TITLE

A deathly silence: why has the number of people found decomposed in England and Wales been rising?

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ETHICAL APPROVAL

Ethical approval was not required as this paper uses publicly available aggregate data.

COLLABORATION STATEMENT

LH had the idea for the paper and discussed with the co-authors, producing the initial drafts. TES developed the "proxy" marker of decomposition using ICD codes. JM carried out the data extraction, analyses, and data visualisations. MM and DD provided expert advice and review throughout. All authors contributed and approved the final manuscript.

ABSTRACT

Background

The number of deaths occurring in private homes in England and Wales had been rising for years, increasingly rapidly from 2020. Media stories and research linked decomposing bodies found in private homes with pandemic-related social isolation. We aim to explore whether these incidents are one-offs or part of a wider trend.

Methods

Using data from the Office for National Statistics, we calculate European Age Standardised Rates for deaths coded as R98 ("unattended death") and R99 ("other ill-defined and unknown causes of mortality") in the 10th version of the international classification of diseases (ICD), and the corresponding codes in ICD-9, by sex and age group from 1979 (when ICD-9 began) to 2020. These are proxy markers for deaths where decomposition precludes attribution of a specific cause at post-mortem.

Results

While mortality from all other causes decreased from 1979 to 2020, the opposite was seen for deaths from R98 and R99 (or "undefined deaths"), with males more affected than females. There was a sharp rise in these deaths in both sexes but in males particularly in the 1990s and 2000s, coinciding with a time when overall mortality was rapidly improving.

Conclusion

The increase in people found dead from unknown causes suggests wider societal breakdowns of both formal and informal social support networks. They are concerning and warrant urgent further investigation. We call on national and international authorities to consider measures that would make it possible to identify these deaths more easily in routine data.

1. INTRODUCTION

In July 2022, the British magazine *The Spectator* published an article "The mystery of Britain's surging at-home deaths".[1] It reported how deaths at home began to rise during the first year of the pandemic in 2020, and that this trend had continued into 2022. Yet the rise in deaths at home pre-dates the pandemic. The Office for National Statistics reports that the number of deaths occurring at home has been rising since 2007, with a sharp spike in 2020 due to the COVID-19 pandemic.[2] Excess deaths at home continued into 2022.[3]

The Spectator story coincided with other media reports of individual deaths. While the increase in deaths at home would not necessarily be a problem, the reported cases raised concerns that there may be a wider problem of growing isolation and lack of social support. For example, Sheila Seleoane, aged 58 years, died in a London social housing block in 2019—and was not discovered for over 2 years, by which point her body was severely decomposed. A subsequent investigation severely criticised her housing association for repeated failures to follow up on missed contacts.[4,5] Laura Winham, aged 38 years, was found "mummified" in 2021, more than 3 years after she had died.[6] Her family blamed care and welfare services for neglecting her. There have been other anecdotal stories of this kind, which have suggested that the reduction in the availability of care and welfare services since 2010 may have contributed to the possible trend.

Such deaths have always occurred. However, against the backdrop of rising deaths at home, as well as growing evidence about the adverse consequences of a decade of austerity, there are concerns about whether those deaths that have attracted media attention reflect a wider problem. Ideally, it would be possible to track trends in numbers of deaths found decomposing at home, but these data are not routinely coded in national statistics. Furthermore, the existing literature on deaths at home is largely focused on palliative care, recognising that, for many, a "good" death at home is a desirable outcome. However, there are two studies, from London, linking a significant increase of severely decomposed bodies since the beginning of the first lockdown to social isolation.[7,8] Neither looked at longer term trends, so it is prudent to extend this analysis further back, especially as deaths at home had been increasing *before* the pandemic, and both deaths cited above were believed to have occurred before 2020, even if the bodies lay undiscovered during the pandemic.

In this exploratory paper, we attempt to discover whether there was any increase in the number of people found in to be in a state of decomposition at the time of post-mortem over time from 1979-2021 in England and Wales. We suggest that if we find an increase in bodies found to be in a state of decomposition at post-mortem it would raise concerns about social isolation and neglect both after *and* before death and might be considered a proxy for a failure of society to safeguard its members.

2. Methods

As data for bodies found in a state of decomposition are not readily available, a proxy was developed (Box 1). We examined publicly available ONS data from 1979 to 2021. First, we calculate deaths at home in England and Wales from 2006-2021 as a proportion of total deaths by sex.[9] We used these years because data on place of death are not publicly reported prior to 2006, and cause of death by place is not reported by individual ICD-10 code.

Box 1: Using ICD codes as a proxy for severe decomposition.

Evidence of decomposition is not routinely recorded nor shared in public records. Research during the pandemic found that 90% of post-mortems which were recorded as "1a unascertained/unascertainable" were due to severe decomposition,[7] consistent with existing literature.[10] However, caution is required as studies examined small numbers (for example, 263 coronial autopsies were compared by Estrin-Serlui and Osborn; 55 of these were decomposed; and 9 certified as unascertained cause of death).[7] The tenth version of the International Classification of Diseases (ICD-10) codes R98 and R99 refer to unattended deaths and "other ill-defined and unknown causes of mortality".[11] If the number of severely decomposed deaths in the community were to increase, then the use of the codes R98 and R99 would most likely increase concordantly. It should be noted that well-defined sudden death syndromes such as sudden arrhythmic death syndrome (SADS) and sudden unexplained death in epilepsy (SUDEP) would not be included in these ICD codes as per ONS guidelines, with SADS routinely coded as R96, I49.9 or I46.1 and SUDEP as G40-41.[12,13] Therefore, we propose that the R98/99 codes may be used as a marker or proxy of (severe) decomposition. This will miss those decomposed but not so much as to prevent the pathologist and/or coroner determining a cause of death. For deaths prior to 2001, when ICD-10 was first used in the UK,[14] we identified the corresponding codes from ICDs 9a, 9b and 9c which are consistent (Table 1).[14–16] These will be referred to as "undefined" deaths from here on.

At present, there is no ICD code for "decomposed body". While R98 and R99 codes are non-specific, we pose that these codes are the most likely way a "1a Unascertained" death would be coded. ONS have confirmed (personal communication 26 October 2023, included in Appendix I) that the only code that can be applied when the cause of death is described as decomposed or unascertained is R99[a]. We have included R98 as the definition of it is in ICD is quite specific for "no cause could be discovered" which is suggestive of decomposition.

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[a] These deaths would then go to a coroner and an inquest held.

Second, we extract deaths due to R98 and/or R99 (ICD-10) and equivalents in ICD-9 from 1979-2021 by 5 year age group and sex.16,17 These data were extracted from all deaths, not deaths disaggregated by place of death (such as at home). However, most deaths that occur outside the home are in a hospital, care home, or hospice environment and would therefore be extremely unlikely to end up in a state of decomposition with the R98/R99 code as they would either have a known diagnosis or undergo a post-mortem. The very few others outside the home would, almost always, show evidence that could be used to ascertain the cause, such as major trauma causing fractures, or be found in circumstances that would indicate the cause, such as a body pulled out of the sea or being found wearing outdoor equipment on a mountain. In these cases a cause of death should be able to be given, such as drowning, exposure, or violence. Deaths that occur not-at-home which lead to such severe decomposition that they are given a cause of death as 1a Unascertained are likely extremely rare (and probably forensic/police cases).

Finally, using the European Standard Population 2013,[18] we calculate the European Age-Standardised mortality rates over time. We excluded all deaths under the age of 20 years due to changes in how sudden infant death syndrome (SIDS) and sudden unexplained death syndrome (SUDS) were coded and recognised throughout the decades examined.

Table 1: ICD-9 and ICD-10 codes used for proxy described in Box 1 for "undefined deaths". NOS is an abbreviation meaning "not otherwise specified".

| ICD version	Years	Code	Description	Includes
9a	1979-1984	798.9	Sudden death, cause unknown	Unattended death
		799.9	Other ill-defined and unknown causes of morbidity and mortality	Unknown cause
9b	1985-1993	798.9	Sudden death, cause unknown	Unattended death
		799.9	Other ill-defined and unknown causes of morbidity and mortality	Unknown cause
9c	1994-2000	798.9	Sudden death, cause unknown	Unattended death
		799.9	Other ill-defined and unknown causes of morbidity and mortality	Unknown cause
10	2001-2021	R98	Unattended death	Death in circumstances where the body of the deceased was found and no cause could be discovered; Found dead
		R99	Other ill-defined and unspecified causes of mortality	Death NOS; Unknown cause of mortality

3. RESULTS

3.1. Deaths at home 2006-2021

Figure 1 presents deaths aged 28 days and over at home as a proportion of all deaths from all causes by sex, 2006 to 2021 in England and Wales.[9] This shows a consistently higher proportion of total male deaths at home than females, with a slight narrowing of the gap during the first two years of the pandemic, increasing over time from 16% in 2006 to 21.4% in 2019, and 26.5% in 2021 for females, and from 22.4% (2006), 27.4% (2019), to 31% (2021) for males. When we disaggregate by age group, we see the highest proportion in those aged 15 to 44 years, followed by those aged 45-64.

