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Did migrants experience a COVID-19 mortality disadvantage in the Swedish care setting? An observational cohort study on type of care and mortality among older migrants in Sweden

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Abstract

This study examines COVID-19 mortality across long-term care settings comparing migrants and Swedish-born during the first 2 years of the pandemic. Previous research shows that migrants faced higher risks of severe COVID-19 outcomes, contrasting with the observed Migrant Mortality Advantage. Using Swedish total population data (2019–22), we stratified participants aged 70+ by care setting and migration status. We analysed the first pandemic year (March 2020–February 2021) and the second year (March 2021–February 2022), alongside pre-pandemic mortality data for context. Outcome measures included all deaths from COVID-19 and other causes. Cox proportional hazards models were employed adjusting for sociodemographic and health variables. Our findings highlight the significant impact of care settings on COVID-19 mortality in the first pandemic year, exceeding that for other causes of death. Migrants born in low- or middle-income countries in institutional care had higher mortality rates (HR = 42.88, 95% CI = 36.69–50.13) than Swedish-born individuals in institutional care (HR = 25.83, 95% CI = 24.12–27.65) relative to Swedish-born with no care. This contrasts with mortality patterns for non-COVID causes before and during the pandemic, indicating a specific migrant disadvantage during the first year. In the second year, the excess COVID-19 mortality in care settings decreased yet continued to be higher for migrants than for Swedish-born, likely influenced by the equalizing effect of vaccinations. Despite mitigation efforts, a clear migrant mortality disadvantage persisted among those receiving home care or living in care homes.

Introduction

The COVID-19 pandemic witnessed a pattern of increased mortality among the elderly and the frail in affected populations. In most contexts, it also showed a pattern of elevated mortality among different groups of migrants. In our study, we focus our attention on the intersection of these critical populations, focusing on the context of Sweden. Around the world, research findings have consistently identified *age* as the primary factor contributing to mortality inequalities from COVID-19 [1]. Studies have also indicated that residence in an elderly care home was among the strongest predictors of COVID-19 mortality [2–4]. While old individuals residing in care facilities demonstrated a significantly heightened risk of death due to COVID-19, a less pronounced yet still substantial risk has been observed among old individuals living independently but receiving home care services [2, 3, 5]. For Sweden, a previous study revealed that older individuals residing in care homes faced an ∼20-fold mortality excess risk from COVID-19 compared to their counterparts not receiving formal care [6].

Previous studies have consistently indicated that compared to native-born populations, migrants were at higher risk of being hospitalized, more likely to receive intensive care, and to die from COVID-19 [1, 6–10]. This risk disparity persisted after accounting for various sociodemographic variables and underlying medical risk factors, contrasting with the well-established observation that migrants otherwise tend to live longer than natives—the Migrant Mortality Advantage [11, 12]. Explanatory mechanisms have been elusive, but pointing at different patterns of exposure to the virus [13]. However, it remains unknown so far, whether the migrant disadvantage in COVID-19 mortality is consistent across different living arrangements and extends into different types of formal care.

Receiving home care or residing in a care home reflects an individual's frailty and increased vulnerability to severe COVID-19 disease. However, it also reflects different patterns of exposure to the virus when exposed to staff and other co-residents [14]. In such environments, individuals have limited possibilities to protect themselves from the spread of the virus and therefore it is expected that differences in mortality between migrants and natives may be lower in the care setting than in the general population.

Our study examines whether there are differences in the risk of COVID-19 mortality between older natives and migrants across different living arrangements and type of formal care in Sweden, while controlling for other sociodemographic and underlying health factors.

Methods

The analysis utilizes comprehensive data spanning the entire Swedish population. The data are collected and maintained by various government agencies, and combined and stored for research purposes at Statistic Sweden's secure data storage facility. Our study focuses on individuals aged 70 at the start of the studied periods (Supplementary Fig. S1). We examine the early period of the COVID-19 pandemic, focusing separately on the first complete pandemic year (March 2020–February 2021) and the second year (March 2021–February 2022). The starting date was set as the first day of the month in which the first recorded COVID-19 death in Sweden occurred, 1 March 2020. Analysing the 2 years separately provides insights into developments over time, as testing became more widespread and the healthcare system got more time to adjust to the new demands. Additionally, we run models for the year preceding the pandemic (March 2019–February 2020), to provide insight into existing mortality disparities by country of origin and care context before the pandemic.

