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## Retrospective Study

# Population-Based Projections of Place of Death for Northern Ireland by 2040

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## ABSTRACT

### Background

There are global challenges in relation to an increasingly older population, rising numbers of deaths and the resulting need for end-of-life care. It is imperative for Health and Social Care to examine where people die and forward plan.

### Aim

To establish the place where people have died 2004-2018 and project future place of death care setting by 2040.

### Materials and Methods

Population-based trend analysis of place of death for people that died in Northern Ireland (2004-2018 from Northern Ireland Statistics and Research Agency) and projections using linear modelling (2019-2040 projections by Office of National Statistics).

### Results

Deaths are projected to increase by 45.9%, from 15,922 in 2018 (of which 36.3% will be aged 85+ years) to 23,231 deaths in 2040 (39.8% aged 85+ years). Between 2004 and 2018, proportions of home and care home (defined as nursing and residential beds) deaths increased (24.5-27% and 16.3-19.4% respectively), while the proportion of hospital deaths declined (51.9-47.6%). If current trends continue, by 2040, deaths within the community (home and care home) will account for between 46.7-55.2% of all deaths. However, if care home capacity is limited at current levels (as of 2018), hospital deaths are projected to account for the largest proportion of deaths by 2040 (51.7%).

### Discussion

Death at an increasing age has implications for end-of-life care provision. This study demonstrates an increasing need for end-of-life care over the next 20-years, particularly within community settings. Projections highlight the need for comprehensive planning to ensure service provision within the community meets the needs of the population.

### Keywords

Trend analysis; Place of death; Community palliative care.

## INTRODUCTION

During the last three decades, the age at which people die has changed significantly. Of note, in 1990 nearly one-quarter of deaths were in children (<5-years). Yet, by 2017 the over-70s percentage of deaths have increased from a third to half of all deaths.<sup>1</sup> This is representative of the world's aging population which continues to grow at an unprecedented rate.<sup>2</sup> By 2043, the overall population growth rate in Northern Ireland is projected to be just over half of that in England, however, the pension age population will grow at a faster rate than anywhere else in the

United Kingdom (UK).<sup>3</sup> Indeed, the Northern Ireland Statistics and Research Agency (NISRA) have estimated that by 2043 the number of people aged 85+ will grow by 106.4% and the number of people aged 65+ is projected to increase by 56.2%, representing 24.2% of the total population. A consequence of living longer is that older people are surviving with complicated health and social care needs. It is estimated that one in four people in the UK are living with multimorbidity, increasing to at least two-thirds of those aged 65+.<sup>4</sup> Ultimately, the expected rise in the number of older people living with multimorbidity will mean increased pressure on services and the need for greater resourcing of these services, as

well as workforce planning, infrastructure, investment and reconfiguration.<sup>5</sup> The increase in our aging population presents several public health challenges that we need to prepare for, not least an increased demand on health and social services but also quality end-of-life care.

Approximately 14% of people in need of palliative care will receive such care.<sup>6</sup> The reasons that some people miss out include, but are not limited to, workforce pressures (e.g. excess professional demands on current staff; need for informal carers to remain in the workforce)<sup>7</sup> funding distribution,<sup>8</sup> disconnected infrastructure,<sup>9,10</sup> barriers to care as a result of diagnosis,<sup>11</sup> issues in identifying palliative care need as well as social and culture taboos around dying and death.<sup>12</sup> Without addressing these issues collectively as research priorities, clinical practice cannot be transformed and therefore quality of life will not be improved. With the growing annual death rate, across the UK and Ireland, this also implies growing numbers of people involved in caring for the dying and who are bereaved.<sup>13</sup> However, limited evidence also pertains to those with pivotal roles in palliative and end-of-life care as patients and families remain ‘voiceless’.<sup>14</sup> Few prospective studies have examined basic questions such as preferences of place of death for those living and dying in Northern Ireland which is fundamental to identifying end-of-life care needs.

