



OPEN ACCESS

Childhood contact with social services and risk of suicide or sudden death in young adulthood: identifying hidden risk in a population-wide cohort study

Sarah McKenna ,¹ Dermot O'Reilly ,¹ Aileen Maguire²

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/jech-2023-220975>).

¹Administrative Data Research Centre Northern Ireland, Queen's University Belfast, Belfast, UK

²Centre for Public Health, Queen's University Belfast, Belfast, UK

Correspondence to

Dr Sarah McKenna, Administrative Data Research Centre Northern Ireland, Queen's University Belfast, Belfast BT12 6BJ, UK; s.mckenna@qub.ac.uk

Received 8 June 2023

Accepted 18 September 2023

ABSTRACT

Background Childhood out-of-home care is associated with premature death in adulthood, in particular death by suicide, accidents and violence. However, little is known about the mortality risk in the much larger population of adults that had contact with social services in childhood but never entered out-of-home care. We determine the association between all tiers of contact with children's social services and risk of suicide and other sudden deaths in young adulthood.

Methods This population-wide, longitudinal, record-linkage study of adults in Northern Ireland born between 1985 and 1997 (n=437 008) followed each individual from age 18 years to July 2021 (maximum age 36 years). Cox regression models estimated the association between level of contact with social services in childhood (no contact; referred but assessed as not in need (NIN); child in need (CIN) and child in care (CIC)) and risk of death by suicide and sudden death in young adulthood.

Results Individuals with childhood social care contact (n=51 097) comprised 11.7% of the cohort yet accounted for 35.3% of sudden deaths and 39.7% of suicide deaths. Risk of suicide or sudden death increased stepwise with level of childhood contact and was highest in adults with a history of out-of-home care (suicide HR 8.85 (95% CI 6.83 to 11.4)). Individuals assessed as NIN, and those deemed a CIN, had four times the risk of death by suicide in young adulthood compared with unexposed peers (HR 4.25 (95% CI 3.26 to 5.53) and HR 4.49 (95% CI 3.75 to 5.39), respectively).

Conclusion Childhood contact with social services is a risk marker for death by suicide and sudden death in young adulthood. Risk is not confined to adults with a history of out-of-home care but extends to the much larger population that had contact with social services but never entered care.

INTRODUCTION

The link between early life adversity and premature mortality is well recognised¹ and represents a global public health concern.²⁻³ Contact with children's social services (ie, subject to a referral, in-home child protection/family support measures or out-of-home care) indicates early life adversity, and affects a large number of children worldwide.⁴⁻⁶ Prior research has focused on the mortality outcomes of arguably the most vulnerable subgroup within this population, those placed in out-of-home care (also described as public or state care, or being looked

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The majority of prospective studies have focused on childhood out-of-home care and risk of all-cause mortality in adulthood. It remains unknown if lower tiers of social care contact in childhood are associated with risk of death by suicide and other causes of sudden death in young adulthood.

WHAT THIS STUDY ADDS

⇒ This study quantifies the excess risk of death by suicide and sudden death in a previously hidden 'at-risk' group, young adults in contact with social services in childhood but assessed as not in need of any help or support.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ There is a need for cross-cutting health and social policy to reduce the negative consequences of early life adversity and improved access to appropriate health services, including those that support mental well-being. Individuals who did not meet the threshold for children's social care services may benefit from targeted interventions.

after, hereafter 'care'). A meta-analysis of 14 studies found care in childhood associated with a twofold increase in all-cause mortality risk in adulthood relative to those without a history of care.⁷ There are few studies of cause-specific adult mortality given childhood care experience but the available evidence suggests this excess mortality is disproportionately attributable to sudden death from external causes such as suicide, accidents and violence.⁷⁻¹³ In addition, little is known about the adult mortality outcomes of the much larger population of children that had contact with social services but never entered care.

Children's social care systems (often termed 'child welfare' systems outside the UK) differ internationally, but in countries such as the USA, Canada and Australia, the focus is on statutory child protection services in response to cases of suspected maltreatment.¹⁴ In the UK (and most European countries) statutory services are provided according to the definition of a vulnerable child likely to suffer impairment to health or development without the