The outcome measures for the analyses of the pandemic years are all deaths from COVID-19 and all deaths from any other cause of death. For the pre-pandemic year, the outcome is death from any cause of death. COVID-19 mortality was identified by the Swedish National Board of Health and Welfare, the agency responsible for the cause of death register, using the following International Classification of Diseases (ICD) codes (10th edition) for the underlying cause of death: U07.1, U07.2, or B342.

In Sweden, elderly care primarily follows the 'age-in-place' model, allowing seniors to live at home as long as possible, supported by publicly funded long-term care (LTC) services [15]. These services include help with daily activities such as housekeeping, grocery shopping, cooking, personal care, and sometimes home health care. Only when a person cannot manage to live at home with full-time home care does they move to a residential care facility. Residents of these facilities are typically frail and have multiple health issues, with a median stay of 2 years before death, as of 2018 [16]. We derive comprehensive information on type of LTC from the Swedish Social Service Register, a unique nationwide database that includes data on residency in care homes as well as utilization of home care services [17]. Following prior studies, we categorize the individuals aged 70 and older into three groups, (i) not receiving formal care ('No care'), (ii) utilizing home care services ('Home care'), and (iii) residing in institutional settings such as special housing or care homes ('Care home') [3].

Regarding the origin of individuals, we distinguish between persons born in Sweden, persons born in other high-income countries (HIC), and persons born in a middle- or low-income country (LMIC), according to an OECD classification based on the United Nations Human Development Index for the different countries [18].

We employed Cox proportional hazards models of mortality with age as the baseline. Separate models are estimated for the pre-pandemic year and the first and second year of the pandemic. The follow-up times comprised 1.45, 1.47, and 1.48 million person-years, respectively. Our main exposure is the combination between the type of care setting and the origin of individuals.

We conduct separate hypothesis tests to compare hazard ratios within each care setting. For example, we compare migrants from LMIC who receive home care with Swedish-born individuals who receive home care. We only report these group differences within a care setting when the results of these tests indicate statistically significant mortality differences ($P \leq .05$).

Additionally, our models account for a variety of covariates, including sex, education (primary, upper secondary, post-secondary), and marital status (never married, married, divorced, and widowed).

To examine whether differences in COVID-19 mortality between migrants and the Swedish-born can be explained by differences in medical conditions, we also control in a second step for different underlying medical conditions. These conditions are pre-existing measures that may lead to a higher risk of SARS-CoV-2 infection or more severe COVID-19 if infected [19]. These were identified through diagnosis and treatments during episodes of inpatient care or visits to specialized outpatient care up to 5 years prior to, or during the index year, indicated by ICD-10 or procedure codes, and/or dispenses of medical drugs in the year prior to, or during the index year indicated by Anatomical Therapeutic Chemical (ATC) codes. Details on the classification of the medical risk groups (Synonymous with Pre-existing Conditions) can be found in Supplementary Table S4 in the Appendix.

Results

In Table 1, we present mortality rates and exposure time to the risk of dying by sociodemographic profiles for the three distinct periods studied in this paper: the pre-pandemic year, the first of the pandemic, and the second year of the pandemic. The corresponding number of observed deaths are presented in Supplementary Table S1 in the Appendix. As expected, different care settings correspond to markedly different mortality regimes. Receiving no care is associated with the lowest mortality, whereas receiving at least some home care is associated with an 8- to 10-fold higher risk of dying. Being in a care home is associated with a further 3–4× increase in the risk of dying. Without controls, being foreign-born is associated with lower mortality in all care settings in the pre-pandemic year, but a substantially higher risk of dying from COVID-19 across all care settings in the pandemic years. All other included variables behave as expected, with lower mortality observed for women, individuals with higher education, those who are married, and those with no pre-existing conditions. Among those with pre-existing conditions, dementia and psychological disorders are associated with the highest increase in the risk of dying, presumably partly because these conditions are strongly linked to residing in a care home.