Although dying at home is a common preference for individuals with a terminal illness<sup>15,16</sup> when confronted with the consequences of a terminal illness, dying at home may not be viable.<sup>17</sup> A Northern Ireland Public Health Agency<sup>18</sup> survey of bereaved carers reported a greater proportion of carers did not know if the place of death was aligned with their loved one’s preferences (37%) and when the preferred place of death was known, over one third (35%) reported their loved one’s death did not take place in their preferred place of death. A study by Bannon and colleagues also reported 53.4% of patients who wanted to die at home achieved their preference, however, this was dependent upon certain factors including living in an affluent area, access to good district nursing care, previous conversations about place of death with health professionals, and the caregiver’s preference for their loved one to die at home.<sup>16</sup> Increasing awareness about palliative care continues to be limited due to a reluctance to discuss death and dying and a lack of experiences with health services.<sup>12</sup>

Achieving preferred place of death matters to the patient and their immediate family and carers and is also considered a good quality marker for end-of-life care by service providers.<sup>19</sup> In addition, such fulfilment helps with the bereavement process. However, it is not clear if these needs are being met within current palliative care provision in Northern Ireland. By conducting a trend analysis, we can provide the context by which to understand current and projected place of deaths in Northern Ireland to explicate service requirements for those at the end-of-life to meet the expected rising number of deaths from the growing elderly population.

## METHOD

### Study Design

Population-based trend analysis was conducted using simple linear

modelling. Explicit assumptions to project where people will die in Northern Ireland, based on recent death registration data (2004–2018) were applied. Methodology was replicated and built upon from Bone et al<sup>2</sup> and Finucane et al.<sup>20</sup>

### Data Sources

The Northern Ireland Statistics and Research Agency provided the dataset. This included all registered deaths by place of occurrence between 2004 and 2018 categorised by sex, age (0–4 years, 5–14, 15–44, 45–64, 65–74, 75–84, 85 and over) and place of death (‘hospital’, ‘care home’, ‘own home’, ‘hospice’, and ‘all other places’). Data was used to project future deaths and place of death in Northern Ireland (2019–2040).

### Data Analysis

Projections by the Office of National Statistics (ONS) ‘2018-based national principal population projections’ were used for all deaths in Northern Ireland up to 2040 (using age and gender specific proportions) with the observed place of death from 2004 to 2018 from NISRA. We applied estimated age and gender-specific proportions of deaths for place of death to the projected death, based on established methodology.<sup>2,20</sup> We modelled three scenarios:

- Scenario 1 assumed no change in the age and gender specific proportions of deaths observed in 2018 in each place of death.
- Scenario 2 assumed that the mean yearly change in age and gender specific proportions of deaths in each place of death that occurred between 2004 and 2018 continues to 2040.
- Scenario 3 assumed that the yearly change in age and gender specific proportions of deaths in each place of death that occurred between 2004 and 2018 continues to 2040, but that care home deaths do not increase above the number observed in 2018, with any additional deaths instead occurring in hospital.

### Ethics

No ethical review was required as data was publicly available via the ONS and NISRA.

## RESULTS

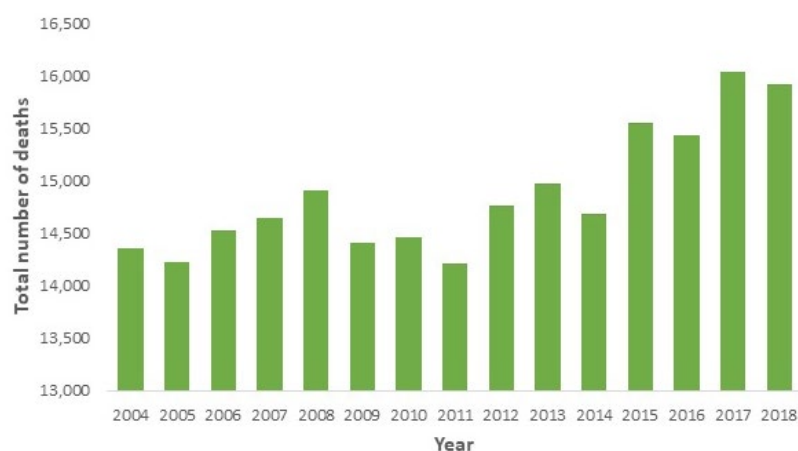
Figure 1 shows the number of deaths per year in Northern Ireland between 2004 (n=14,354) and 2018 (n=15,922).

In Northern Ireland in 2018, more men died in their own home (30.0% *vs.* 24.1%), in hospital (49.6% *vs.* 45.7%) and ‘All other places’ (3.7% *vs.* 1.8%) compared to women. More women died in care homes (25.1% *vs.* 13.5) and hospices (3.4% *vs.* 3.1%) compared to men (Figure 2). See supplement files for data.

