerated at California Department of Corrections and Rehabilitation (CDCR) institutions, by age group, March 1, 2020–October 9, 2021

Categories and variables	Pooled (N = 148,488)	Age 55+ (n = 25,697)	Age <55 (n = 122,791)
Demographics			
Age (mean), years	41.06	62.39	36.60
Sex, male, %	95.29	96.79	94.97
Race and ethnicity, %			
White	21.57	33.86	18.99
Asian or Pacific Islander	1.45	1.04	1.54
Black	27.12	32.23	26.05
Hispanic or Latino/a	44.92	26.76	48.72
American Indian or Alaska Native	1.19	1.44	1.13
Medical conditions, %			
Advanced liver disease	2.65	8.85	1.36
Asthma	11.58	11.67	11.56
Chronic kidney disease	12.64	39.93	6.93
Chronic lung disease (including COPD)	2.35	10.70	0.60
Cardiovascular disease (other than hypertension)	4.50	13.57	2.60
Cancer	2.57	9.55	1.11
Dementia or Parkinson disease	0.45	2.11	0.11
Diabetes	7.52	23.66	4.14
End stage renal disease on dialysis	0.07	0.23	0.03
HIV	0.81	1.44	0.68
Hypertension	20.29	49.12	14.26
Obesity (body mass index ⩾30 kg/m^2)	41.62	42.67	41.40
Any mental health diagnosis	49.22	59.46	47.08
Housing characteristics			
No. of institutions during period (mean)	1.44	1.25	1.41
Not incarcerated at CDCR during entire study period, %	50.46	33.83	53.94
Security level, %			
Level I (lowest)	17.39	12.97	18.32
Level II	46.98	69.79	42.21
Level III	14.02	5.29	15.85
Level IV (highest)	19.74	11.29	21.50
100% of total days in period spent in cell, %	44.08	36.53	45.66
100% of total days in period spent in dorm, %	18.57	24.49	17.33
COVID-19-related outcomes, %			
Ever quarantined	84.64	89.18	83.69
Ever isolated	39.28	53.82	36.24
Ever tested	93.48	95.21	93.12
Ever had confirmed COVID-19 case	34.06	46.58	31.44
Cases only			
Ever had ED visit with COVID-19	3.28	7.80	1.88
Ever hospitalized with COVID-19	2.07	5.76	0.93
Ever in ICU with COVID-19	0.30	1.04	0.07
Died because of COVID-19	0.47	1.72	0.09
At least fully vaccinated as of October 9, 2021, %	52.70	69.88	49.10
Released by October 9, 2021, %	34.01	25.85	35.72

SOURCES California Department of Corrections and Rehabilitation and California Correctional Health Care Services, 2021. **NOTES** Variables are defined in the Data and Methods section and appendix A (see note 25 in text). Other or unknown race or ethnicity is 3.8 percent for total population, 4.7 percent for older people, and 3.6 percent for younger people. Not incarcerated at a CDCR institution during entire study period does not include those who died because of COVID-19 (assuming they would have stayed the entire duration). $p < 0.001$ for t-tests of difference and analysis-of-variance tests between those younger than age 55 and those age 55 or older for all results except asthma ($p = 0.661$). "At least fully vaccinated" is defined in the text. COPD is chronic obstructive pulmonary disease. ED is emergency department. ICU is intensive care unit.

average of 471.1 and 385.4 days in the study period for older and younger adults, respectively, as shown in appendix exhibit B1.[25] Among older adults, 33.8 percent were incarcerated for less than the entire study period, compared with 53.9 percent of younger adults. A lower proportion of older adults spent 100 percent of their time in one- or two-person cells compared with younger adults (36.5 percent versus 45.7 percent) (exhibit 1). A higher proportion of older

adults (24.5 percent) spent 100 percent of their time in dormitory housing (versus 17.3 percent of younger adults).