Figure 1: Deaths at home as proportion of total deaths, 2006-2021, by sex, England and Wales. Authors' calculations based on data from ONS 2022[9]
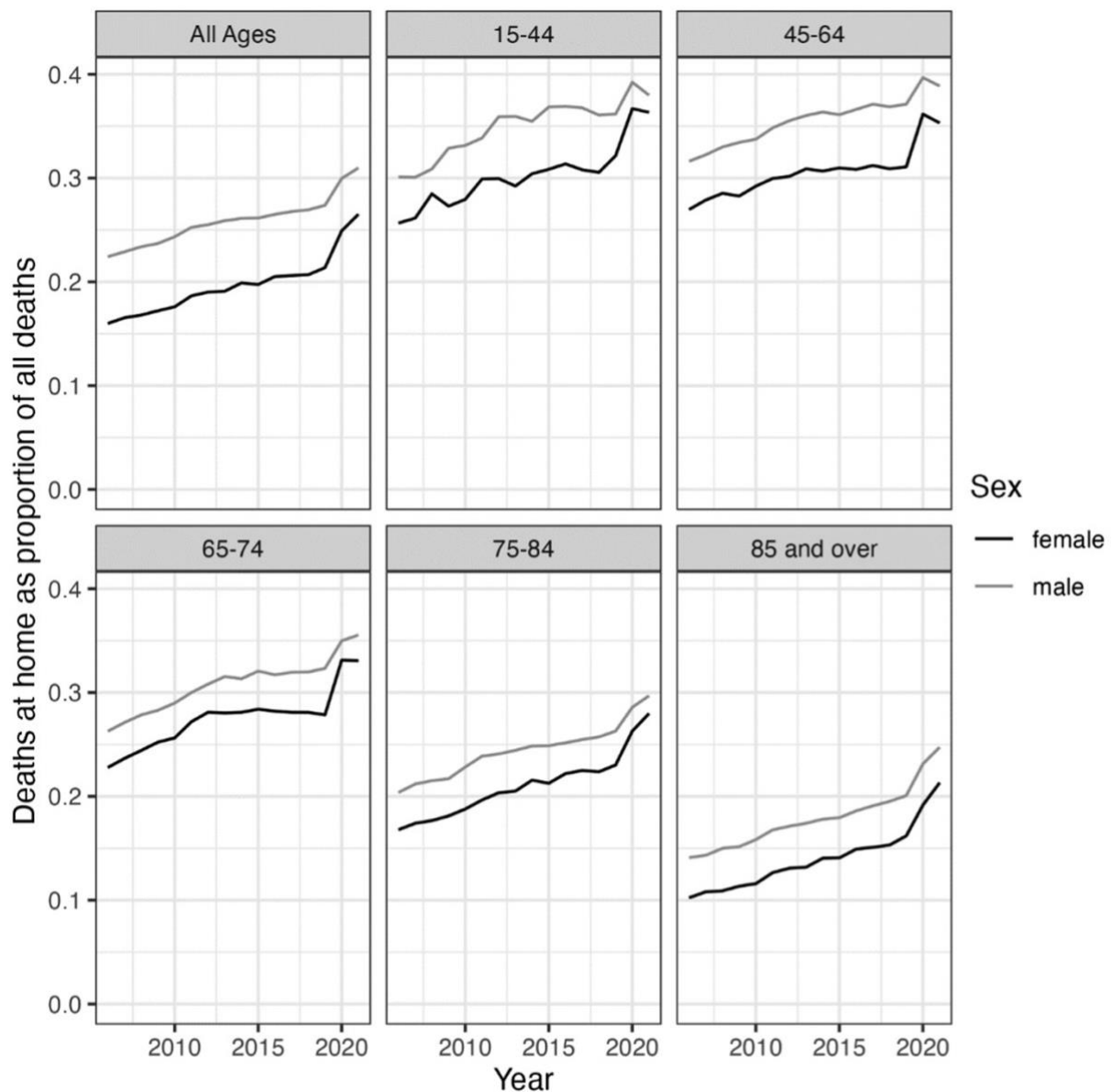
3.2. Standardised Mortality Rates for "Undefined" Deaths (R98/R99) and All Other Causes from 1979-2020 by sex

Figure 2: European age standardised rates for "undefined" deaths (i.e. those coded R98/R99) and all other causes of death by sex, England and Wales, 1979 to 2020. Dashed vertical line indicates change in ICD version from ICD-9 to ICD-10 in 2001.
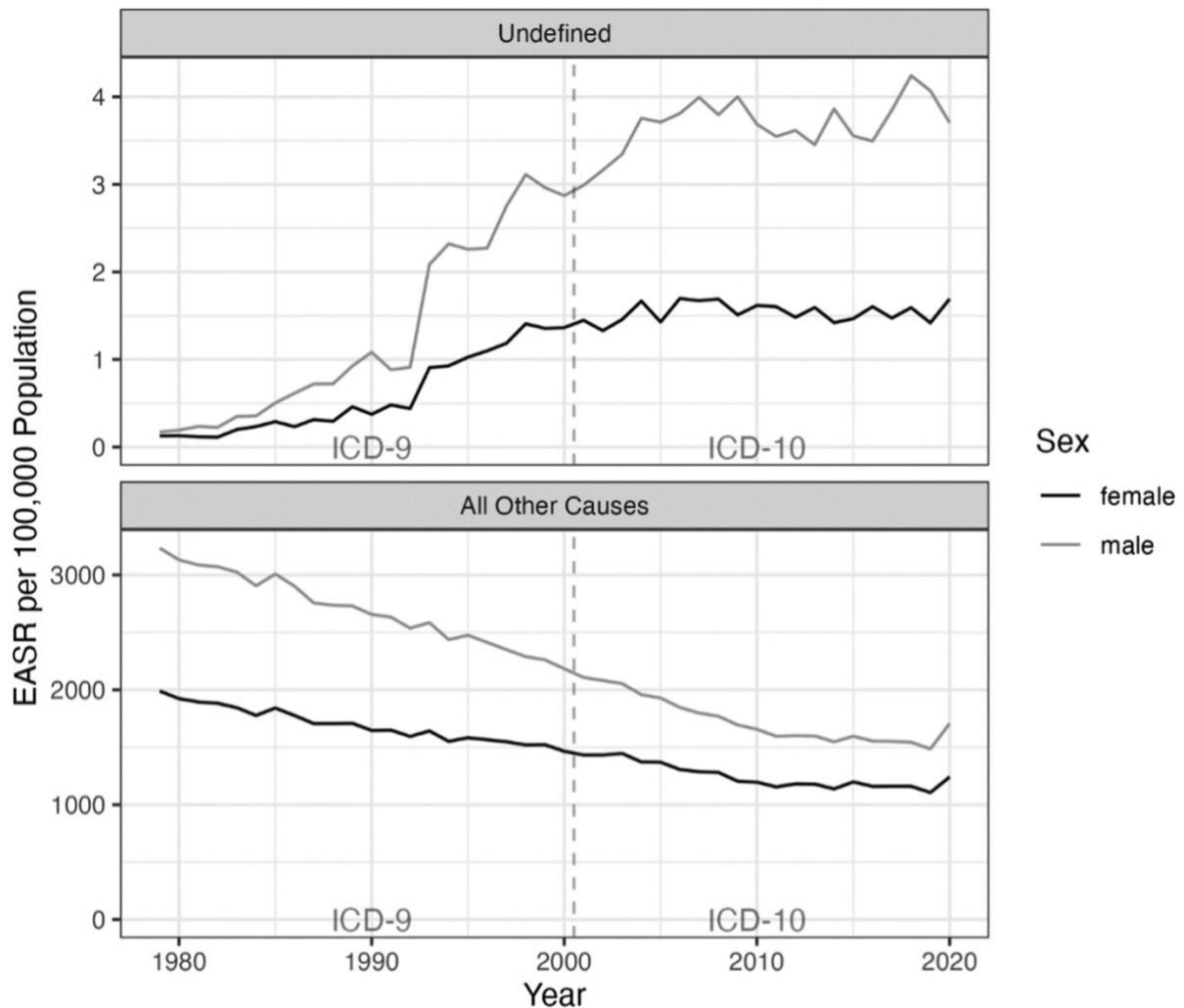
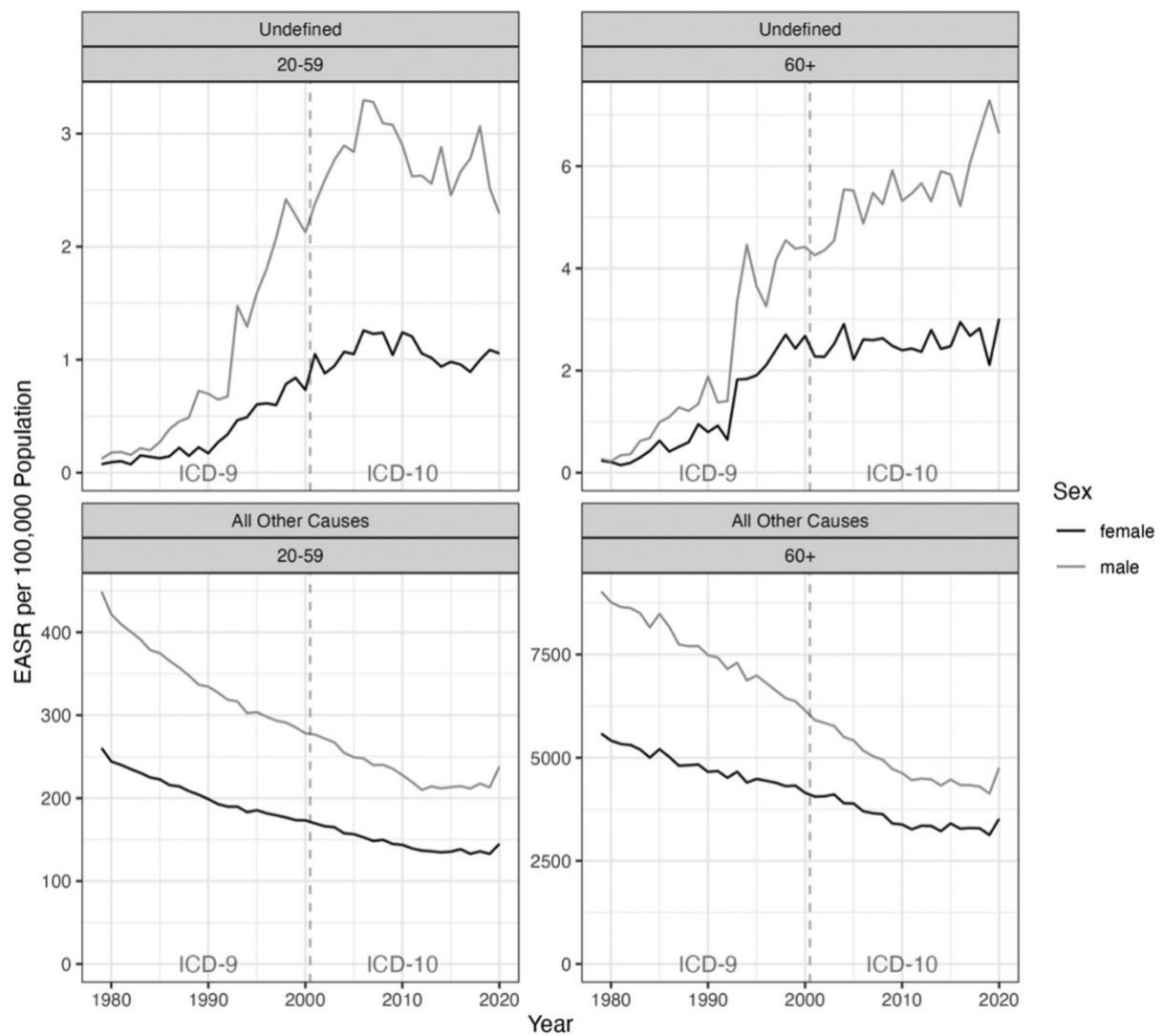EASR: European Age Standardised Rate. 2013 Reference Population.

