

Is area deprivation associated with greater impacts of COVID-19 in care homes across England? A preliminary analysis of COVID-19 outbreaks and deaths

Anders Malthe Bach-Mortensen , Michelle Degli Esposti

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Social Policy and Intervention, University of Oxford, Oxford, UK

Correspondence to

Dr Anders Malthe Bach-Mortensen, Social Policy and Intervention, University of Oxford, Oxford OX1 2ER, UK; anders.bach-mortensen@spi.ox.ac.uk

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ABSTRACT

Introduction The COVID-19 pandemic has disproportionately impacted care homes and vulnerable populations, exacerbating existing health inequalities. However, the role of area deprivation in shaping the impacts of COVID-19 in care homes is poorly understood. We examine whether area deprivation is linked to higher rates of COVID-19 outbreaks and deaths among care home residents across upper tier local authorities in England (n=149).

Methods We constructed a novel dataset from publicly available data. Using negative binomial regression models, we analysed the associations between area deprivation (Income Deprivation Affecting Older People Index (IDAOPI) and Index of Multiple Deprivation (IMD) extent) as the exposure and COVID-19 outbreaks, COVID-19-related deaths and all-cause deaths among care home residents as three separate outcomes—adjusting for population characteristics (size, age composition, ethnicity).

Results COVID-19 outbreaks in care homes did not vary by area deprivation. However, COVID-19-related deaths were more common in the most deprived quartiles of IDAOPI (incidence rate ratio (IRR): 1.23, 95% CI 1.04 to 1.47) and IMD extent (IRR: 1.16, 95% CI 1.00 to 1.34), compared with the least deprived quartiles.

Discussion These findings suggest that area deprivation is a key risk factor in COVID-19 deaths among care home residents. Future research should look to replicate these results when more complete data become available.

INTRODUCTION

The COVID-19 pandemic is known to disproportionately impact care homes due to the vulnerability of the population residing in such facilities, but years of austerity and political neglect may have left the social sector needlessly exposed.¹ Estimates suggest that half of all COVID-19-related deaths in the UK will be care home residents.² The UK government's response to care home outbreaks has been heavily criticised for delayed and limited testing capacity,³ and for not ensuring safe working conditions for care workers by providing protective personal equipment.⁴ The consequences of the delayed and inadequate support are illustrated by the high prevalence of excess care home deaths, and by social care workers being twice as likely to die from COVID-19 compared with healthcare workers.⁵

There have been a number of descriptive reports investigating the variation in COVID-19-related deaths across the UK, generally finding that higher area deprivation is associated with increased death rates. For example, a report from the Office for National Statistics demonstrated a higher prevalence of COVID-19-related deaths in the most deprived areas compared with the least deprived areas.⁶

However, it is currently unclear whether area deprivation affects the number of COVID-19 outbreaks in care homes across local authorities (LA). Further, there has been no explicit investigation of whether COVID-19-related deaths among care home residents are associated with area deprivation. This research aims to investigate whether area deprivation is associated with—and may be driving—the occurrence of COVID-19 outbreaks and deaths among care home residents across LAs in England.

METHODS

We conducted a cross-sectional analysis of the associations between area deprivation and the impacts of COVID-19 in care homes by constructing a unique dataset from publicly available data for all upper tier LAs across England with sufficient data (n=149). Due to incomplete data, we did not include City of London and Isles of Scilly.

Exposure

Our primary exposure was area deprivation as measured by government-derived national indices. We identified two main indicators from the latest English indices of deprivation.⁷ First, we used the Income Deprivation Affecting Older People Index (IDAOPI), as this index relates directly to our population of interest (ie, care home residents). Second, we used the Index of Multiple Deprivation (IMD) extent, which captures the proportion of people living in the most deprived areas of the LA.