© Author(s) (or their employer(s)) 2023. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: McKenna S, O'Reilly D, Maguire A. *J Epidemiol Community Health* Epub ahead of print: [please include Day Month Year]. doi:10.1136/jech-2023-220975

provision of services.¹⁴ The aim of UK children's social care is to improve children's outcomes and help them achieve their full potential in line with peers.¹⁵ A range and level of services can be provided, dependant on assessed need, and in the most severe cases can include placement in care. While individuals with a history of care constitute an important 'at-risk' population for death by suicide and other sudden deaths, they represent a small proportion of child social care populations. In England, an estimated one in seven children were in need of social care support or intervention at least once over an 8-year period, whereas 1 in 52 children were in care over the same period.¹⁶ In the USA, an estimated one in three children experience an investigation for alleged maltreatment before the age of 18 years.¹⁷ Prior research from Sweden shows that tiers of social care contact below placement in care (unsubstantiated investigations and in-home services) are associated with increased risk of all-cause mortality in adulthood, however, lack the sample size to examine specific causes of death such as death by suicide.^{18–20}

To our knowledge, only two population-level studies have examined risk of death by suicide and other unnatural causes of death in social care cohorts that include adults with a childhood history of contact with social services below the tier of placement in care. A Swedish study found adults that received 'other child welfare' interventions (in care for less than 2 years, or in-home measures) had over a twofold increased risk of avoidable death compared with general population peers.¹¹ In Australia, adults with any child protection system contact (including placement in care) were more likely to die from unnatural causes such as poisonings, alcohol, drugs or other substances (incidence rate ratio (IRR) 4.82 (95% CI 3.31 to 7.01)) or suicide (IRR 2.82 (95% CI 2.15 to 3.68)) compared with those with no child protection contact.²¹ However, both studies conflate out-of-home care with in-home care populations. Furthermore, cases of maltreatment or suspected maltreatment represent a minority of children that have contact with social services in the UK.²² High thresholds for intervention from statutory social services mean a large proportion of referrals do not result in any service provision.^{5,23} In earlier work, we identified that children referred to social services but assessed as not in need (NIN) of any help or protection have a fivefold increased risk of mental ill health compared with those with no contact.²⁴ We hypothesise this group will have an increased risk of death by suicide given the established link between mental ill health and suicide.²⁵ The potentially increased cause-specific mortality risk among this 'hidden' population, who are known to social services but have not experienced placement in care, has not been previously examined.

Consequently, the aim of this paper is to determine the association between all levels of childhood contact with social services in Northern Ireland (NI) and death by suicide, sudden death and all-cause mortality in young adulthood. We extend prior work by examining cause-specific mortality risk in individuals subject to in-home child protection or family support measures or referred but assessed as NIN of any help or support.

Methods

Patient and public involvement statement

This study is part of a programme of research produced in partnership with Voice of Young People in Care and a panel of care experienced young people who meet quarterly with the research team to help set the research agenda, specify research questions and interpret findings.

Study design, population and data sources

This longitudinal cohort study linked administrative data from three population-wide databases: the National Health Applications and Infrastructure Services (NHAIS) database, the Social Services Client Administration and Retrieval Environment (SOSCARE) system and General Register Office (GRO) death records. NHAIS contains demographic information on all patients registered with a primary care general practitioner. NI has a universal 'free at the point of service' healthcare system with almost 100% population registration. SOSCARE data contains the case records of all individuals and all interactions with children's social services, which in NI are the responsibility of five regional Health and Social Care Trusts. Mortality data from the GRO provided information on date and cause of death, as defined by the International Classification of Diseases 10 (ICD-10) codes. NI is unique among UK nations in that it has an integrated health and social care system allowing for the linkage of individual records across datasets by matching of Health and Care Number, a unique identifier recorded in any interactions with health and social care services.

NHAIS identified all individuals in NI born in the 13 years between 1 January 1985 and 31 December 1997 (n=449 263). Excluded individuals were those who died before reaching age 18 years and those missing area-level data. Also excluded were individuals recorded within social services data as having a disability to limit the possible confounding of social care contact and mortality risk caused by existing disabilities. A small number of individuals first in contact with social services after age 18 years were excluded, as these cases were unrelated to child protection. The final cohort was 437 008 (97.3%) individuals in NI born 1985–1997 with full data (figure 1).

Measures

Contact with social services was ascertained from SOSCARE and classified into four mutually exclusive groups, based on highest level of involvement: (1) no contact; (2) referred but assessed as not in need of help or protection, in every interaction with social services (NIN); (3) assessed as a child in need (CIN) (ie, subject to a CIN plan or child protection measures in their own home) and (4) child in care (CIC) (ie, foster, kinship, or residential care or placed with parent(s)). Although the legal definition of a CIC is a 'looked after child', lived experience experts preferred the term 'CIC', which is used throughout. Children in care are by definition also a CIN but are examined here as a separate group.