Next, we present age-standardised rates (ASR) of "undefined" deaths (those coded R98 and R99 and ICD-9 equivalents) and all other causes of death by sex for England and Wales 1979 to 2020 (

Figure 2). Please note, absolute numbers for these can be found in Table A and Figure C in Appendix II. We indicate where the ICD version changed from ICD-9 to ICD-10 to highlight where we might expect to see any artefact due to the transition. For both sexes, the ASR for all other causes decreased steadily over time, with some fluctuations, until stalling after 2010 and increasing in 2020, when the pandemic began. The undefined deaths panel shows the

opposite, with an increase for both sexes from 1979 to 2020. For females, the greatest increase is between the mid-1990s to mid-2000s, after which it stabilises. For males, there appear to be two periods of increase, first in the 1990s then again in the early 2000s. By the 2000s, the male rate is more than double the female rate. Note due to the small numbers, over-interpretation of the annual fluctuations should be avoided.

3.3. Standardised Mortality Rates by broad age group

Figure 3: ASRs by broad age group (20-59 years, 60+ years) for males and females, 1979-2020, England and Wales. Dashed vertical line indicates change in ICD version from ICD-9 to ICD-10 in 2001. Note y axes are variable.
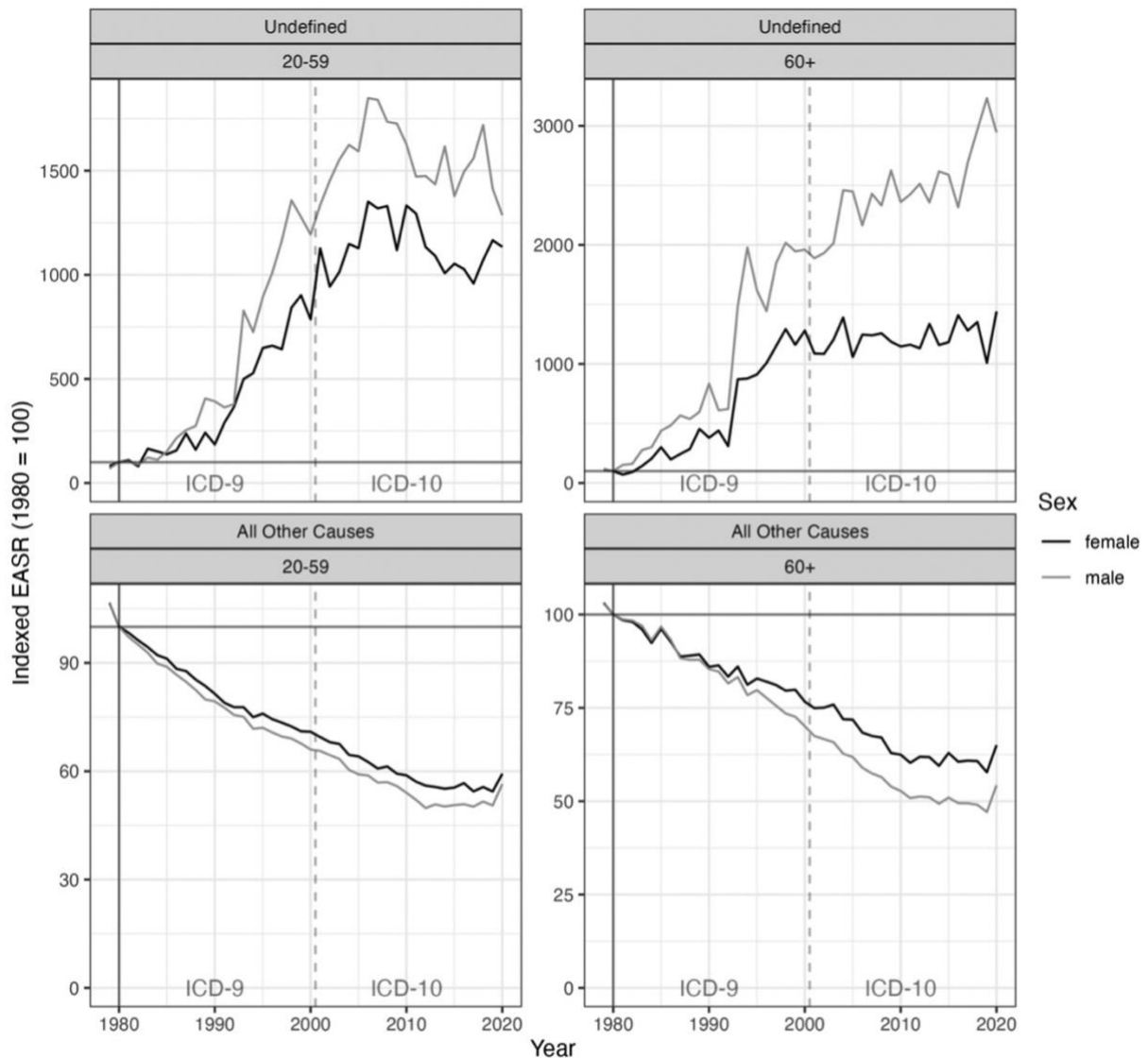

EASR: European Age Standardised Rate. 2013 Reference Population.