Figure 1 presents the group-specific mortality differences in the pre-pandemic year (all full models are presented in Supplementary Tables S2 and S3 in the Appendix). Care status has the strongest association with mortality rates among all included variables. Individuals with home care face a mortality risk 5–7× higher (Sweden HR = 7.36, 95% CI = 7.20–7.53; HIC HR = 7.18, 95% CI = 6.86–7.51; LMIC HR = 5.59, 95% CI = 5.17–6.05), while those in institutional care settings have a 15–17× greater mortality risk (Sweden HR = 16.73, 95% CI = 16.35–17.13; HIC HR= 16.54, 95% CI: 15.83–17.28; LMIC HR = 14.88, 95% CI= 13.58–16.30), compared to Swedish-born individuals not receiving care services. We found a mortality disadvantage among HIC migrants without care, a majority of whom are Finnish-born, and evidence of a mortality advantage among LMIC migrants receiving care at home or in an institutional setting. Both results are in line with previous research [20, 21].

The results in the first year of the pandemic (Fig. 2a) confirm the strong association between care status and mortality rates for any other causes of death than COVID-19. Compared to individuals not receiving any care, those residing in institutional care settings experienced mortality rates as much as 17–19× higher for other causes of death (Sweden HR = 18.9, 95% CI = 18.47–19.35; HIC HR = 17.97, 95% CI = 17.19–18.79; LMIC HR = 16.97, 95% CI = 15.49–18.58). Similarly, individuals receiving home care faced a mortality risk ∼6–7× greater than those without any care services (Sweden HR = 7.4, 95% CI = 7.24–7.57; HIC HR = 7.42, 95% CI = 7.10–7.76; LMIC HR = 5.93, 95% CI = 5.49–6.39). Being a migrant was associated with a slightly lower risk of dying from other causes of death when being in long-term care. Controlling for underlying health conditions attenuated the excess risks for more vulnerable populations slightly but the overall pattern remained (Model 1 *vs.* Model 2). The patterns replicate the findings for all-cause mortality in the last pre-pandemic year, with the migrants experiencing

Table 1. Mortality rates by cause: all cause-mortality in the pre-pandemic year (March 2019–February 2020), COVID-19 and other causes in the first (March 2020–February 2021), and second (March 2021–February 2022) pandemic year.

	Pre-pandemic year (March 2019–February 2020)		First pandemic year (March 2020–February 2021)			Second pandemic year (March 2021–February 2022)		
	Rate per 1000 PY (all causes)	Exposure time in 1000 PY	Rate per 1000 PY (COVID-19)	Rate per 1000 PY (all other causes)	Exposure time in 1000 PY	Rate per 1000 PY (COVID-19)	Rate per 1000 PY (all other causes)	Exposure time in 1000 PY
Sex								
Man	52.37	658.10	8.85	51.33	668.03	2.46	51.20	674.99
Woman	48.51	793.35	6.76	47.27	801.61	1.46	46.94	808.41
Education								
Primary	70.54	488.77	10.75	69.92	472.84	2.73	70.48	455.99
Secondary	44.64	577.11	6.84	43.67	591.94	1.69	43.92	605.42
Post-secondary	31.14	366.90	4.77	31.03	387.01	1.13	31.02	405.16
Missing	68.85	18.66	19.89	70.76	17.85	6.95	71.73	16.83
Marital status								
Never married	52.44	130.23	7.22	51.40	137.27	1.95	51.16	144.30
Married	32.28	746.01	4.88	32.03	756.71	1.40	32.10	764.91
Divorced	48.49	253.16	7.61	46.78	259.54	2.03	46.78	265.11
Widowed	92.42	322.05	14.79	90.94	316.12	3.07	91.14	309.06
Formal care/country of birth								
No care/Sweden	15.47	1060.24	1.51	15.04	1074.66	0.73	15.16	1084.43
No care/HIC	17.42	104.52	2.66	17.16	105.41	1.56	17.44	105.77
No care/LMIC	15.76	39.78	6.80	17.91	42.82	3.31	17.98	45.38
Home care/Sweden	152.64	150.79	18.92	146.62	156.08	4.53	144.99	160.84
Home care/HIC	140.75	16.01	23.00	139.71	16.74	5.73	135.24	17.27
Home care/LMIC	103.46	6.86	35.47	105.33	7.39	14.50	104.42	7.86
Care home/Sweden	388.53	64.58	80.12	418.96	58.59	12.64	443.19	54.26
Care home/HIC	357.62	7.05	99.88	371.29	6.45	12.22	387.43	6.14
Care home/LMIC	312.59	1.60	132.86	337.52	1.49	19.66	351.80	1.42
Diseases of the circulatory system								
No	61.83	331.32	4.21	28.59	355.17	1.04	26.52	408.45
Yes	46.84	1120.12	8.83	55.66	1114.47	2.25	57.37	1074.95
Cancer								
No	42.28	1178.26	7.54	39.24	1217.15	1.77	41.64	1288.97
Yes	84.70	273.19	8.54	96.72	252.49	2.91	96.87	194.42
Diabetes/obesity								
No	48.96	1168.86	6.76	45.56	1191.32	1.62	44.95	1227.10
Yes	55.64	282.59	11.79	64.34	278.32	3.34	67.68	256.29
Dementia/psychological disorders								
No	44.03	1336.38	5.57	40.17	1372.71	1.66	41.04	1416.31
Yes	122.56	115.07	38.01	175.87	96.93	7.20	214.39	67.08
Other medical risk groups								
No	38.65	1032.23	5.01	33.84	1072.52	1.33	35.84	1137.68
Yes	78.84	419.22	15.02	90.38	397.13	3.82	91.76	345.71
Total	50.26	1451.45	7.71	49.12	1469.65	1.91	48.88	1483.39