Mortality data provided information on date and cause of death from 1 January 1985 to 31 July 2021. Suicide and other sudden deaths from external causes were the primary outcomes of interest. Although suicide and other unnatural deaths are likely to represent the majority of excess deaths in those with a history of care, we include all-cause mortality as previous studies have identified higher overall risk of death in these young adults.⁷ Suicide deaths were defined using the ICD-10 for intentional self-harm (X60–X84, Y87.0) and events of undetermined intent (Y10–Y34, Y87.2) in line with the UK-wide definition. Suicide and accidents are the major causes of death in young people.²⁶ These causes of death were grouped together to create a 'sudden death' variable as seen in previous studies.^{12,27} Sudden deaths were defined as deaths due to accidents (V01–V99; W00–X59), assault (X85–Y09; Y87.1), intentional self-harm (X60–X84, Y87.0) and events of undetermined intent (Y10–Y34, Y87.2). All-cause mortality included all recorded causes of death.

Data on age, sex, area-level income deprivation and area of residence were derived from NHAIS. Area of residence was

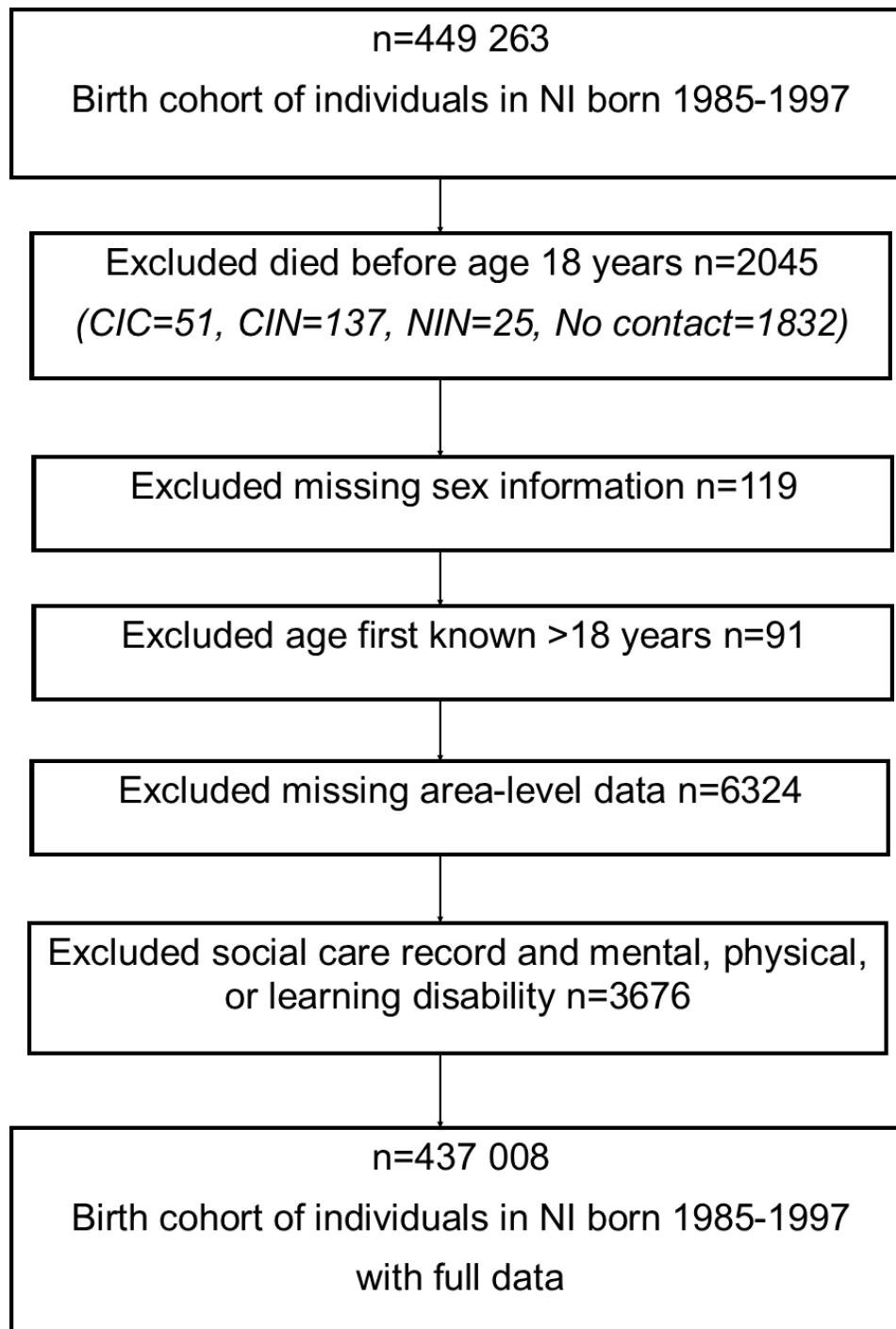


Figure 1 Flow chart of the cohort selection for the study of death by suicide, sudden death and all-cause mortality in young adulthood given childhood contact with social services. CIC, child in care; CIN, child in need; NI, Northern Ireland; NIN, not in need.