COVID-19-RELATED OUTCOMES Older and younger adults had different COVID-19-related outcomes. Without adjustment for differential exposure by age group, older adults were more likely than younger adults to have been quarantined (89.2 percent versus 83.7 percent), to have spent more days in quarantine (41.4 versus 33.4 days), to have been isolated (53.8 percent versus 36.2 percent), and to have spent more days in isolation (8.3 versus 5.3 days; all $p < 0.001$) (exhibit 1 and appendix exhibit B1).[25] Older adults were more likely to be tested for COVID-19 (95.2 percent versus 93.1 percent) and to have had a documented COVID-19 infection (46.6 percent versus 31.4 percent; both $p < 0.001$). Although the weekly total of newly detected cases of COVID-19 among incarcerated people younger than age fifty-five was generally two to four times higher than among those age fifty-five or older, the proportion of older adults who were diagnosed during any given week was always higher (exhibit 2).

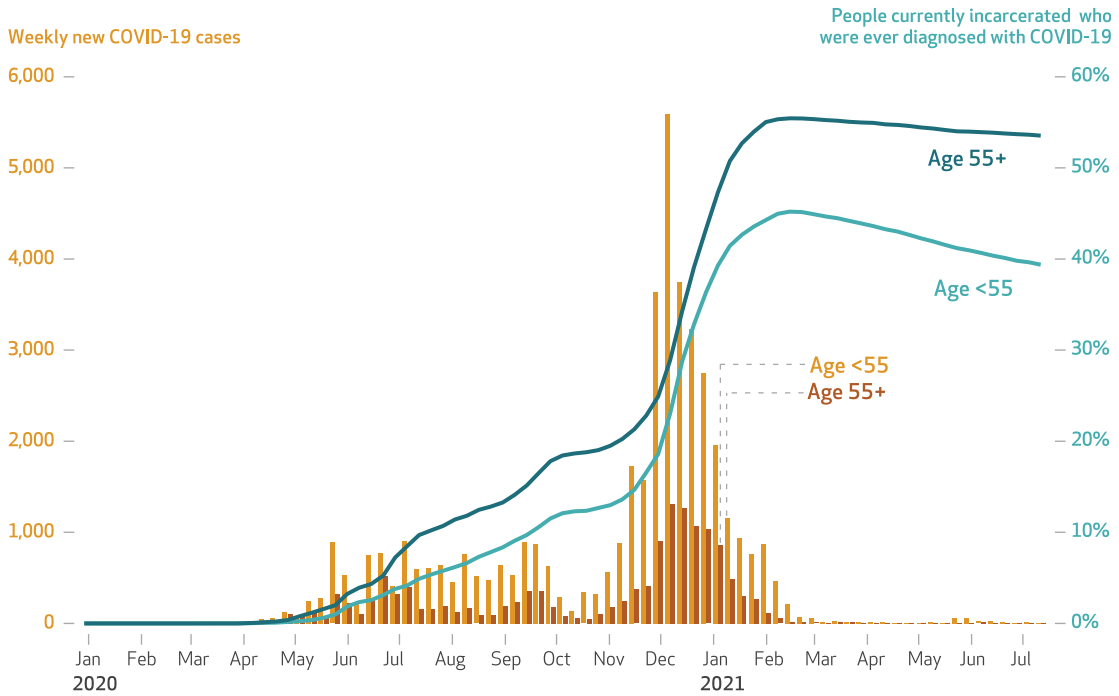
Furthermore, older adults experienced higher rates of serious health outcomes resulting from COVID-19 infection (exhibit 1). Among confirmed cases, older adults were more likely than younger adults to require an ED visit (7.8 percent versus 1.9 percent), be hospitalized (5.8 percent versus 0.9 percent), be admitted to an ICU (1.0 percent versus 0.1 percent), and die because of COVID-19 (1.7 percent versus 0.1 percent; all $p < 0.001$).

VACCINATION AND RELEASE FROM PRISON Older adults were more likely than younger adults to be fully vaccinated as of October 9, 2021 (69.9 percent versus 49.1 percent; $p < 0.001$). Overall, 34.0 percent (50,508) of the 148,488 people incarcerated at CDCR institutions during the pandemic were released by October 9, 2021 (exhibit 1). Older adults were significantly less likely than younger adults to be released (25.9 percent versus 35.7 percent; $p < 0.001$).