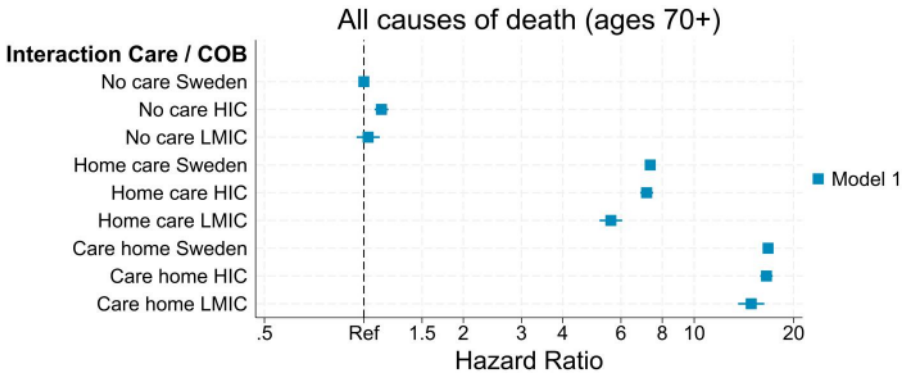

Figure 1. Hazard ratios of dying from any causes of death for individuals aged 70+ in Sweden—pre-pandemic year. Model 1 is controlled for sex, education, and civil status.

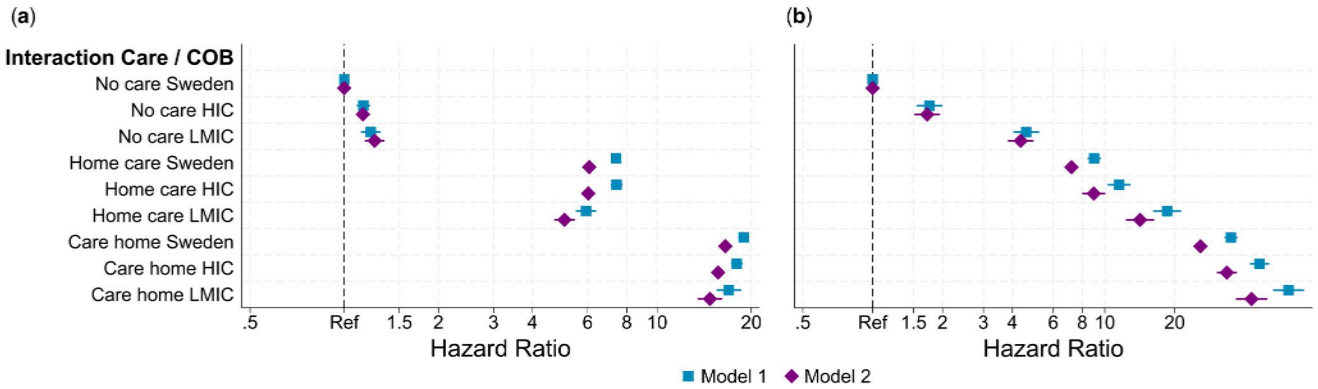

Figure 2. Hazard ratios of dying from COVID-19 and any other cause of death for individuals aged 70+ in Sweden—first year of the pandemic. (a) Other causes of death. (b) COVID-19. Model 1: controlled for sex, education, and civil status. Model 2: Model 1+ medical conditions.