based on a classification of settlements in NI and grouped into urban, intermediate and rural.²⁸ A measure of disadvantage was extracted from the income deprivation domain of the Northern Ireland Multiple Deprivation Measure²⁹ and divided into three groups (less deprived, intermediate and more deprived). Income deprivation and area of residence were assigned to patient address in 2010 for those alive and resident in NI at that time, and as the last recorded address for those who died before 2010. Ideally, the area-level variables would be time-varying covariates. However, in the creation of this large, linked dataset, the data providers allowed for allocation at one time point only.

Reporting follows the Strengthening of the Reporting of Observational Studies in Epidemiology guidelines.³⁰

Statistical analyses

Descriptive statistics determined cohort characteristics and incidence of death. Mortality outcomes and covariates were compared by social care subgroup using the χ^2 statistic for categorical variables. Separate Cox proportional hazards models were constructed to calculate the association between childhood social care contact and each mortality outcome. Time at risk

Table 1 Cohort characteristics by childhood social care status (n=437 008)

	No contact		Not in need		Child in need		Child in care	
	385 911	(88.3%)	11 565	(2.7%)	33 784	(7.7%)	5748	(1.3%)
Birth year								
1985–1988	141 975	(36.8%)	2752	(23.8%)	4847	(14.4%)	1591	(27.7%)
1989–1992	121 525	(31.5%)	4052	(35.0%)	9262	(27.4%)	1855	(32.3%)
1993–1997	122 411	(31.7%)	4761	(41.2%)	19 675	(58.2%)	2302	(40.0%)
Sex								
Female	194 041	(50.3%)	4856	(42.0%)	17 100	(50.6%)	2846	(49.5%)
Male	191 870	(49.7%)	6709	(58.0%)	16 684	(49.4%)	2902	(50.5%)
Deprivation								
Less deprived	86 365	(22.4%)	1501	(13.0%)	3255	(9.6%)	480	(8.4%)
Intermediate	220 504	(57.1%)	7005	(60.6%)	19 573	(57.9%)	3140	(54.6%)
More deprived	79 042	(20.5%)	3059	(26.4%)	10 956	(32.4%)	2128	(37.0%)
Area of residence								
Rural	102 204	(26.5%)	2436	(21.1%)	6963	(20.6%)	855	(14.9%)
Intermediate	123 168	(31.9%)	5011	(43.3%)	13 721	(40.6%)	2285	(39.7%)
Urban	160 539	(41.6%)	4118	(35.6%)	13 100	(38.8%)	2608	(45.4%)

Data are n (%). For brevity, p value from χ^2 tests for categorical variables not shown here but are included in online supplemental table T51.

was from reaching age 18 years until date of failure (death), or right censoring due to emigration or end of follow-up at 31 July 2021. Follow-up time ranged from 6 to 18 years, and maximum age at end of follow-up was age 36 years. Models were fitted unadjusted, and adjusted for sex, area-level deprivation and area of residence. There is no general consensus on appropriate time scales for survival analysis³¹ and as chronological age is the time-scale here no further adjustment for age was made. Sensitivity analyses excluded deaths of undetermined intent from the suicide analyses. All analyses were conducted using Stata V.16.

RESULTS

Characteristics of the study population are shown in table 1. Of 437 008 individuals born 1985–1997, 11.7% had a childhood history of contact with social services (2.7% NIN, 7.7% CIN and 1.3% CIC). Compared with peers with no contact, a larger proportion of individuals with a childhood social care history were born later in the cohort (1993–1997), most notably children in need (31.7% vs 58.2%). This is likely reflective of improving social care data quality over time and the increasing incidence of children involved with social services, as 2015 saw the highest number of children looked after in NI since 1995.³² There was no substantial difference in sex distribution across most categories except for those deemed NIN, which had a male majority (58.0%). However, exposure to the highest levels of deprivation shows a dose–response relationship with level of contact with social services and the greatest proportion of care experienced individuals are observed in urban areas.