RESULTS FROM MULTIVARIATE ANALYSES Even after we adjusted for potential confounders, older adults experienced increased odds of having had a confirmed case of COVID-19 (aOR: 1.25

EXHIBIT 2

Weekly new COVID-19 cases and percent of people who are currently incarcerated who were ever diagnosed with COVID-19 in California Department of Corrections and Rehabilitation (CDCR) institutions, by age group, January 2020–July 2021



SOURCES California Department of Corrections and Rehabilitation and California Correctional Health Care Services, 2021. **NOTES** The figure depicts epidemic curves of weekly new COVID-19 cases among incarcerated people at CDCR institutions, by age category, including the absolute weekly total of COVID-19 cases among incarcerated people age 55 or older or younger than age 55 and the percent of people in those age groups who were incarcerated at CDCR institutions who were diagnosed (tested positive) with COVID-19 each week at a CDCR institution.

for ages 55–64, 1.39 for ages 65–74, and 1.40 for age 75 or older, all relative to people younger than age 55), of hospitalization with COVID-19 (aOR: 4.59, 8.67, and 15.10), and of COVID-19-related death (aOR: 9.61, 26.40, and 61.89; all $p < 0.001$) (exhibit 3). Compared with the younger group, all older age groups were also more likely to be fully vaccinated (aOR: 1.73, 2.01, and 1.93; all $p < 0.001$) (additional results in appendix B).[25]

EXHIBIT 3

Odds ratios for COVID-19-related health and health care outcomes for people ever incarcerated at a California Department of Corrections and Rehabilitation institution during the COVID-19 pandemic, by age group, March 1, 2020–October 9, 2021

			Odds ratios	
Outcomes by age group, years	**Frequency**	**Percent**	**Unadjusted**	**Adjusted**
Ever quarantined				
Younger than age 55	102,761	83.69	(Ref)	(Ref)
Ages 55–64	15,877	88.10	1.44	1.24
Ages 65–74	5,733	91.57	2.12	1.64
Age 75+	1,306	92.36	2.36	1.96
Ever isolated				
Younger than age 55	44,494	36.24	(Ref)	(Ref)
Ages 55–64	9,341	51.83	1.89	1.26
Ages 65–74	3,634	58.04	2.43	1.44
Age 75+	854	60.40	2.68	1.69
Ever tested				
Younger than age 55	114,339	93.12	(Ref)	(Ref)
Ages 55–64	17,103	94.90	1.38	1.21
Ages 65–74	6,000	95.83	1.70	1.36
Age 75+	1,364	96.46	2.02	1.93
Ever had confirmed COVID-19 case				
Younger than age 55	38,605	31.44	(Ref)	(Ref)
Ages 55–64	8,193	45.46	1.82	1.25
Ages 65–74	3,110	49.67	2.15	1.39
Age 75+	667	47.17	1.95	1.40
Cases only				
ED visit with COVID-19				
Younger than age 55	727	1.88	(Ref)	(Ref)
Ages 55–64	489	5.97	3.31	3.44
Ages 65–74	313	10.06	5.83	5.95
Age 75+	132	19.79	12.86	11.69
Hospitalized with COVID-19				
Younger than age 55	360	0.93	(Ref)	(Ref)
Ages 55–64	341	4.16	4.61	4.59
Ages 65–74	247	7.94	9.17	8.67
Age 75+	101	15.14	18.96	15.10
ICU admission with COVID-19				
Younger than age 55	28	0.07	(Ref)	(Ref)
Ages 55–64	58	0.71	9.82	8.09
Ages 65–74	50	1.61	22.51	15.47
Age 75+	16	2.40	33.86	19.48
Died because of COVID-19				
Younger than age 55	34	0.09	(Ref)	(Ref)
Ages 55–64	80	0.98	11.19	9.61
Ages 65–74	83	2.67	31.11	26.40
Age 75+	43	6.45	78.17	61.89
At least fully vaccinated				
Younger than age 55	60,296	49.10	(Ref)	(Ref)
Ages 55–64	12,267	68.07	2.21	1.73
Ages 65–74	4,638	74.08	2.96	2.01
Age 75+	1,051	74.33	3.00	1.93

SOURCE California Department of Corrections and Rehabilitation and California Correctional Health Care Services, 2021. **NOTES** $N = 148{,}488$. Odds ratios from logistic regressions; see the Data and Methods section for covariates used in the adjusted odds ratios. "At least fully vaccinated" is defined in the text. $p < 0.001$ for significance of all odds ratios. ED is emergency department. ICU is intensive care unit.