Outcomes

Our three main outcomes were (1) number of confirmed and suspected COVID-19 outbreaks in care homes, (2) COVID-19-related deaths, and (3) all-cause deaths—both among care home residents. We used the government publication of weekly reported deaths notified to the Care Quality Commission (CQC), as this is currently the most comprehensive publicly available dataset on deaths among care home residents.⁸ Although



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Table 1 Number of deaths among care home residents across deprivation quartiles

	Number of outbreaks	COVID-19-related deaths	All-cause deaths
Total number	6622	17 509	45 468
Average value per local authority (SD)	43.85 (38.96)	117.51 (100.64)	305.15 (274.46)
	Average share of care home outbreaks (%)	COVID-19-related deaths per 1000 care home beds (SD)	All-cause deaths per 1000 care home beds (SD)
Deprivation quartiles (IDAOPi)			
1	42.21%	41.23 (13.32)	107.83 (18.66)
2	39.17%	40.80 (15.62)	111.44 (21.43)
3	44.88%	51.90 (19.35)	117.68 (24.51)
4	50.13%	51.14 (15.71)	112.53 (21.33)
Deprivation quartiles (IMD extent)			
1	43.24%	42.41 (15.01)	109.00 (21.15)
2	44.06%	44.35 (18.05)	112.19 (21.50)
3	45.13%	46.67 (15.12)	113.08 (18.35)
4	44.01%	51.62 (18.03)	115.07 (25.37)
Total	44.11%	46.24 (16.80)	112.31 (21.62)

The death statistics cover the period 10 April to 21 June 2020. Outbreaks are from 9 March to 21 June 2020. Care home beds are calculated according to the care homes serving older people and dementia clients per local authority. IDAOPi, Income Deprivation Affecting Older People Index; IMD, Index of Multiple Deprivation.

the weekly updated dataset on daily deaths occurring in care homes⁹ includes more recent data, these data do not have all types of deaths among care home residents (eg, those occurring

in hospital). The dataset used in this analysis includes the period 10 April to 19 June 2020, and thus covers the central part of the first wave (see online supplemental figures A1 and A2 for graphs of the development in COVID-19 deaths and outbreaks over the investigated period). For number of outbreaks (ie, the number of care homes with at least two confirmed or suspected COVID-19 infections among staff or residents), we relied on the weekly updated dataset ‘COVID-19: number of outbreaks in care homes—management information’ published by Public Health England (9 March to 21 June 2020).¹⁰

Covariates

In order to control for potential confounding from population characteristics associated with area deprivation and our outcomes of interest, we adjusted for the following demographics at the area (LA) level: number of people above 65, population density and percentage of black and minority ethnic population.

ANALYSIS

In our regression models, the main exposure is area deprivation as measured by IDAOPi and IMD extent (see above). We separately modelled three outcome variables: (1) the number of COVID-19 outbreaks, (2) the number of COVID-19-related deaths, and (3) the number of all-cause deaths in upper tier LAs (n=149). We include relevant (logged) offset variables for each model, presenting the results for outbreaks as rate of the total number of care homes and the results for both mortality variables as rates of death per 1000 care home beds for older people and dementia clients. Because preliminary analyses indicated that COVID-19 outbreaks and deaths were significantly overdispersed (p<0.05), we used negative binomial regression models.