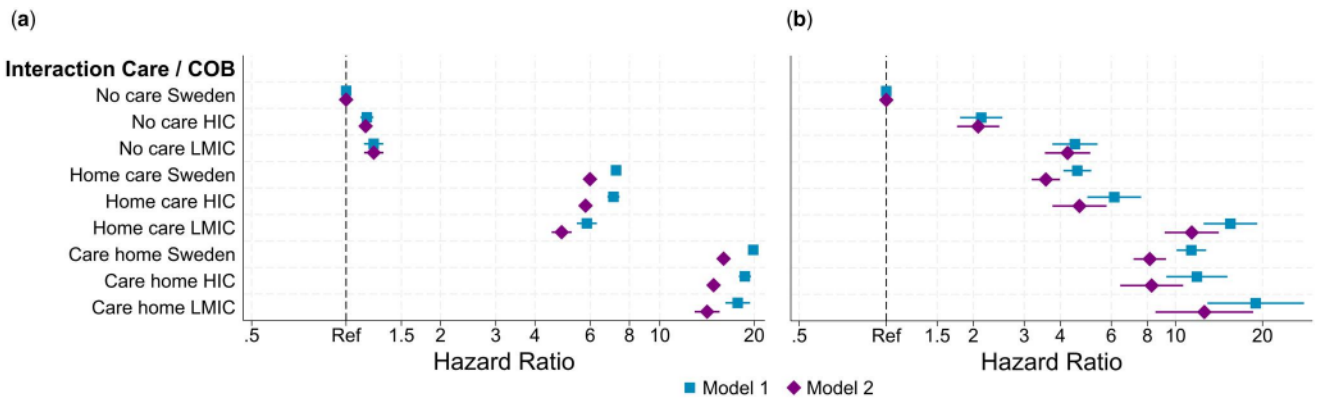

Figure 3. Hazard ratios of dying from COVID-19 and any other causes of death for individuals aged 70+ in Sweden—second year of the pandemic. (a) Other causes of death. (b) COVID-19. Model 1: controlled for sex, education, and civil status. Model 2: Model 1+ medical conditions.

somewhat lower mortality within each care setting. However, the patterns are largely reversed for COVID-19 related deaths (Fig. 2b). In each care setting, migrant individuals faced a substantive mortality disadvantage compared to their respective Swedish-born counterparts, which also held for migrants receiving no formal care. The relative excess mortality was higher for individuals from LMIC countries across all care statuses, with the relative excess risk being highest among those receiving no formal care (No care HR = 4.59, 95% CI = 4.04–5.21; Home care HR = 18.57, 95% CI = 16.15–21.35; Care home HR = 61.93, 95% CI = 53.10–72.22). Again, controlling for underlying health conditions attenuated the excess risks but the overall patterns remained (Model 2).

Figure 3a and b shows the mortality patterns during the second year of the pandemic. Mortality from causes other than COVID-19 mirrors the patterns observed in the first pandemic year. In contrast, when looking at the COVID-19 related deaths, the excess risk among those receiving formal care was about half as high as in the first year of the pandemic, and differences across migrant status were reduced significantly. However, among the elderly who used home care, the disadvantage of LMIC migrants (Model 1: HR = 15.49, 95% CI = 12.51–19.18; Model 2: HR = 11.39, 95% CI = 9.18–14.13) remained higher than for HIC migrants (Model 1: HR = 6.14, 95% CI = 4.96–7.61; Model 2 HR= 4.66, 95% CI = 3.76–5.78) and the Swedish-born (Model 1 HR = 4.58, 95%

CI = 4.10–5.11; Model 2 HR= 3.56, 95% CI = 3.18– 3.99). The difference in mortality rates between LMIC migrants who received home care and those who lived in a care home was no longer significant.

a) b)

Even though our main interest was in analysing differences in mortality by migrant background across various types of care settings, we take the opportunity to also highlight the role of other individual socioeconomic characteristics (see Supplementary Tables S2 and S3). As expected, we find that men have a higher mortality risk across all models, while individuals with post-secondary education have lower risks. Differences in civil status appear smaller, but compared to those never married, widowed individuals seem to have a lower mortality risk.

Conclusions

To our knowledge, this is the first study to compare COVID-19 mortality by migrant status across elderly care settings. Our study shows that older migrants, especially from LMICs, experienced higher COVID-19 related mortality than the Swedish-born across all care settings during the first year of pandemic. The relative differences between migrants and non-migrants were smaller in care homes than in home care and smaller still in home care than in conditions with no formal care, but the excess mortality in institutional care as compared to no formal care was huge and the excess mortality of people with a migration background remarkable. In the second pandemic year, excess mortality among those receiving formal care decreased by about half, and disparities across migrant status narrowed, yet LMIC migrants using home care continued to face higher mortality hazard ratios than both HIC migrants and the Swedish-born.