To explore the impact of differential exposures across age groups that might not be corrected by controlling for whether someone was not at a CDCR prison for the entire study period, we repeated our analyses in a sample restricted to people who spent every day at CDCR institutions or who died because of COVID-19 during the study period (appendix C).[25] These adjusted analyses demonstrated similar trends in health outcomes by age group as our main analyses, except for the outcome "ever tested," in which the difference according to age lost statistical significance at the 5 percent significance level. Serious outcomes such as hospitalization and death due to COVID-19 did not change appreciably (appendix C, exhibits C2 and C3).[25]

Despite higher adjusted odds for adverse COVID-19 outcomes among older age groups, higher percentages of younger age groups were released from CDCR institutions, and age patterns of release among older adults were similar before and during the pandemic (exhibit 4). Notable exceptions include five particular months from September 2020 to March 2021, when the proportion of people age 75 or older released surpassed the proportion released in the 45–54, 55–64 and 65–74 age groups. In addition, we found that age patterns of intakes over time were stable, with a dramatic decrease across all age groups after March 2020 (appendix exhibit B3).[25]

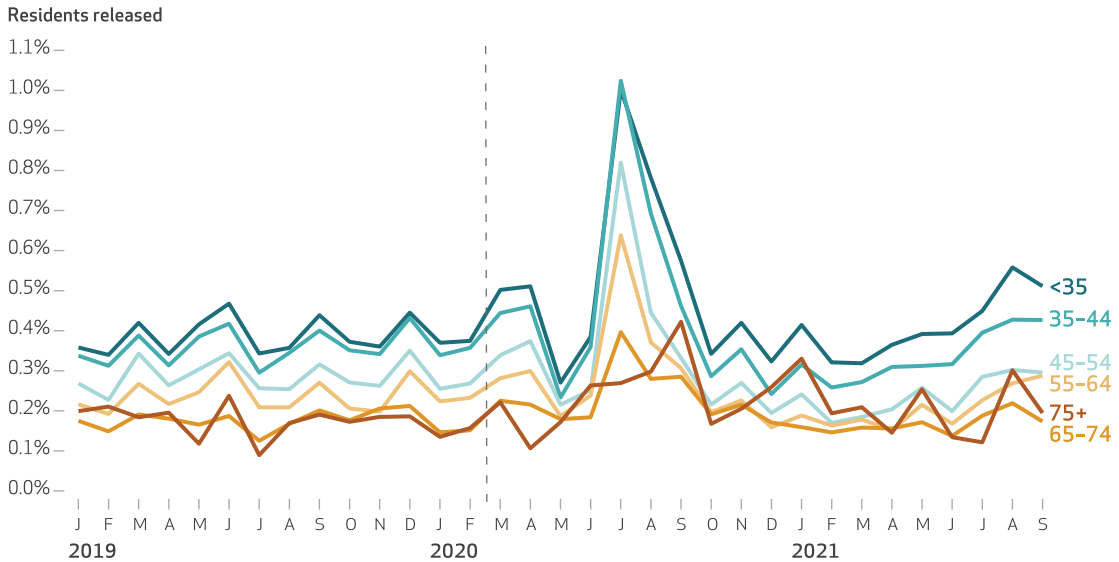
Discussion

In this study of the 148,488 people incarcerated in California state prisons during the first twenty months of the COVID-19 pandemic, we found that older adults shouldered a disproportionately high share of poor COVID-19 outcomes, were more likely to get vaccinated, and were less likely to be released from prison. This study confirms the results of others that have demonstrated high rates of medical conditions among incarcerated older adults.[5,28–30] Although other COVID-19 studies in prison settings have examined outcomes across all age groups, this study, consistent with the supplemental analyses by Theresa Ryckman and colleagues,[24] shows that older adults were far more likely to experience severe COVID-19 health outcomes in prison just as they were in the community, including a nearly fifteenfold increased likelihood of hospitalization and a sixty-twofold increased likelihood of death for incarcerated adults age seventy-five or older compared with incarcerated younger adults.