Next, we explore ASRs by broad age group: working years (20-59 years), and older (60 and over) (Figure 3). These shows similar patterns for both age groups, with a consistently higher rate for males than females (approximately 3 times as high).

We also present the same data indexed to 1980 (Figure 4). This makes it easier to see how relative trends in both undefined and all other causes of death have gone in very different directions. Caution is required in interpretation as it may give the impression the two trends balance each other out. This is incorrect, as undefined deaths are many orders of magnitude rarer than deaths from all other causes.

Figure 4: Indexed trends in EASRs (the year 1980 = 100) by broad age group (20-59 years, 60+ years) for males and females, 1979-2020, England and Wales. Dashed vertical line indicates change in ICD version from ICD-9 to ICD-10 in 2001. Note y axes are variable.

EASR: European Age Standardised Rate. 2013 Reference Population.

4. DISCUSSION

4.1. Main findings of this study

We present preliminary findings analysing deaths of people likely to have been found decomposed, using a proxy marker of ICD codes[b]. We have argued that any increase in this measure can be considered as a proxy for long periods of neglect after death and that this, in turn, may be a proxy for prolonged neglect and social isolation before death. This may be a marker of breakdown in formal and informal social support networks. This said, it is important to acknowledge that decomposition is a complex process, caused by many individual and environmental factors, and the speed of it can vary greatly.[19] However, we focused on those deaths where decomposition has reached the stage where it was no longer possible to determine a cause of death. Our reading of the literature suggests that, except in exceptional circumstances such as a summer heatwave or a death in a very hot room, to reach severe decomposition would take some time and would strongly suggest that the deceased was extremely isolated in the peri-mortem period. Furthermore, while changes in variables such a medical conditions and ambient temperature do matter, on a large population scale the most important factor that would affect decomposition is post-mortem interval, while individual or environmental circumstances would likely be balanced over time. The average body mass index (BMI) has increased in recent decades, and this can increase post-mortem decomposition speed,[20] but there is no evidence on the relative importance of this outlining how important a factor in determining this would be in affecting decomposition speed compared relative to the post-mortem interval.

We were concerned that recent reports of people found decomposed could signify a longer-term trend which would point to growing failure of society to prevent people falling through the gaps in the welfare state during a prolonged period of austerity and becoming socially isolated. We confirmed that this increase has occurred, and over a prolonged period, the earlier part of which predates austerity. Interestingly, loneliness and isolation are often associated with ageing, as exemplified by National Health Service advice on countering it,[21] with a perception that older women are especially vulnerable, given their longer life expectancy than men. However, while we did find an increase in bodies found decomposed in older females, the rates increased at an even faster rate for both younger and older males, with a rapid increase in the 1990s and 2000s. The increase seen for both sexes in the 1990s and 2000s is particularly surprising given the substantial improvements seen in mortality during this period. There is some suggestion that these deaths may be more common in those born between 1975 and 1985 (see Appendix II but, if true, we can only speculate as to a reason).

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[b] Details in Box 1 and Table 1.

4.2. What is already known on this topic

From 2012 onwards, trends in mortality worsened, a phenomenon that has been linked to the austerity measures implemented from 2010. [22–25] Initially, older age groups were most affected, with the first increase in mortality seen in older women in 2012, and soon after more groups were affected with now widespread worsening of mortality outcomes for many groups. For example, an increase in mid-age mortality has been reported in the UK in recent years, in particular from so-called "deaths of despair" (i.e. deaths related to drug and alcohol use, or suicide).[26,27] However, it important to note that, while the underlying social changes that give rise to these deaths may be similar to those studied here, in particular those that lead to greater social isolation, any substantial overlap is unlikely as, in most cases, a specific cause will be able to be allocated to these deaths of despair by means of toxicological detection of drugs or in overdose with suicidal intent, or from other evidence indicative of suicide. That said, the rise in these deaths could also be a reason for more deaths of males found at home, decomposed, who may have also been socially isolated.

Social isolation and loneliness are increasingly recognised as bad for health—two 2023 meta-analyses found associations with an increased risk of all-cause mortality.[28,29] In the analysis of post-mortem reports "every markedly decomposed case that died at home lived alone".[7] Data on people living alone in the UK between 1996 and 2021 show significant differences by age group and sex (See Figures D and E in Appendix II).[30,31] At ages 25-44 years, almost double the number of males than females live alone, according to the latest data, but numbers in both sexes have decreased over time. At ages 45-64 years, the difference is smaller but remained by 2021, but while numbers of females were slightly higher until 2004, both have increased, with males diverging around 2007 after which there was a marked increase. At ages 65 and over, both sexes have seen an increase since 2014.

However, here the gender difference is reversed, with a greater number of females living alone than males, although the data demonstrate that the ratio of males living alone relative to females has almost doubled in the 65 and over age group from 1996 to 2021.[30] This should be interpreted with caution as, first, these are crude numbers and do not take into account the population structure i.e. there are more females than males in the older population (see population pyramid in Figure E).[31,32] Second, males have lower life expectancy than females and, in a heterosexual marriage, the husband is less likely to be left alone than the wife due to the death of their spouse, as husbands usually die before their wives.

This changing landscape of living arrangements could in part explain the rise in undefined deaths for both sexes, but specifically the accelerating rise in males relative to females. However, living alone is only one factor contributing to peri-mortem social isolation. Family, friend and local community social connections can also be expected to play an important role, but these factors are harder to quantify at the population level so data that might show any change in these parameters over time is sparse and fragmentary.

4.3. What this study adds

Using a proxy for severe decomposition, we have shown an increase over time among both sexes in "undefined" deaths. In addition, it found that more deaths among males are coded "undefined" than females in both working age and older groups, suggesting a higher rate of being found decomposed.

4.4. Limitations of this study

To our knowledge, the ICD-10 codes R98 and R99 (and equivalents) have not previously been used as a proxy for severe decomposition. These codes will miss those cases where the body is decomposed but with post-mortem findings which can still establish a defined cause of death (for example, as mentioned, in the study of post-mortems before and after the pandemic lockdown only 16% of severely decomposed bodies had an unascertained cause of death).[7] Nonetheless, these ICD codes may still act as a reasonable surrogate given that, in the same study, almost all unascertained deaths did demonstrate severe decomposition. However, we cannot say with certainty that these codes are a good proxy for advanced decomposition. There is a paucity in research describing exactly how often decomposed deaths lead to an unascertained cause of death, as the majority of deaths where bodies were found decomposed would still result in a cause of death being given. While the numbers are small in the limited existing research, and although we have demonstrated a possible relative increase in the frequency of unascertained deaths, the absolute number of decomposed bodies as a proportion of all deaths remains low, and so the number included in any potential further studies would be low, and further research in this area would be useful.

Severe decomposition or degradation of a body is the most likely reason for the final cause of death to be given as "unascertained". There may be rare exceptions, such as coronial or administrative issues, which can lead to an "unascertained" cause of death, such as the body being repatriated following an autopsy abroad. However, pertaining to our findings of an increase in this proxy, it may be that more causes of death were reported as "unascertained" in the past, and ICD-9 code "sudden death, cause unknown" may have been used prior to the acceptance of conditions such as Sudden Arrhythmic Death Syndrome

(SADS) or Sudden Unexplained Death in Epilepsy (SUDEP). If sudden death syndromes such as these were previously coded as R99 and equivalents, we would have expected to see a decrease in deaths coded as "undefined" over time, but we found the opposite i.e., that deaths have increased.

4.5. Unanswered questions and future research

We are sharing these results in the hope of stimulating further research. Examples include whether there is a more suitable proxy for a body found in a state of decomposition, or whether our proxy is considered valid by experts in the field. We also hope to encourage others to report preliminary findings, and to raise the alarm about a possibly concerning trend that is challenging to investigate. Furthermore, future research may want to further explore the effects of living alone on mortality and, in particular, being found decomposed. All bodies found in a state of decomposition should be referred for post-mortem however research using coroners' reports is challenging given variation in reporting across the country. Notably, the two cited studies were undertaken in an individual city.[7,8] Furthermore, we cannot easily link the anonymised, coded death data to compare to individual post-mortem reports to validate whether the proxy is indeed appropriate.