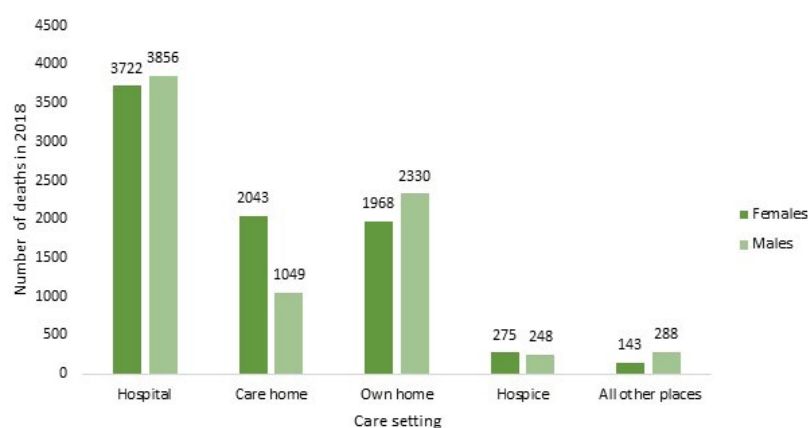
Figure 3 shows the most common place of death between 2004 and 2018. Hospital is the most common care setting however by 2018, deaths in hospital, hospice and ‘all other places’ decreases whereas deaths at home and care home increase.

Table 1 demonstrates between 2004 (14,354) and 2018 (15,922) deaths increased by 10.9% in Northern Ireland. There will be a (based on ONS projected deaths) 45.9% increase in the number of deaths in Northern Ireland by 2040. ONS projected deaths suggest deaths in Northern Ireland will increase from 15,922 in

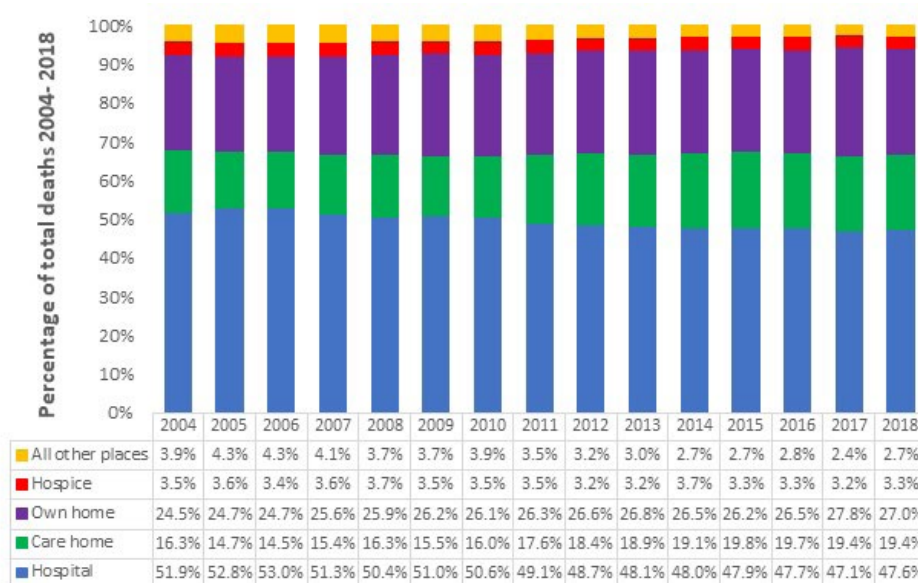
**Figure 1.** Based on NISRA Total Number of Deaths between 2004 and 2018