Older age groups also experienced 1.2–2.0 increased adjusted odds of being quarantined, medically isolated, or having had a confirmed case of COVID-19 compared with incarcerated younger adults. Although quarantine and medical isolation are critical public health interventions for mitigating COVID-19 transmission, the only cells available for quarantine or medical isolation in many prisons (California included) are those used regularly for solitary

EXHIBIT 4

Percent of residents released from California Department of Corrections and Rehabilitation (CDCR) institutions, by age group, January 2019–September 2021



SOURCE California Department of Corrections and Rehabilitation and California Correctional Health Care Services, 2021. **NOTE** Dashed vertical line represents March 2020, which is when COVID-19 policies approximately began within CDCR institutions.

confinement—a practice that runs counter to international prison standards of human rights.[31] In many US prisons during the pandemic, people requiring quarantine were placed in cells previously used for solitary confinement and were subject to the punitive measures associated with this housing type, such as restricted access to personal property and calls with family.[32,33] Older adults who spent many weeks or longer alone in quarantine could be at differentially high risk for developing the well-known geriatric health consequences of social isolation, which can include functional decline or impairment, loss of mobility, and even mortality.[34,35] Thus, high rates of quarantine among incarcerated older adults found in our study could suggest a heightened risk for longer-term adverse geriatric health impacts related to being incarcerated during the pandemic.

Although older adults accounted for 17.3 percent of the CDCR's population during the pandemic, we found that they represented 85.8 percent of the prisons' COVID-19-related deaths. Across the US, adjusted COVID-19 death rates among incarcerated people have been threefold higher than those found in the community,[36] a reminder of the difficulties involved in protecting incarcerated older people in the same manner in which older Americans in the community are protected. Comparing case counts and COVID-19 death rates between the incarcerated and community populations would require statistical adjustments for demographics and baseline health. Future researchers should consider comparing COVID-19 infection rates in prisons with those in the communities in which the prisons are located, according to patient age.

The aging of prison populations is a global phenomenon that, absent concerted attention to policy change, will continue to grow. In the US, sentencing practices in the "tough on crime" era of the 1980s and 1990s were far more severe than they are now. Thus, many older adults in US prisons with decades-long or life sentences would, today, receive far fewer years in prison.[37] For example, the "Three Strikes and You're Out" legislation was passed in California in 1994, turning convictions (for crimes as minor as stealing pizza) into double sentences (for second convictions) and into sentences for twenty-five years to life (for third convictions).[38] This resulted in a rapid increase in the average age of incarcerated Californians, with many other states following suit.[38] By 2011 the US Supreme Court had upheld a lower court decision that mandated prison population reductions after finding that California's prison health care had become unconstitutionally poor because of overcrowding. Yet most California prisons remained above design capacity even during the COVID-19 pandemic.

Younger adults were far more likely to be released during the pandemic—a trend similar to the prepandemic era.

The complex history of California's aging prison population is a reminder that each US state has its own policy and legislative history that has led to an aging prison population. Yet studies show that despite far higher rates of incarceration and substantially longer sentences than other nations,[39] US prison stays longer than twenty months have little to no effect on reducing overall recidivism.[40] Instead, harmful, collateral consequences of long incarcerations on communities of color and the profound financial cost of these sentences are not met with commensurate improvements in public safety or crime rate reductions.[37] Our study reinforces the need to address public health harms in US society, including advancing policies that can be operationalized to consider broader grounds for release or parole of incarcerated older adults, especially during a respiratory pandemic.[41]