Recording bodies found decomposing would be a useful addition to publicly available data. Thus, while recognising that the duties of coroners are strictly delineated in law,[33] we encourage the Chief Coroner of England and Wales, the Coroners' Society for England and Wales, (and their counterparts in Scotland and Northern Ireland) to explore whether and how they might report whether the deceased was severely decomposed or not. This could permit decomposition data to enter public record and subsequently be coded and analysed by the ONS in a similar way to other mortality data such as cause of death and place of death. In the longer term, we would encourage the World Health Organisation to consider adding a code to indicate advanced decomposition to the International Classification of Disease, perhaps using the "U" chapter, which allows for the adoption of new codes to address emerging concerns, as has been done with COVID and vaping.[34]

5. CONCLUSION

Many people would be shocked that someone can lie dead at home for days, weeks, or even longer, without anyone raising an alarm among the community they live in. Being found decomposed after days, weeks, months, or even years, might indicate a high level of neglect, but this is speculative without further investigation. We share these inconclusive and preliminary results in the hope of encouraging others to take up this important topic, and we propose that future mortality data could include information about the severity of post-mortem decomposition to enable further investigation into this topic.

6. REFERENCES

1. Spectator, T. The mystery of Britain's surging at-home deaths. *The Spectator* https://www.spectator.co.uk/article/why-are-thousands-of-people-dying-at-home/ (2022).

2. Office for National Statistics. Deaths registered in private homes, England and Wales - Office for National Statistics. https://cy.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/deathsinprivatehomesenglandandwales/latest#deaths-in-private-homes-2001-to-2021 (2021).

3. Office for National Statistics. Excess deaths in England and Wales - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/excessdeathsinenglandandwalesmarch2020todecember2022/2023-03-09#excess-deaths-by-place-of-occurrence (2023).

4. Peabody Trust. The Sheila Seleoane Report - Lessons Learned. https://www.peabody.org.uk/media/16102/altair-the-sheila-seleoane-report-lessons-learned-2022.pdf (2022).

5. Farley, H. What we can learn from a lonely death in social housing. *BBC News* https://www.bbc.com/news/uk-65187603 (2023).

6. Butler, P. Vulnerable woman lay dead in Surrey flat for more than three years. *The Guardian* (2023).

7. Estrin-Serlui, T. & Osborn, M. Putrefaction in the pandemic: a comparative study of the frequency of advanced decomposition change in coronial autopsies since the start of the COVID-19 pandemic. *J Clin Pathol* jclinpath-2021-207675 (2021) doi:10.1136/jclinpath-2021-207675.

8. Bates, A. W. H. Characteristics of Coronial Autopsy Cases in the London Area of the United Kingdom, Pre and Post COVID-19 Lockdown. *Academic Forensic Pathology* **13**, 3–8 (2023).

9. Office for National Statistics. Deaths registered in England and Wales - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathsregisteredinenglandandwalesseriesdrreferencetables (2022).

10. Ylijoki-Sørensen, S. *et al.* Coding ill-defined and unknown cause of death is 13 times more frequent in Denmark than in Finland. *Forensic Sci Int* **244**, 289–294 (2014).

11. World Health Organisation,. ICD-10 Version:2016. https://icd.who.int/browse10/2016/en.

12. Office for National Statistics. Sudden Adult Deaths 2016 to 2021. https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/suddenadultdeaths2016to2021 (2021).

13. Office for National Statistics. Deaths from epilepsy: 2014 to 2020. https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/deathsfromepilepsy2014to2020 (2020).

14. User guide to mortality statistics - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/methodologies/userguidetomortalitystatisticsjuly2017#cause-of-death-coding.

15. NVSS - Mortality - Historical Data - Comparability Between ICD Revisions. https://www.cdc.gov/nchs/nvss/mortality/comparability_icd.htm (2019).

16. [ARCHIVED CONTENT] Release Edition Reference Tables - ONS. https://webarchive.nationalarchives.gov.uk/ukgwa/20160111174808/http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-215593.

17. Office for National Statistics. Deaths registered in England and Wales – 21st century mortality - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/the21stcenturymortalityfilesdeathsdataset (2022).

18.   Revision of the European Standard Population - Report of Eurostat's task force - 2013 edition. https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-ra-13-028.

19.   Cockle, D. L. & Bell, L. S. Human decomposition and the reliability of a 'Universal' model for post mortem interval estimations. *Forensic Science International* **253**, 136.e1-136.e9 (2015).

20.   Byard, R. W. The complex spectrum of forensic issues arising from obesity. *Forensic Sci Med Pathol* **8**, 402–413 (2012).

21.   Loneliness in older people. *nhs.uk* https://www.nhs.uk/mental-health/feelings-symptoms-behaviours/feelings-and-symptoms/loneliness-in-older-people/ (2021).

22.   McCartney, G., Walsh, D., Fenton, L. & Devine, R. *Resetting the course for population health: evidence and recommendations to address stalled mortality improvements in Scotland and the rest of the UK.* (2022).

23.   McCartney, G., McMaster, R., Popham, F., Dundas, R. & Walsh, D. Is austerity a cause of slower improvements in mortality in high-income countries? A panel analysis. *Social Science & Medicine* **313**, 115397 (2022).

24.   Rashid, T. *et al.* Life expectancy and risk of death in 6791 communities in England from 2002 to 2019: high-resolution spatiotemporal analysis of civil registration data. *Lancet Public Health* **6**, (2021).

25.   Alexiou, A. *et al.* Local government funding and life expectancy in England: a longitudinal ecological study. *Lancet Public Health* **6**, e641–e647 (2021).

26.   Walsh, D. *et al.* Deaths from 'diseases of despair'in Britain: comparing suicide, alcohol-related and drug-related mortality for birth cohorts in Scotland, England and Wales, and selected cities. *J Epidemiol Community Health* **75**, 1195–1201 (2021).

27.   Augarde, E., Gunnell, D., Mars, B. & Hickman, M. An ecological study of temporal trends in 'deaths of despair' in England and Wales. *Soc Psychiatry Psychiatr Epidemiol* **57**, 1135–1144 (2022).

28.   Wang, F. *et al.* A systematic review and meta-analysis of 90 cohort studies of social isolation, loneliness and mortality. *Nat Hum Behav* 1–13 (2023) doi:10.1038/s41562-023-01617-6.

29.   Naito, R. *et al.* Social isolation as a risk factor for all-cause mortality: Systematic review and meta-analysis of cohort studies. *PLoS ONE* **18**, e0280308 (2023).

30.   Office for National Statistics. Families and households - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/datasets/familiesandhouseholdsfamiliesandhouseholds (2023).

31.   Office for National Statistics. UK population pyramid interactive - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/ukpopulationpyramidinteractive/2020-01-08 (2023).

32.   Office for National Statistics. National population projections - Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2018based (2019).

33.   The Crown Prosecution Service. Coroners. https://www.cps.gov.uk/legal-guidance/coroners (2021).

34.   World Health Organisation. Provisional assignment of new diseases of uncertain etiology or emergency use (U00-U49). *ICD-10 Version:2019* https://icd.who.int/browse10/2019/en#/U00-U49 (2023).

News release – Journal of the Royal Society of Medicine

Peer-reviewed / Observational study

Rise in people discovered dead and decomposed raises concerns

An exploratory study has raised concerns about the increasing number of people in England and Wales whose bodies are discovered so late that they have decomposed.

The study, published in the *Journal of the Royal Society of Medicine*, has highlighted potential links between growing isolation and such deaths, even before the COVID-19 pandemic.

The study was authored by a team led by Dr Lucinda Hiam of the University of Oxford and including histopathology registrar Dr Theodore Estrin-Serlui of Imperial College NHS Healthcare Trust.

The researchers analysed data from the Office for National Statistics (ONS), identifying deaths where bodies were found in a state of decomposition. They used a novel proxy: deaths coded as R98 ("unattended death") and R99 ("other ill-defined and unknown causes of mortality") according to the International Classification of Diseases (ICD-10) and previous versions, referred to as "undefined deaths".

The study revealed a steady increase in "undefined deaths", i.e., deaths of people found decomposed, between 1979 and 2020 for both sexes. The proportion of total male deaths exceeded female deaths, with these deaths increasing significantly among males during the 1990 and 2000s, when overall mortality was rapidly improving. This acceleration in deaths where people are found decomposed, particularly for men, is a concerning trend, the authors said.

"Many people would be shocked that someone can lie dead at home for days, weeks or even longer, without anyone raising an alarm among the community they live in," said Dr Estrin-Serlui. "The increase in people found dead and decomposed suggests wider societal breakdowns of both formal and informal social support networks even before the pandemic. They are concerning and warrant urgent further investigation."

The authors of the study are calling on national and international authorities to consider measures that would make it possible to identify deaths where people are found decomposed more easily in routine data.