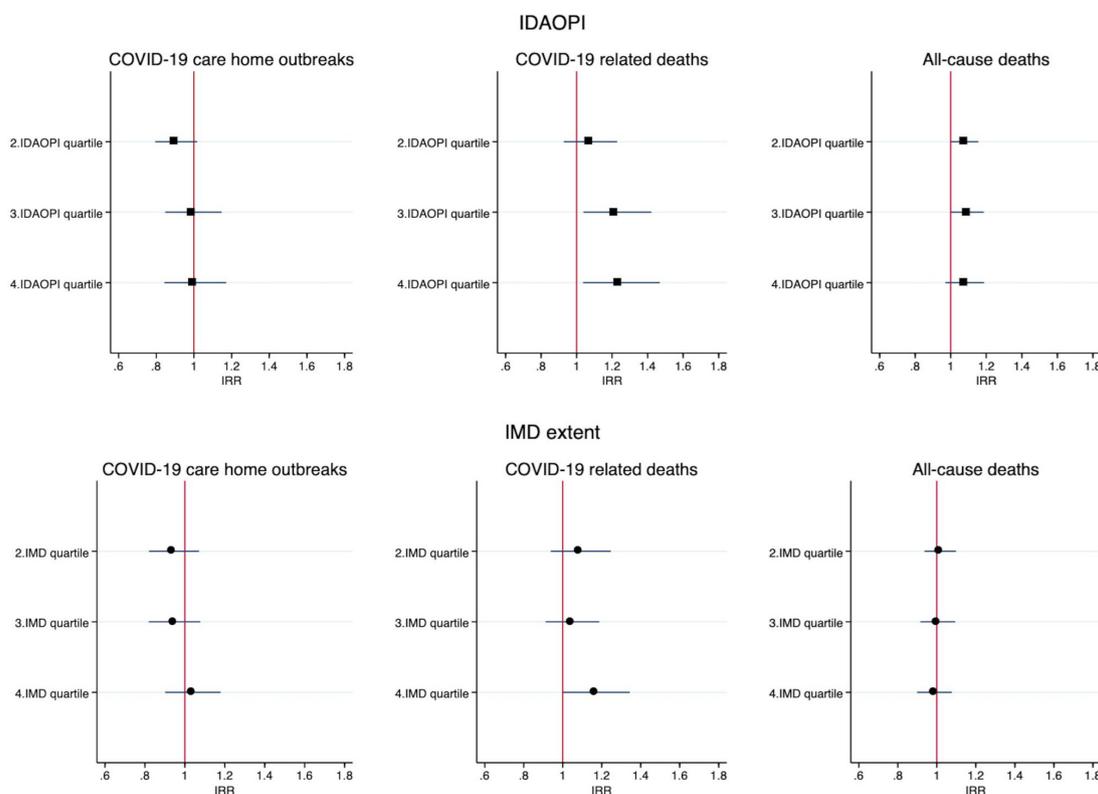


Figure 1 Exponentiated results from the adjusted negative binomial regression models displayed in full in online supplemental appendix 1. All death outcomes refer to care home residents. The reference category in all columns is the least deprived quartile of Income Deprivation Affecting Older People Index (IDAOPi) and Index of Multiple Deprivation (IMD) extent. IRR, incidence rate ratio.

Short report

All models were calculated with robust sandwich estimated standard errors.

RESULTS

Table 1 shows the descriptive statistics of the main outcomes and their variation across the quartiles of the area deprivation indices. More than 6600 outbreaks have been documented from 9 March to 21 June 2020, and 17 509 COVID-19-related deaths and 45 468 all-cause deaths have occurred among care home residents from 10 April to 21 June 2020. LAs in higher quartiles of area deprivation have more COVID-19 deaths per 1000 care home beds, whereas the association between relative outbreaks, all-cause deaths and deprivation is less clear.

Figure 1 displays the exponentiated effect of IDAOPI and IMD extent on outbreaks and deaths, with the least deprived quartile as the reference category. The incidence rate ratios (IRR) are derived from the negative binomial regression models, adjusting for population above 65, population density and proportion of black and minority ethnic population. The mortality models are also adjusted for number of outbreaks and care homes. The full results of the models can be found in online supplemental appendix 1.

In the first column ('COVID-19 care home outbreaks'), the figure shows that there is no statistically significant difference in the predicted number of outbreaks between the least deprived quartiles of IMD extent and IDAOPI and the most deprived quartiles. This suggests that area deprivation is not associated with the relative number of care home outbreaks.