Overall, 2273 (0.52%) cohort members had died by the end of the follow-up period, over one-half (56.9%) from sudden causes and almost one-third (32.8%) by suicide (table 2). It is notable that although individuals with childhood social care contact comprised only 11.7% of the cohort, they accounted for 30.9% of all deaths, 35.3% of sudden deaths and 39.7% of deaths by suicide. Sudden deaths and deaths by suicide were proportionally more common among this group. Deaths from suicide accounted for just under one-half (48.2%) of all deaths among young adults that were in care during childhood (CIC).

The relationship between the level of social services contact and mortality risk is more clearly evident in the regression

analyses (table 2). Risk generally increased stepwise with level of childhood social care contact but was only moderately attenuated with the addition of controls. Risk of death by suicide, sudden death and all-cause mortality were comparable between individuals assessed as NIN in childhood and those with a CIN history. Both groups had over four times the risk of suicide relative to unexposed peers (HR 4.25 (95% CI 3.26 to 5.53) and HR 4.49 (95% CI 3.75 to 5.39), respectively), and over three times the risk of sudden death (HR 3.65 (95% CI 2.97 to 4.49) and HR 3.83 (95% CI 3.32 to 4.41), respectively). Mortality risk

Table 2 Risk of suicide, sudden death and all-cause mortality in young adulthood according to level of childhood contact with social services (n=437 008)

Childhood social care	Deaths n (%)	Unadjusted	Fully adjusted*
Suicide			
No contact	450 (0.12)	1.00	1.00
Not in need	63 (0.54)	4.88 (3.75 to 6.36)	4.25 (3.26 to 5.53)
Child in need	166 (0.49)	4.97 (4.15 to 5.94)	4.49 (3.75 to 5.39)
Child in care	67 (1.17)	10.51 (8.13 to 13.59)	8.85 (6.83 to 11.47)
Sudden death			
No contact	836 (0.22)	1.00	1.00
Not in need	101 (0.87)	4.22 (3.43 to 5.18)	3.65 (2.97 to 4.49)
Child in need	260 (0.77)	4.17 (3.62 to 4.79)	3.83 (3.32 to 4.41)
Child in care	96 (1.67)	8.10 (6.56 to 10.00)	7.12 (5.75 to 8.81)
All-cause mortality			
No contact	1570 (0.41)	1.00	1.00
Not in need	154 (1.33)	3.57 (3.03 to 4.22)	3.16 (2.68 to 3.73)
Child in need	410 (1.21)	3.76 (3.37 to 4.20)	3.48 (3.11 to 3.88)
Child in care	139 (2.42)	6.42 (5.40 to 7.64)	5.70 (4.78 to 6.78)

Data are number (%) of deaths within social care category, and HRs with 95% CIs from Cox proportional hazards models.

n=457 sudden deaths out of n=1293 total sudden deaths were in those with childhood social care contact ((101+260+96)/1293×100=35.3%).

n=296 suicide deaths out of n=746 total suicide deaths were in those with childhood social care contact ((63+166+67)/746×100=39.7%).

* Adjusted for sex, area-level income deprivation and area of residence.

was highest in young adults with a history of being a CIC, with over eight times risk of suicide, seven times the risk of sudden death and five times the risk of all-cause mortality relative to unexposed peers (HR 8.85 (95% CI 6.83 to 11.47); HR 7.12 (95% CI 5.75 to 8.81) and HR 5.70 (95% CI 4.78 to 6.78), respectively). Survival analysis excluding suicide deaths due to undetermined intent yielded similar trends and effect sizes as observed in the main analysis (online supplemental table TS2).

DISCUSSION

This is the first population-wide study to estimate the association between all tiers of contact with children's social services and risk of death by suicide, sudden death and all-cause mortality in young adulthood, finding a graded association with mortality risk. Children in contact with social services have increased risk of dying prematurely as young adults between the ages of 18 and 36 years, with the strongest associations observed for risk of death by suicide. Over one-third of all those who died by suicide or sudden death in young adulthood in NI were known to social services in childhood.

The highest excess mortality was observed in adults with a childhood history of care, and is consistent with earlier studies which indicate childhood care is associated with increased mortality risk across the life course, in particular deaths from external causes.^{7–11} This study advances prior knowledge by quantifying the previously hidden risk of death by suicide and other sudden causes of death in the much larger population of adults that had contact with social services but never entered care. The finding that adults assessed as 'not in need' in childhood who received no services face an equivalent risk of premature death to those assessed as a CIN highlights a potential missed opportunity for intervention. Although these individuals may not need traditional social services support they have been shown to be at an increased risk of both poor mental health²⁴ and premature mortality. Direct comparison with existing studies is challenged by heterogeneity in how exposure subgroups are defined, and cross-national differences in social care systems and populations. However, findings support evidence from other jurisdictions that former in-home care populations or those with child protection contact have increased risk of all-cause mortality,^{18–20} unnatural death and suicide^{11 21} compared with those with no social care contact.