ENDS

Notes to editors

A deathly silence: why has the number of people found decomposed in England and Wales been rising? (DOI: 10.1177/01410768231209001) by Lucinda Hiam, Theodore Estrin-Serlui, Danny Dorling, Martin McKee and Jon Minton will be published by the Journal of the Royal Society of Medicine at **00:05 hrs (UK time) on Wednesday 22 November 2023**.

The link for the full text of the paper when published will be:

https://journals.sagepub.com/doi/full/10.1177/01410768231209001

For further information or a copy of the paper please contact: James Hakner
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Appendix to Press Release

"Attached is a table with the raw data, showing R98/R99 deaths (what we call "undefined deaths") from 1958 to 2021. The sheet labelled "unexplained_share" demonstrates how many of these undefined deaths there were as a percentage of all deaths that year. There are other sheets in the document showing how many undefined deaths there were per year, disaggregated by age group and sex. As you can see, the absolute number of these deaths per year overall is low, however the important points we want to raise are fourfold:

A) Despite the absolute number of these deaths being very low relative to all other deaths, we can see that there is a trend of them increasing since the early 1990s, and also there is an apparent increase in the number of men affected compared to women from the late 1980s onwards.

B) This data really is the tip of an iceberg, as we know from established post-mortem data that these R98/R99 deaths would significantly underestimate the absolute number of deaths with advanced decomposition. About 80% of these R98/R99 deaths are likely to have shown advanced decomposition, however of all decomposed deaths, only 10-20% of them are likely to have ended up coded as R98/R99. Below is a crude, approximate Venn diagram to demonstrate the situation. Our study was only able to capture the R98/R99 death circle due to current ONS coding methods, as there is no statistical code for decomposed bodies.

C) The vast majority of those people who died and developed advanced decomposition would have had significant peri-mortem social isolation, and we wish to draw attention to that fact. A previous paper by one of our study's co-authors (Estrin-Serlui) showed a direct link due to the COVID-19 pandemic's enforced social isolation measures. We have now shown that an overall upwards trend in these undefined deaths predates the pandemic, and so may indicate increasing levels of social neglect and worsening societal breakdown of community, familial and social support networks over the past few decades.

DEATHS WITH ADVANCED DECOMPOSITION

"Undefined" R98/R99 deaths
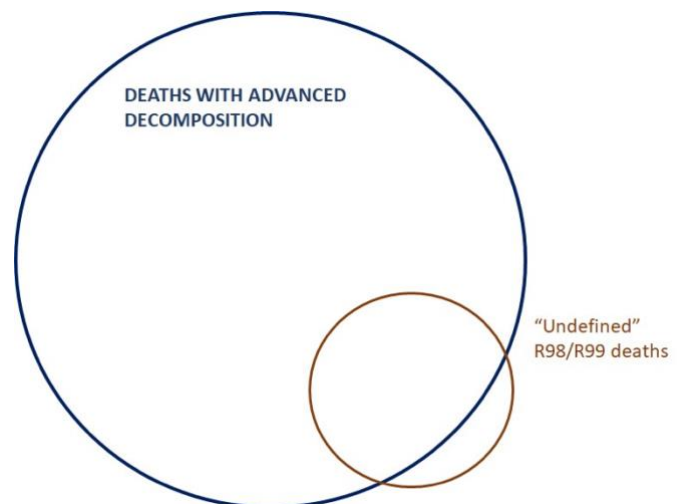
D) It is important to remember that decomposed deaths themselves would likely only represent a small subset of deaths in people with social/societal neglect (although the exact percentage is unclear as we do not have data on this). Therefore, the number of people suffering loneliness, social isolation and lack of support is almost certainly much higher than the total number of decomposed deaths; but capturing undefined deaths could prove a good way of tracking this tragic trend over time."

FULL PAPER SUPPLEMENATRY MATERIAL APPENDIX I: PERSONAL CORRESPONDENCE REGARDING THE USE OF CODES FROM THE OFFICE FOR NATIONAL STATISTICS (ONS)

Following queries from one reviewer, we contacted the Office for National Statistics (ONS) for additional clarification regarding the codes R98 and R99. The correspondence is included below, with their kind permission. We are extremely grateful to the ONS for their prompt and useful responses.

6.1. Email response from ONS to Dr Estrin-Serlui, 26th October 2023:

"The only code we can apply when the cause of death is described as Decomposed or Unascertained/Decomposed is R99. These deaths would then go to a Coroner and an Inquest would be held. As a result, these records would be manually coded. This will be the mention code , the Underlying code according to the ICD10 Classifications."

6.2. Email response from ONS to Dr Estrin-Serlui, 26th October 2023:

"Further to your supplementary questions:

1. *Are there any other causes of death that would end up with a R99 code?*

The causes are as follows:-

- *Not Known / Unknown /N/A*
- *Unascertained*
- *Skeleton found*
- *Undetermined*
- *Decomposed / Body decomposed, decoposition*
- *Causes where no ICD code is applicable E.G Persistent vegetative state, Brain death /brain dead*

These are the main ones we see there are others but it is where the Certifier gives no indication of where in the body it occurred for example 'Ventricle failure' we have no way of knowing if the ventricle failure is the Heart or the brain without specificity given so we use R99. We have a rule that we code what we see we must never assume.

1. *What sort of cause of death formulation would end up with a R98 code (unattended death) being assigned?*

In the last 2 years we have never received a death certificate with the term 'Unattended death' specified."

FULL PAPER SUPPLEMENATRY MATERIAL Appendix II: FURTHER INFORMATION

7.   LEXIS SURFACES OF DEATHS BY YEAR FROM UNDEFINED CAUSE AND ALL OTHER CAUSES

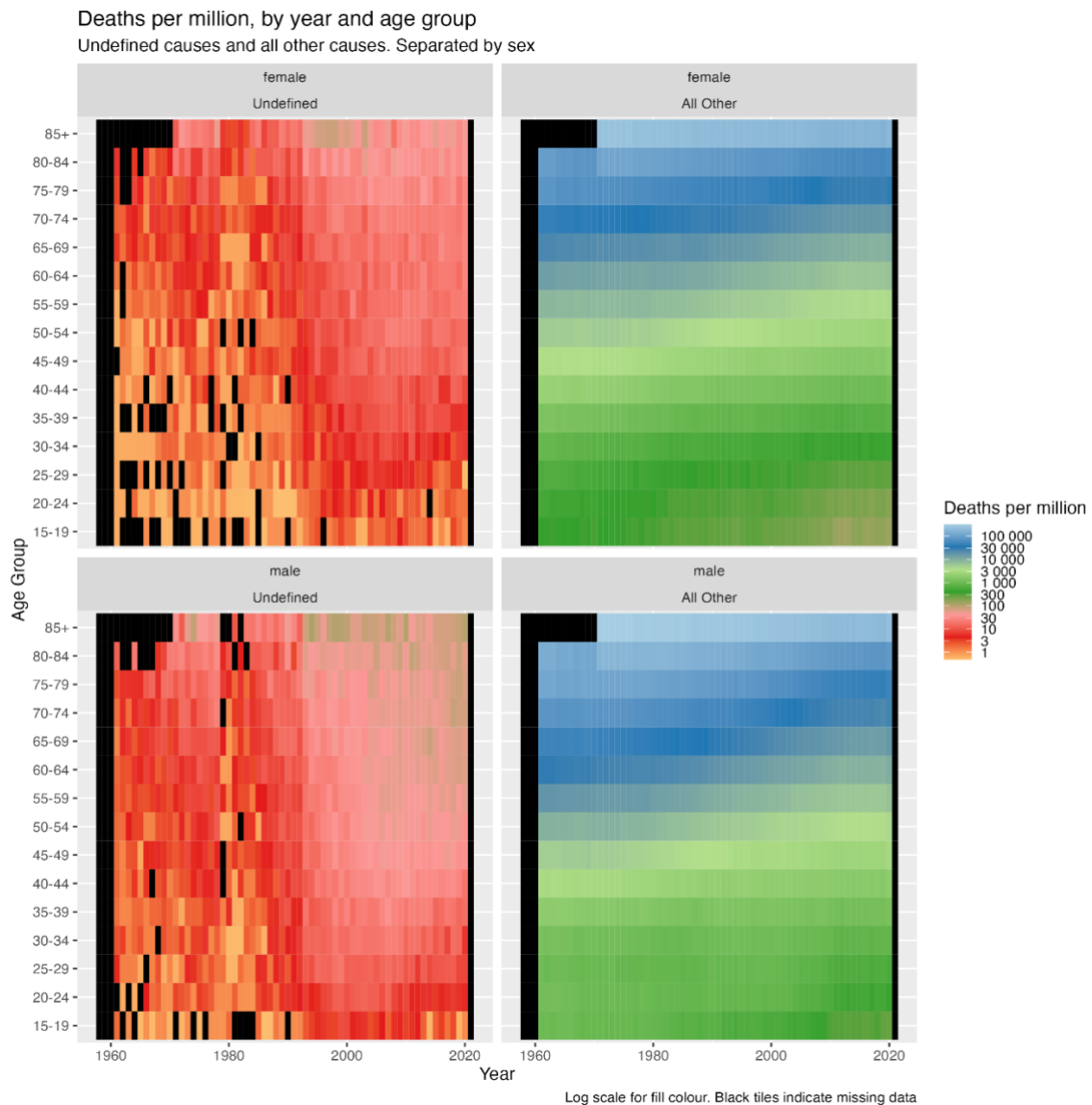   **7.1. Lexis Surfaces of deaths per million by year, age group, and sex**