**Figure 2.** Based on NISRA Total Number of Deaths by Care Setting for Females and Males in 2018



**Figure 3.** Based on NISRA 2004-2018 Deaths by Care Setting



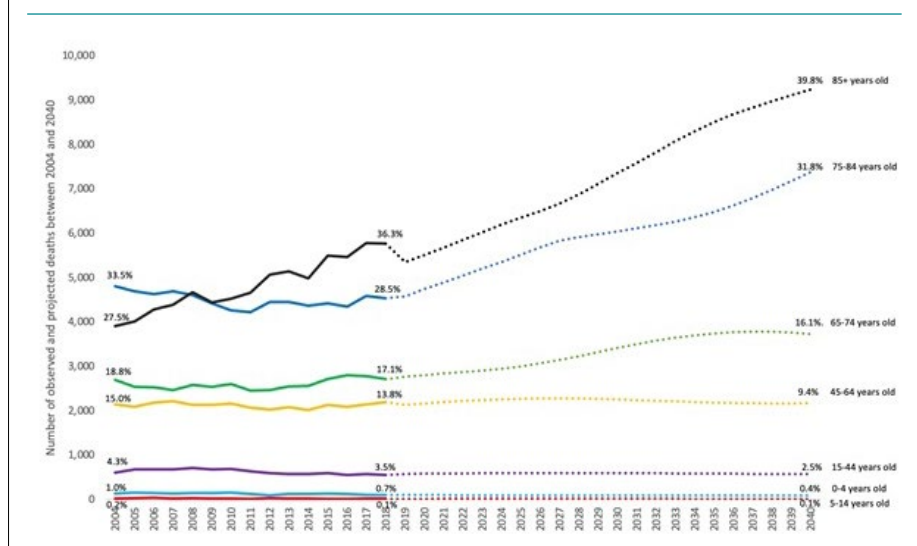
2018 to 23,231 by 2040. The greatest increase in age group will continue to be 85+, accounting for 39.8% of all deaths by 2040. In addition, those aged 75 and above will account for 71.7% of all deaths by 2040.

**Table 1. Percentage of Observed Deaths (2004, 2018) and Projected Deaths by Age (2040)**

	2004	% of Deaths	2018	% of Deaths	2040*	% of Deaths
0-4	144	1.0%	107	0.7%	97	0.4%
5-14	29	0.2%	22	0.1%	22	0.1%
15-44	612	4.3%	556	3.5%	574	2.5%
45-64	2150	15.0%	2204	13.8%	2174	9.4%
65-74	2697	18.8%	2717	17.1%	3733	16.1%
75-84	4813	33.5%	4544	28.5%	7385	31.8%
85 +	3909	27.2%	5772	36.3%	9247	39.8%
Total (% increase)	14354	-	15922	(+10.9%)	23231	(+45.9%)
*ONS projections						

By 2040, the majority of age groups show a decline in proportional percentage of deaths (0-4, 5-14, 15-44, 45-64 and 65-74). However, those aged 75-84 and those aged 85+ have a projected increase in deaths (3.3% and 3.5% respectively) (Figure 4).

**Figure 4. Age Specific ONS Projections for Death Trends for Northern Ireland by 2018 - 2040**



**Table 2. Scenario-based Calculations of Deaths by Location for 2004, 2018 and 2040**

	Observed Deaths				Projected Deaths In 2040					
	2004		2018		Scenario 1		Scenario 2		Scenario 3	
	n	%	n	%	n	%	n	%	n	%
Hospital	7447	51.9%	7578	47.6%	11175	48.1%	9474	40.8%	12013	51.7%
Care home	2340	16.3%	3092	19.4%	4798	20.7%	5631	24.2%	3092	13.3%
Own home	3513	24.5%	4298	27.0%	6044	26.0%	7192	31.0%	7192	31.0%
Hospice	501	3.5%	523	3.3%	692	3.0%	716	3.1%	716	3.1%
Other places	553	3.9%	431	2.7%	521	2.2%	218	0.9%	218	0.9%
	14354	100.0%	15922	100.0%	23231	100.0%	23231	100.0%	23231	100.0%

## Scenarios

Table 2 provides summary data for scenario-based calculations.