While this study identifies and quantifies the mortality risk associated with childhood contact with social services, further studies are needed to better understand the potential causes both before, during and after exposure to social care. The cumulative impacts of genetic, psychological, behavioural and environmental risk or protective factors may explain pathways from early life adversity to premature adult mortality.^{33–35} For example, childhood adversity is a risk factor for poor school performance³⁶ and children involved with social services are more likely to have lower educational achievement compared with peers.³⁷ Education is a key mediator that can mitigate against mental ill health, risky behaviours, low income and unemployment.^{38 39} Children involved with social services can experience sustained health and social inequalities that accumulate over time^{40 41} and disadvantaged socioeconomic and health trajectories which account for a significant proportion of their excess mortality risk in adulthood.¹⁹ A similar adverse chain of events may potentially explain the hidden mortality risk in the NIN group. Resource constraints mean that statutory services have to be rationed, and the social care system is skewed towards acute services for those in highest need.^{42 43} If only families and children with the highest needs

are eligible for statutory support, then the larger contingent of families that are struggling may be falling through the net. This group warrants further research attention to better understand the actual needs of the child deemed 'NIN' and the family and environmental characteristics which may contribute to premature death.

Limitations

A key strength of our study is the use of longitudinal population-wide data to capture all tiers of social care contact, however, several limitations should be considered. It was not possible to move beyond observing associations, or account for a full range of possible confounding such as genetic susceptibility, mental health status or parental mental health. The area-level measures were defined at one time point and may not reflect the characteristics of all individuals in the cohort over time. Future studies using designs appropriate for drawing causal inferences are needed to better understand the mechanisms behind childhood contact with social services and adult mortality risk.⁴⁴ Excluding children who died before the age of 18 years may have introduced survival bias and an underestimation of the association between social care contact and adult mortality risk. Although mortality risk differs for men and women, the relative rarity of death by suicide and other sudden causes of death and the cell count restrictions imposed by the data custodians meant it was not possible to stratify risk by sex. Children's social care systems differ cross-nationally, and levels of mental ill health are higher in NI than other UK jurisdictions, therefore further international research is needed to test the generalisability of the results. Finally, while exploring variation by social care pathways such as age at first contact with social services, number of referrals and duration of contact were beyond the remit of this study, future research should investigate their importance for risk of death by suicide and other cause-specific mortality to identify individuals at greatest risk for targeted interventions or support.

CONCLUSIONS

Reducing the burden of suicide deaths is a global public health priority. The finding that over one-third of young adults who died by suicide and other sudden deaths in NI had contact with social services in childhood suggests that action is needed to address the childhood antecedents of health and social inequalities associated with premature mortality. Poor outcomes are not inevitable, and care experienced young people stress the positive outcomes that are achieved when children and young people have the right support. While everyone can be at risk of suicide, adults with a childhood history of social care contact, even those deemed NIN, should be recognised as an 'at-risk' group by policy-makers and medical providers. An effective response will require cross-cutting policy to tackle the negative consequences of early life adversity and improve access to appropriate health services, including those that support mental well-being.

Twitter Sarah McKenna @Sarah_McKenna63 and Aideen Maguire @Aideen_QUB

Acknowledgements The authors would like to acknowledge the help provided by the staff of the Honest Broker Service (HBS) within the Business Services Organisation Northern Ireland (BSO). The HBS is funded by the BSO and the Department of Health (DoH). The authors would also like to acknowledge Voice of Young People in Care (VOYPIC) and the group of care experienced young people involved in the research project for bringing their lived experience and expertise to developing the research questions and interpreting the results.

Contributors Funding acquisition AM and DO'R. Conceptualisation and data curation AM. Preparation of manuscript SM, DO'R and AM. Data validation SM and AM. Data management and formal analysis SM. Review and editing SM, DO'R and AM. All authors had full access to the data, critically revised the paper for

intellectual content and approved the final version of the manuscript. SM and AM are guarantors of the work.

Funding This work was supported by the UKRI's Administrative Data Research Centre Northern Ireland (ES/S00744X/1), Medical Research Council Fellowship (MR/P014631/1) and Health Data Research UK/ DATAMIND (MR/W014386/1).

Disclaimer The authors alone are responsible for the interpretation of the data and any views or opinions presented are solely those of the author and do not necessarily represent those of the BSO.