In the second column ('COVID-19-related deaths'), the figure shows that both IDAOPI and IMD extent operate as significant predictors of deaths among care home residents. Specifically, COVID-19-related deaths were more common in the most deprived quartiles of IDAOPI (IRR: 1.23, 95% CI 1.04 to 1.47) and IMD extent (IRR: 1.16, 95% CI 1.00 to 1.34), compared with the least deprived quartiles. The observed effect is thus more pronounced in the indicator of area deprivation specific to the population of interest (ie, IDAOPI). All-cause deaths among care home residents were not consistently associated with area deprivation.

The pattern of findings was replicated in models using numbers of beds and care homes as control (as opposed to offset) variables and when using Poisson models on the continuous (as opposed to quartile) deprivation indicators (IDAOPI and IMD extent) (see online supplemental appendices 2 and 3).

DISCUSSION

Our provisional findings suggest that COVID-19 outbreaks in care homes do not vary according to area deprivation, but the degree to which care home residents die as a result of such outbreaks does. As such, these findings support growing evidence on the equity harms of the current pandemic and how it is exacerbating existing health inequities among vulnerable populations.¹¹ This analysis thus adds an important nuance to the existing findings, in that it shows that the spread of the virus to care homes is not consistently associated with area deprivation, but that the consequences of COVID-19 outbreaks (in terms of deaths among residents) have been more severe in areas of high deprivation.

There are a number of limitations associated with this research that are important to acknowledge. First, the data analysed in this research are provisional and the results may change as more complete information is released. Second, there is a relatively high degree of uncertainty on COVID-19 mortality statistics due

to insufficient testing capacity, especially in the early months of the pandemic.¹² Considering that the CQC does not normally publish the type of data analysed in this paper, we had to rely on the death counts adjusted to the number of care home beds (as opposed to excess death estimates). Moreover, the outbreak outcome investigated in the analysis does not include information on the magnitude (in terms of incidence) of a care home outbreak, as this information is not publicly available. Last, although the analysis is suggestive of an association between relative mortality and area deprivation, it cannot be used to explain the mechanisms driving this relationship.¹³ However, it is well established that health is negatively influenced by income inequality,¹⁴ and the relationship identified in this analysis may be driven in part by differing pre-existing or coexisting health conditions in clients across deprivation.

Future research should aim to replicate our findings with more complete data to confirm the role of area deprivation in moderating the impacts of COVID-19 in care homes, with a specific focus on avoidable mortalities. By releasing more details on the type of care homes in which COVID-19-related deaths have occurred (eg, size, ownership, employment conditions, and client types and preconditions), it will be possible to investigate whether specific care home characteristics are associated with a higher prevalence of deaths. A thorough examination of the difference in outcomes and the mechanisms and care home characteristics leading to these differences will be necessary to enable meaningful debate and reflection on this national tragedy and offer potential opportunities for preventing avoidable mortalities among vulnerable populations going forward.

What is already known on this subject

- ▶ Despite the COVID-19 pandemic disproportionately impacting care homes across England, the government's response has been criticised for not adequately protecting vulnerable residents and key workers.

What this study adds

- ▶ By examining the natural variation in COVID-19 outbreaks and related deaths of care home residents across all upper tier local authorities in England in the first wave of the pandemic, this study finds that the spread of the virus to care homes does not vary by area deprivation. However, COVID-19-related deaths were more common in more deprived areas compared with less deprived areas, suggesting that deprivation is a key amenable risk factor for preventing avoidable mortalities. These findings add to the growing evidence that the current pandemic is exacerbating existing health inequities among already vulnerable populations.

Twitter Anders Malthé Bach-Mortensen @AMBachMortensen

Contributors AMBM developed the idea for the manuscript, which was refined based on feedback from MDE. The data operationalisation and main analyses were done by AMBM, but all results presented in the paper were replicated by MDE. Both authors contributed to the writing of the manuscript.