Figure E: Deaths per million by year (x axis) and age group (y axis), from "undefined" causes (left) and all other causes (right), 1958-2021, England and Wales. Females on top panel, males on bottom panel

Figure A presents Lexis surfaces of deaths per million by year, age group, and sex from both "undefined" causes and "all other causes", from 1958 to 2021 in England and Wales. The paired colour palette alternates between light and dark versions of the same colour, before moving onto another colour (dark red, light red, dark green, light green, dark blue, light blue) to reveal mortality 'bands'. As the "undefined" deaths category is still rare, there are some

years in which no deaths were recorded for a particular age group. These are indicated with black tiles to make them distinct from colours indicating observed values. As each of the age bands are five years, but the year data by single year, the aspect ratio has been adapted to have a tile five times taller than it is wide.

 'All other causes' (which is substantively identical to 'all') shows mortality bands moving gradually upwards when going from left to right, i.e. age-specific mortality rates are tending to fall over time, as is well known. When looking at death rates that are undefined (left column in Figure A), the main finding was a rapid relative rise in mortality risk at almost all adult ages from the early 1990s which appears more pronounced from age groups over 40 years. Looking at the tile colours for young ages, such as 20-24 and 25-29, there is a possible indication of a cohort effect, with slightly higher rates for 20-25 year olds in the late 1990s and early 2000s than in the few years later or earlier.
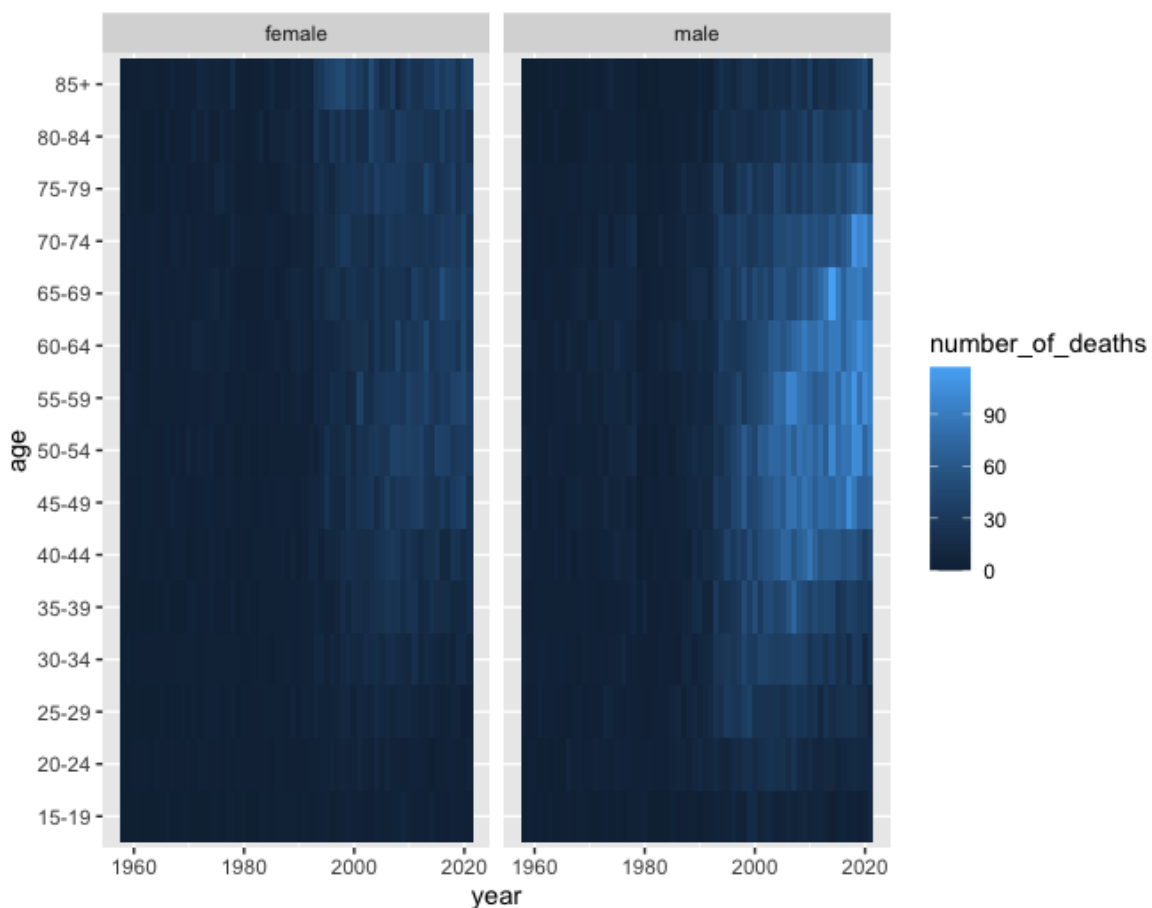

Figure F: Number of undefined deaths by age group and sex, 1958-2021, England and Wales. Females on left panel, males on right panel

Figure B shows the number of undefined deaths by age group and sex from 1958 to 2021, where lighter blue is a higher number of deaths. Using a different colour scheme to that used in Figure A, and just showing crude counts of deaths, highlights a particular pattern that might otherwise be less clearly seen. There are more deaths in males than females,

occurring in mid-age, and there is a diagonal pattern of a cohort effect affecting those born between the mid-late 1950s to mid-late 1970s.

7.2. Summary of findings

We found a rapid relative rise in mortality risk from undefined causes at almost all adult ages from the early 1990s, more pronounced from age groups over 40 years, a possible indication of a cohort effect in younger age groups (20-24y and 25-29y), with slightly higher rates for 20–25-year-olds in the late 1990s and early 2000s. It is not possible, with the data available to us, to offer an explanation for this observation. At first sight it suggests a cohort effect in those born between 1975 and 1985 but, while recognising the now extensive literature on life course epidemiology, any link between early life experiences and circumstances around the time of death would be highly speculative. Nonetheless, having observed this finding, we are making it available should others wish to explore it further.

8. ABSOLUTE NUMBER OF DEATHS OVER TIME

The absolute number of deaths by sex over time coded "undefined" are shown in Table 1 and Figure G below.

Table 2: Absolute number of "undefined" deaths in England and Wales, 1958-2021, by sex

Year	Female	Male	Total
1958	22	37	59
1959	24	38	62
1960	20	43	63
1961	22	37	59
1962	15	33	48
1963	21	38	59
1964	34	48	82
1965	23	36	59
1966	31	51	82
1967	39	45	84
1968	34	57	91
1969	38	62	100
1970	41	58	99
1971	47	57	104
1972	52	76	128
1973	61	93	154
1974	60	91	151
1975	59	101	160
1976	59	104	163
1977	54	96	150