Competing interests None declared.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. Data were provided by the Honest Broker Service in the Trusted Research Environment for Health and Social Care (HSC) Northern Ireland, which provides approved researchers with access to linked, deidentified health and social care data. Data are available for research projects in the public interest that relate to Health and Social Care, subject to approval by the Honest Broker Service Governance Board (for information contact honestbrokerservice@hscni.net).

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Sarah McKenna <http://orcid.org/0000-0002-2164-1515>

Dermot O'Reilly <http://orcid.org/0000-0002-9181-0652>

REFERENCES

- Rod NH, Bengtsson J, Budtz-Jørgensen E, et al. Trajectories of childhood adversity and mortality in early adulthood: a population-based cohort study. *Lancet* 2020;396:489–97.
- Gilbert R, Widom CS, Browne K, et al. Burden and consequences of child Maltreatment in high-income countries. *Lancet* 2009;373:68–81.
- Hughes K, Ford K, Bellis MA, et al. Health and financial costs of adverse childhood experiences in 28 European countries: a systematic review and meta-analysis. *The Lancet Public Health* 2021;6:e848–57.
- Petrowski N, Cappa C, Gross P. Estimating the number of children in formal alternative care: challenges and results. *Child Abuse & Neglect* 2017;70:388–98.
- UK Government. Characteristics of children in need. 2022. Available: <https://explore-education-statistics.service.gov.uk/find-statistics/characteristics-of-children-in-need> [Accessed 6 Jun 2023].
- Department of health and human services USA. Child Maltreatment. . 2021 Available: <https://www.acf.hhs.gov/sites/default/files/documents/cb/cm2021.pdf> [Accessed 6 Jun 2023].
- Batty GD, Kivimäki M, Frank P. State care in childhood and adult mortality: a systematic review and meta-analysis of prospective cohort studies. *The Lancet Public Health* 2022;7:e504–14.
- Murray ET, Lacey R, Maughan B, et al. Association of childhood out-of-home care status with all-cause mortality up to 42-years later: office of national statistics longitudinal study. *BMC Public Health* 2020;20:735.
- Kalland M, Pensola TH, Meriläinen J, et al. Mortality in children registered in the Finnish child welfare Registry: population based study. *BMJ* 2001;323:207–8.
- Vinnerljung B, Ribe M. Mortality after care among young adult foster children in Sweden. *Int J Soc Welfare* 2001;10:164–73.
- Hjern A, Vinnerljung B, Lindblad F. Avoidable mortality among child welfare recipients and Intercounty Adoptees: A national cohort study. *J Epidemiol Community Health* 2004;58:412–7.
- Sørensen TT, Rod NH, Nguyen T-L, et al. Out-of-home care placement and mortality rate in early adulthood: identifying vulnerable subgroups in a nationwide cohort study. *Eur J Epidemiol* 2023;38:189–97.
- Allik M, Brown D, Gedeon E, et al. Children's Health in Care in Scotland (ChiCS) Main findings from population-wide research. Available: <https://eprints.gla.ac.uk/279347/> [Accessed 6 Jun 2023].
- Thoburn J. *Globalisation and child welfare: some lessons from a cross-national study of children in out-of-home care*. Norwich: School of Social Work and Psychosocial Studies, University of East Anglia, 2007.
- Department of Health & Department of Education. A life deserved: 'caring' for children and young people in Northern Ireland. 2021. Available: <https://www.health-ni.gov.uk/publications/life-deserved-strategy-looked-after-children> [Accessed 6 Jun 2023].
- Fitzsimons P, James D, Shaw S, et al. Drivers of activity in children's social care. 2022. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/108011/Drivers_of_Activity_in_Children_s_Social_Care.pdf [Accessed 6 Jun 2023].
- Kim H, Wildeman C, Jonson-Reid M, et al. Lifetime prevalence of investigating child maltreatment among US children. *Am J Public Health* 2017;107:274–80.
- Gao M, Brännström L, Almqvist YB. Exposure to out-of-home care in childhood and adult all-cause mortality: a cohort study. *Int J Epidemiol* 2017;46:1010–7.
- Almqvist YB, Brännström L. Do trajectories of economic, work- and health-related disadvantages explain child welfare clients' increased mortality risk? A prospective cohort study. *BMC Public Health* 2019;19:418.
- Jackisch J, Brännström L, Almqvist YB. Troubled childhoods cast long shadows: childhood adversity and premature all-cause mortality in a Swedish cohort. *SSM - Population Health* 2019;9:100506.