The results of our study are significant as before the pandemic began, older migrants from LMICs exhibited a mortality advantage when receiving institutional care. Our results for 2019 are in line with other findings of Migrant Mortality Advantages in various general populations. In our context, a positive health selection of migrants from LMICs appears to have produced a situation within institutional care arrangements where migrants have lower mortality rates than the Swedish-born elderly. However, for those who did not receive formal care, we found a slightly higher risk of dying in the pre-pandemic period, especially among migrants from HICs. In Sweden, immigrants from Finland are the predominant group among older migrants from HICs. The elevated risk identified among migrants from HICs aligns with previous research, which found that immigrants from Finland have experienced elevated mortality [20]. A recent review supports the fact that the migrant mortality advantage in high-income countries is strongly associated with migrants' countries of origin and that the phenomenon appears most consistent among immigrants from non-Western countries who have moved to the West [22]. When migrants in Sweden are disaggregated by country of origin, most origin groups except Finland show a mortality advantage for both men and women [23]. This is relevant for our study because among the 70+ population, the largest migrant group consists of individuals born in Finland. Until the end of the 1990s, the majority of Sweden's migrant population was born in other Nordic and European countries, particularly Finland [24]. Our findings add to the literature by showing that HIC migrants in Sweden experience a disadvantage on average when living without long-term care, while showing no significant difference when receiving home care. In contrast, migrants from LMIC demonstrate a healthy migrant effect, particularly when in institutional care during the pre-pandemic period.

We examined COVID-19 mortality levels across various living and care arrangements and confirmed the excess risks among migrants. These differences appear not to be driven by the differential prevalence of underlying medical conditions. After controlling for underlying health conditions, the relative excess risk remained highest among the migrants who did not receive any formal care. In a recent Swedish study, authors suggested that differential exposure, as opposed to differential susceptibility, likely accounted for the higher COVID-19 mortality observed among the origins who were disproportionately affected by the pandemic in Sweden [13]. Our results for those receiving no formal care support this assertion. Mortality disparities also persisted in both types of care settings, particularly in the first year of the pandemic, despite migrants and natives being exposed to the same institutional environment. However, the care setting attenuated the relative mortality differences between migrants and non-migrants. Still, the Swedish efforts to prevent contagion appear to not have been entirely effective, as migrants continued to suffer higher mortality from COVID-19, regardless of their living arrangements, including those completely controlled by the institutions. Thus, our findings do not entirely support our expectation that institutional care would equalize all effects of COVID-19 on mortality outcomes. The highly controlled environment of care settings, regulated by the state and with restricted visitations from relatives, was anticipated to mitigate the impact of migration status more strongly during the pandemic.

Results for the remaining causes of death during the pandemic were similar to the patterns found for 2019, confirming the existence of a migrant mortality advantage for these causes within the care setting. However, older migrants who did not receive care during the pandemic experienced a clear all-cause mortality disadvantage in that period, particularly for migrants from LMICs. It is possible that this mortality disadvantage was partly due to them being tested less frequently, which could have led to an under-reporting of COVID-19 deaths [6]. These results indicate that the COVID-19 mortality among migrants in Sweden may have been somewhat underestimated, as also suggested by previous studies [25].

In the second year of the pandemic in Sweden, we see reduced COVID-19 mortality differentials, but a persistent mortality disadvantage among LMIC migrants who received home care. The general reduction in COVID-19 mortality differentials in the care setting may be related to the timing and the more firmly organized execution of vaccinations in this sector, the active vaccination campaigns in care settings or the fact that migrants outside care settings had lower vaccination rates (lower adherence to vaccination recommendations). The most substantial relative mortality differences between migrants and non-migrants are observed among those not receiving formal care. Our results are in line with previous research, concluding that the mortality disparity between native-born and migrant populations is unlikely to be fully explained by underlying health conditions and is only partially attributable to observable structural factors [6].

Our study has several strengths. First, it includes unique data on formal care receipt, capturing both institutional care and home care. Additionally, we benefit from high quality longitudinal information on pre-existing conditions, an important potential confounder in the association between migrant status and COVID-19 mortality. Furthermore, our dataset encompasses the entire Swedish population across both the pre-pandemic and pandemic periods.