|			
1978	72	128	200
1979	22	28	50
1980	24	32	56
1981	20	34	54
1982	19	34	53
1983	38	48	86
1984	40	46	86
1985	48	73	121
1986	43	92	135
1987	58	103	161
1988	55	112	167
1989	86	146	232
1990	66	156	222
1991	91	140	231
1992	83	148	231
1993	172	320	492
1994	174	340	514
1995	192	361	553
1996	207	379	586
1997	223	442	665
1998	271	515	786
1999	264	498	762
2000	264	485	749
2001	281	517	798
2002	259	558	817
2003	291	591	882
2004	332	656	988
2005	289	657	946
2006	343	702	1045
2007	341	730	1071
2008	348	706	1054
2009	315	754	1069
2010	341	694	1035
2011	337	681	1018
2012	315	699	1014
2013	339	677	1016
2014	311	769	1080
2015	321	709	1030
2016	356	709	1065
2017	329	785	1114
2018	362	879	1241
2019	326	838	1164
2020	390	769	1159
2021	309	733	1042
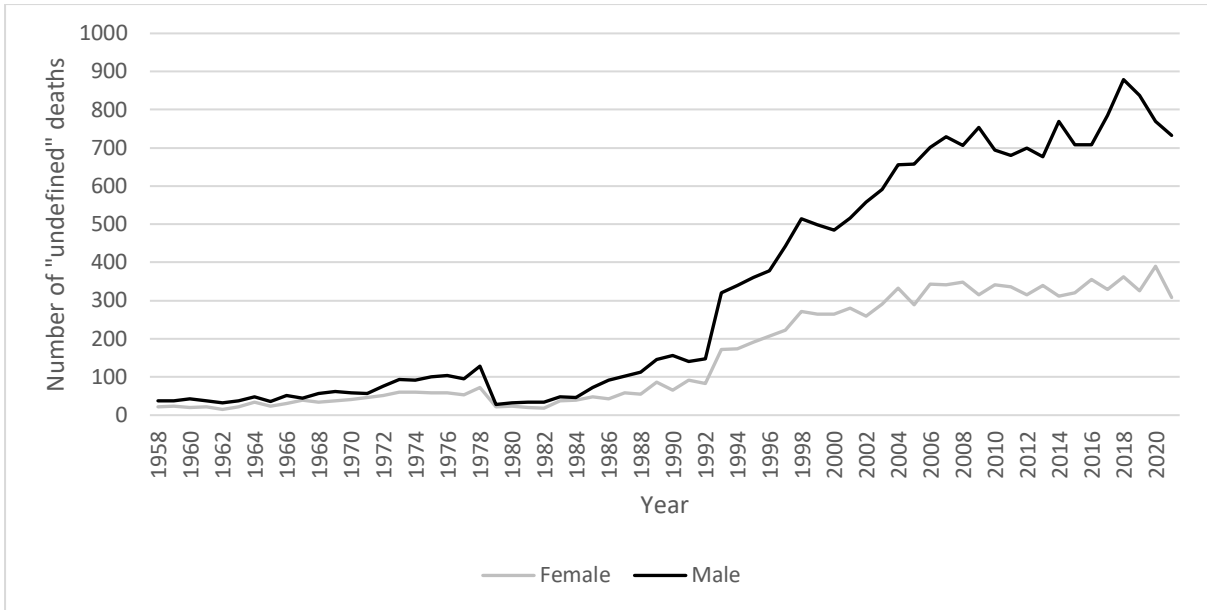
Figure G: Absolute number of "undefined" deaths in England and Wales, 1950-2021, males and females. Source: ONS mortality data

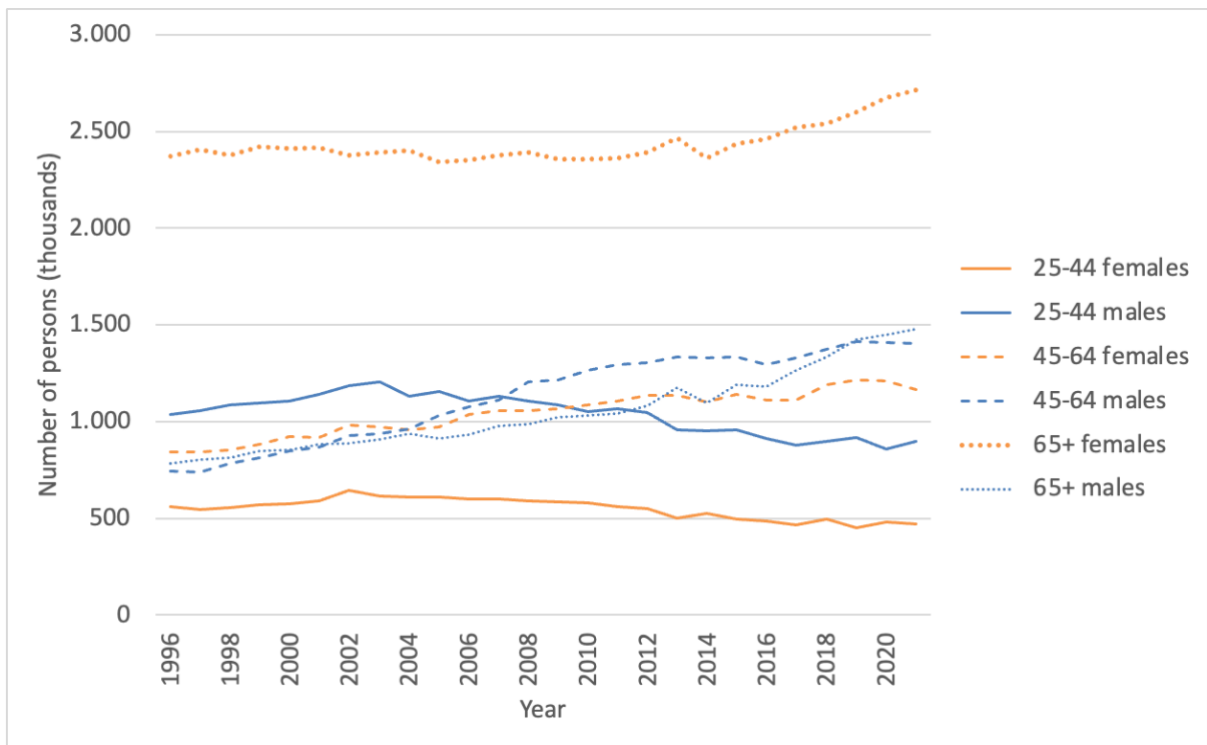## 9. PEOPLE LIVING ALONE IN THE UK

Figure H: Number of persons (thousands) living alone in the UK by sex (males in blue, females in orange) and age group over 25 years old. Source: estimates from ONS, Families and Households, released date: 18 May 2023[1]
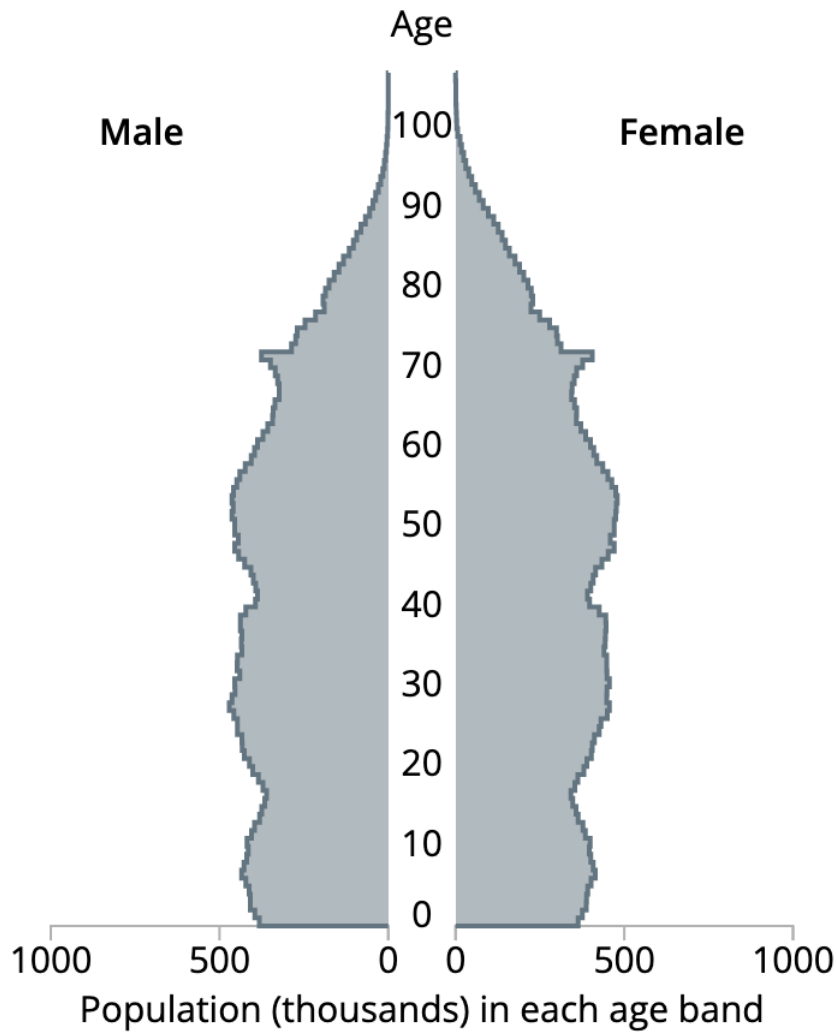
Figure I: UK population pyramid, 2018. Source: Office for National Statistics, Northern Ireland Statistics and Research Agency, National Records of Scotland and Welsh Government[2]

10. REFERENCES

1. Office for National Statistics. Families and households - Office for National Statistics.

   https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/da

   tasets/familiesandhouseholdsfamiliesandhouseholds (2023).

2. Office for National Statistics. UK population pyramid interactive - Office for National Statistics.

   https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationest

   imates/articles/ukpopulationpyramidinteractive/2020-01-08 (2023).