- Segal L, Armfield JM, Gnanamanickam ES, et al. Child Maltreatment and mortality in young adults. *Pediatrics* 2021;147:e2020023416.
- Rodgers H, McCluney J. Children's social care statistics for Northern Ireland 2020/21. 2021. Available: <https://www.health-ni.gov.uk/publications/childrens-social-care-statistics-northern-ireland-2020-21> [Accessed 6 Jun 2023].
- Bunting L, McCartan C, McGhee J, et al. Trends in child protection across the UK: a comparative analysis. *Br J Soc Work* 2018;48:1154–75.
- McKenna S, O'Reilly D, Maguire A. The mental health of all children in contact with social services: a population-wide record-linkage study in Northern Ireland. *Epidemiol Psychiatr Sci* 2023;32:e35.
- Hawton K, van Heeringen K. Suicide. *Lancet* 2009;373:1372–81.
- Office for National Statistics. Leading causes of death, UK: 2001 to 2018. 2023. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/articles/leadingcausesofdeathuk/2001to2018> [Accessed 6 Jun 2023].
- Maguire A, Moriarty J, O'Reilly D, et al. Education as a Predictor of antidepressant and anxiolytic medication use after bereavement: a population-based record linkage study. *Qual Life Res* 2017;26:1251–62.
- Northern Ireland Statistics & Research Agency. Review of the statistical classification and delineation of settlements. 2015. Available: <https://www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/review-of-the-statistical-classification-and-delineation-of-settlements-march-2015-%281%29.pdf> [Accessed 6 Jun 2023].
- Northern Ireland Statistics & Research Agency. Northern Ireland multiple deprivation measure 2010. 2010. Available: https://www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/NIMDM_2010_description_of_indicators_domains_and_the_multiple_deprivation_measure.pdf [Accessed 6 Jun 2023].
- von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Journal of Clinical Epidemiology* 2008;61:344–9.
- Hurley MA. A reference relative time-scale as an alternative to chronological age for cohorts with long follow-up. *Emerg Themes Epidemiol* 2015;12:18.
- Waugh I, Rodgers H. Children's Social Care Statistics for Northern Ireland 2015/2016. . 2016 Available: 2016. <https://www.health-ni.gov.uk/sites/default/files/publications/health/child-social-care-15-16.pdf> [Accessed 6 Jun 2023].
- Probst C, Kilian C, Sanchez S, et al. The role of alcohol use and drinking patterns in socioeconomic inequalities in mortality: a systematic review. *The Lancet Public Health* 2020;5:e324–32.
- Tweed EJ, Leyland AH, Morrison D, et al. Premature mortality in people affected by Co-occurring homelessness, justice involvement, opioid dependence, and psychosis: a retrospective cohort study using linked administrative data. *The Lancet Public Health* 2022;7:e733–43.
- Ben-Shlomo Y. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and Interdisciplinary perspectives. *Int J Epidemiol* 2002;31:285–93.
- Stone S. Child Maltreatment, out-of-home placement and academic vulnerability: a fifteen-year review of evidence and future directions. *Children and Youth Services Review* 2007;29:139–61.
- Jay MA, Mc Grath-Lone L. Educational outcomes of children in contact with social care in England: a systematic review. *Syst Rev* 2019;8:155.
- Werner EE, Smith RS. *Journeys from childhood to midlife: Risk, resilience, and recovery*. Cornell University Press, 2001.
- Berlin M, Vinnerljung B, Hjern A. School performance in primary school and Psychosocial problems in young adulthood among care leavers from long term foster care. *Children and Youth Services Review* 2011;33:2489–97.
- Brännström L, Vinnerljung B, Forsman H, et al. Children placed in out-of-home care as Midlife adults: are they still disadvantaged or have they caught up with their peers *Child Maltreat* 2017;22:205–14.

- 41 Brännström L, Forsman H, Vinnerljung B, *et al.* The truly disadvantaged? Midlife outcome Dynamics of individuals with experiences of out-of-home care. *Child Abuse Negl* 2017;67:408–18.
- 42 Canavan J, Pinkerton J, Dolan P. *Understanding Family Support: Policy, Practice and Theory*. Philadelphia: Jessica Kingsley Publishers, 2016.
- 43 Department of Health. Children's social care services Northern Ireland: an independent review. 2022. Available: <https://www.health-ni.gov.uk/publications/independent-review-childrens-social-care-services> [Accessed 6 Jun 2023].
- 44 Jackisch J, Almqvist YB. Childhood adversity is associated with Hospitalisations and survival following external causes and non-communicable diseases: A 46-year follow-up of a Stockholm birth cohort. *J Epidemiol Community Health* 2023;77:209–15.