We examined two public health interventions that could reduce the number of people susceptible to infection and adverse COVID-19 outcomes: vaccination and release from prison.[36] After California's prison-based medical professionals made an early push for resident and staff vaccination,[42] COVID-19 vaccines became available to the highest-risk incarcerated Californians in December 2020. By February 2021 nearly every incarcerated Californian had been offered a vaccine, and vaccine acceptance increased with advancing age through at least March 2021.[42] Vaccination rates reported in exhibit 1 are lower than if we had only examined people who were incarcerated when vaccines had become available. Appendix exhibit C1 shows that among the sample restricted to the 73,558 people who were incarcerated continuously or died because of COVID-19 during the study period, 89.7 percent of older adults versus 78.0 percent of younger adults were at least fully vaccinated.[25] As of July 8, 2022, 81 percent of both the incarcerated

The challenge must be to consider the differential impact that COVID-19 has had on morbidity and mortality among incarcerated older adults.

people in California state prisons and all adults in California had been fully vaccinated.[17]

Although incarcerated older adults had remarkably higher risk for ED visits, hospitalization, ICU admission, and death, younger adults were far more likely to be released during the pandemic—a trend similar to the prepandemic era. It is likely that many older adults did not qualify for release because of less flexible sentences (for example, life without the possibility of parole). Although data limitations did not allow us to investigate this question, future studies might examine the extent to which people were released through pandemic-related mechanisms (for example, court order, clemency petition granted, state policy, or parole boards) or because of non-pandemic-related procedures.

Long sentences and mass incarceration have played an "extremely limited role," if any, in reducing or deterring crime, whereas other strategies (for example, community health and outreach, increased economic opportunities, education) have been far more effective.[37,43,44] That an increased risk for adverse outcomes did not correspond to an increased likelihood of release for older adults—the population with the lowest recidivism rates[45]—demonstrates the need for policies that enable safe release (even if temporarily) and "second chance" parole mechanisms for older adults, such as presumptive parole, second-look sentencing, granting of good-time credits that translate into shorter sentences, universal parole eligibility, retroactive application of sentence reduction reforms, elimination of parole revocations, and commutation, all detailed elsewhere.[37] During the pandemic several states, including California, introduced legislation to improve "compassionate release" or elder parole processes to increase older adults' access to release. The impacts that COVID-19 has had on older adults should spur policy makers to partner with medical professionals in geriatrics and palliative care to optimize these statutes, which are often written in ways that are at odds with medical science, minimizing their utility.[46,47]

Although our study could not address all aspects of the pandemic's impact on incarcerated older adults, it is the first to our knowledge to describe the adverse impacts that COVID-19 had on one large state's incarcerated older adult population and to examine vaccination and population reduction. Our findings should be considered by policy makers as they weigh the ample evidence demonstrating how advanced age is associated with far lower rates of recidivism against the risk for adverse health outcomes among older adults who are incarcerated during a respiratory pandemic.[37]

Conclusion

We found that incarcerated older adults in California were more likely to have confirmed cases of COVID-19 and to be at far greater risk for serious adverse outcomes, including hospitalization, ICU admission, and death. Although older adults accounted for 17.3 percent of the CDCR's population, they represented 85.8 percent of COVID-19-related deaths in California state prisons. Despite these serious age-related risks, population reduction as a public health mitigation measure was not preferentially targeted toward older adults. Instead, younger adults were more likely to have been released, and California's policies did not appear to be sufficiently flexible in identifying ways to house most older adults more safely during the pandemic.

The COVID-19 pandemic arrived in the US after decades of mass incarceration led to the warehousing of millions of people in jails and prisons, an experience disproportionately affecting Black and Latino/a Americans and one that has resulted in an aging prison population.[48] As the US struggles to reckon with the profound public health consequences of confining tens of thousands of people to life in prison, the challenge must also be to consider the differential impact that COVID-19 has had on morbidity and mortality among incarcerated older adults and devise more equitable strategies that respond to such future risks in a timely and comprehensive manner. Such strategies should include consideration for release from prison (whether temporary or permanent) for older adults, the population with the lowest recidivism rates yet the highest risk for adverse health outcomes.[45] ■

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