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ORCID iD

Anders Malthe Bach-Mortensen <http://orcid.org/0000-0001-7804-7958>

REFERENCES

- 1 The Health Foundation. Legacy of political neglect had left social care fatally exposed before the outbreak began. Available: <https://www.health.org.uk/news-and-comment/news/legacy-of-political-neglect-had-left-social-care-fatally-exposed> [Accessed 29 Jun 2020].
- 2 The Guardian. More than half of England's coronavirus-related deaths will be people from care homes. Available: <https://www.theguardian.com/society/2020/jun/07/more-than-half-of-englands-coronavirus-related-deaths-will-be-people-from-care-homes> [Accessed 21 Jun 2020].
- 3 Burki T. England and Wales see 20 000 excess deaths in care homes. *Lancet* 2020;395:1602.
- 4 The Guardian. Elizabeth Gardiner: "Health and care workers should be free to speak out on PPE.", 2020. Available: <https://www.theguardian.com/society/2020/may/12/elizabeth-gardiner-health-care-workers-free-speak-ppe> [Accessed 21 Jun 2020].
- 5 Coronavirus (COVID-19) related deaths by occupation, England and Wales - Office for National Statistics. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/coronaviruscovid19relateddeathsbyoccupationenglandandwales/deathsregistereduptoandinclusing20april2020#deaths-involving-covid-19-among-health-and-social-care-workers> [Accessed 21 Jun 2020].
- 6 Deaths involving COVID-19 by local area and socioeconomic deprivation, 2020. Available: [https://www.ons.gov.uk/peoplepopulationandcommunity/peoplepopulationandcommunity/birthsdeathsandmarriages/birthsdeathsandmarriages/deaths/bulletins/deaths-involving-covid-19-by-local-area-and-deprivation/deaths-occurring-between-1-march-and-31-may-2020](https://www.ons.gov.uk/peoplepopulationandcommunity/peoplepopulationandcommunity/birthsdeathsandmarriages/birthsdeathsandmarriages/deaths/bulletins/deaths-involving-covid-19-by-local-area-and-deprivation/deaths-involving-covid-19-by-local-area-and-deprivation/deaths-occurring-between-1-march-and-31-may-2020) [Accessed 21 Jun 2020].
- 7 English indices of deprivation. Ministry of Housing, Communities & Local Government, 2019. Available: <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>
- 8 Office for National Statistics. Deaths involving COVID-19 in the care sector, England and Wales, 2020. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deaths-involving-covid-19-in-the-care-sector-england-and-wales> [Accessed 10 Jan 2021].
- 9 Number of deaths in care homes notified to the Care Quality Commission. England - Office for National Statistics. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/number-of-deaths-in-care-homes-notified-to-the-care-quality-commission-england> [Accessed 21 Jun 2020].
- 10 Public Health England. COVID-19: number of outbreaks in care homes – management information, 2020. Available: <https://www.gov.uk/government/statistical-data-sets/covid-19-number-of-outbreaks-in-care-homes-management-information> [Accessed 21 Jun 2020].
- 11 The Health Foundation. Do all care home residents face an equal risk of dying from COVID-19? Available: <https://www.health.org.uk/news-and-comment/charts-and-infographics/do-all-care-home-residents-face-an-equal-risk-covid-19> [Accessed 21 Jun 2020].
- 12 Health Foundation. What has been the impact of COVID-19 on care homes and the social care workforce? Available: <https://www.health.org.uk/news-and-comment/charts-and-infographics/what-has-been-the-impact-of-covid-19-on-care-homes-and-social-care-workforce>
- 13 The Health Foundation. Inequalities and deaths involving COVID-19. Available: <https://www.health.org.uk/news-and-comment/blogs/inequalities-and-deaths-involving-covid-19> [Accessed 27 Jun 2020].
- 14 Pickett KE, Wilkinson RG. Income inequality and health: a causal review. *Soc Sci Med* 2015;128:316–26.