Our study also has some limitations. We were unable to account for care home specific factors that may have influenced the outcomes. For example, the geographical location of care homes likely plays a role, as care homes situated in areas with higher community viral transmission rates or more frequent staff infections may also have housed a greater proportion of migrants. Similarly, household compositions and family relations (e.g. having children living nearby) may influence mortality risks, affecting comparisons across living arrangements. Additionally, our study has limitations due to the endogeneity of mortality and care states, as the selection into home care or institutional care may be related to factors that affect mortality in different ways for migrants and natives. As an observational study with primarily descriptive aims, our findings should be interpreted as associations rather than causal effects. However, our temporal comparisons (across the pre-pandemic, first, and second

pandemic years) partly address those issues, as the mechanisms driving care state selection likely remained relatively stable across these periods. Despite this, we also acknowledge the additional complexity introduced by pandemic-specific factors, including survival bias effects from the very high mortality rates in care homes during the first wave of the pandemic and the influence of potential behaviours by families keeping older relatives at home during the pandemic. While these limitations prevent causal inference, our descriptive analysis provides valuable insights into differential mortality patterns that emerged during the COVID-19 pandemic.

We acknowledge the potential role of unobserved heterogeneity in mortality hazard models. To assess robustness, we conducted extensive checks using various parametrizations (Weibull, Gompertz, piecewise exponential) with and without time-varying covariates, including attempts to incorporate frailty terms with both gamma and inverse Gaussian distributions. With the full sample, none of these models converged when frailty terms were included. To investigate further, we analysed multiple 5% subsamples where the models did converge in most cases, consistently revealing extremely small frailty variance estimates for gamma-distributed frailty and contradictory results with the inverse Gaussian distribution, indicating boundary solutions rather than meaningful heterogeneity. We acknowledge Bijwaard and Ridder's [26] important caveat that failure to detect frailty does not exclude the presence of frailty and may still bias our coefficient estimates. However, our consistent findings across different parametric specifications and multiple subsamples suggest that frailty is genuinely minimal rather than simply undetected in our register-based mortality analysis.

Furthermore, we considered implementing more sophisticated approaches such as the timing-of-events framework to simultaneously model entry into care states and mortality hazards but were constrained by measurement issues related to the precise timing of care entry due to administrative reporting delays, and questionable assumptions about anticipation effects given that care entry often follows after a period of gradual health decline.

To conclude, we have demonstrated that older migrants, especially those from low- and middle-income countries, experienced higher COVID-19-related mortality across all care settings. High mortality among older people in care homes has been documented both in Sweden and internationally. Our study shows that also within these institutions, migrants were more affected than native Swedes. Overall, we conclude that public health strategies implemented in care facilities to contain the spread of the virus could have been essential not only in reducing overall COVID-19 mortality from the first to the second pandemic year but also in reducing mortality inequalities by nativity.

Key points

- The persistence of higher COVID-19 mortality risk among migrants across different care settings remains unexplored, underscoring the need for this study.
- In Sweden, during the COVID-19 pandemic, older migrants—particularly those from low- and middle-income countries—experienced a greater mortality disadvantage in long-term care settings compared to both older migrants without formal care and Swedish-born individuals.
- These mortality disparities remained significant after adjusting for health conditions, suggesting that differences in exposure to the virus, rather than increased susceptibility, may be the primary driver.
- Even within institutional care, substantial mortality differences persisted between foreign-born and Swedish-born individuals, potentially due to insufficient infection prevention measures.
- Our results suggest that migrant populations are particularly vulnerable during viral outbreaks, indicating that policymakers should consider targeting interventions, such as testing, vaccination, and providing protective measures, toward these groups.
- Future research should focus on identifying specific factors that produce increased exposure among migrants to develop more effective mortality and morbidity reduction strategies.

Supplementary data

Supplementary data are available at *EURPUB* online.

Conflict of interest: No competing interest.

Data availability

This study is produced under the Swedish Statistics Act, where privacy concerns restrict the availability of register data for research. Aggregated data can be made available by the authors, conditional on ethical vetting. The authors access the individual-level data through Statistics Sweden's micro-online access system MONA.

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Ethics statements

The analyses have been approved by the Swedish ethical-vetting authority, Dnr 2020-02199.

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