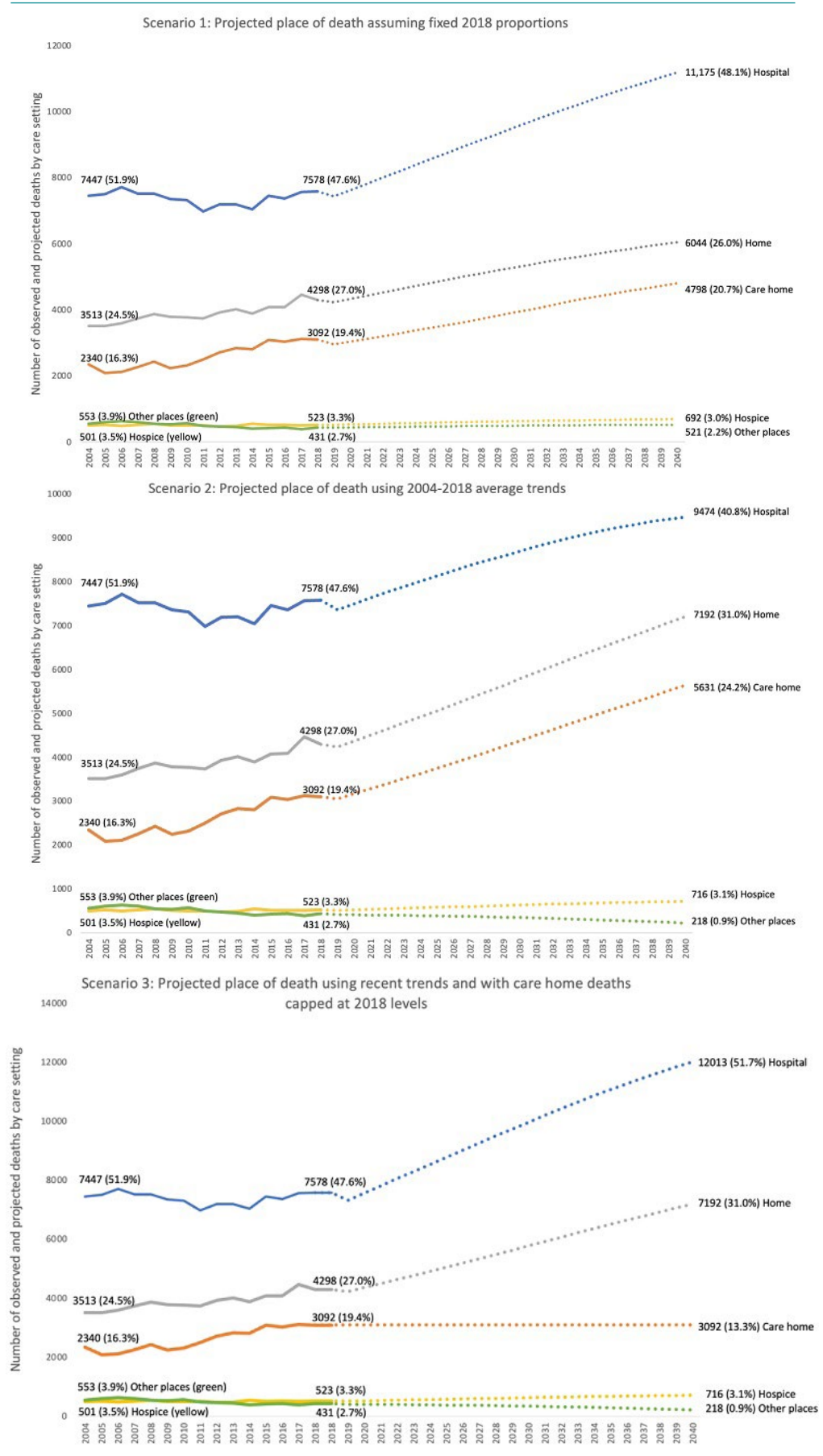
Figure 5 (Scenario 1) shows that, if the proportional percentage of deaths in all care settings stay the same as of 2018 (adjusted for projected changes in age and sex), hospital continues to be the largest setting where deaths occur by 2040 (n=11,175). This is followed by deaths at home (n=6044), care home (n=4798), hospices (n=692) and other places (n=521).

Figure 5 (Scenario 2) shows that, if the mean annual proportional percentage change trend continues between 2004 and 2018 at the same pace through to 2040, there will be a greater increase in home (+14.8%) and care home (+24.7%) deaths. Hospital deaths will experience a declining trajectory resulting in a reduction in the proportional percentage (-14.3%). Hospice (-6.1%) and 'other places' (-66.6%) will also see a decrease in deaths. By 2040, over 50% of deaths will occur in the community setting, however hospitals will continue to have the single greatest percentage of deaths.

Figure 5 (Scenario 3) shows that, if capacity of care homes was capped at 2018 level (n=3092), the additional people would die in hospital. Hospital deaths would account for an in-



**Figure 5. Proportional Percentage of Deaths in All Care Settings Remain the Same as of 2018**



creased proportion of deaths by 2040 (51.7%; +2539 deaths). See supplement file for data.

## DISCUSSION

The current analysis suggests that if Northern Ireland trends continue, the need for end-of-life care will increase over the next 20-years, particularly within community settings. By 2040, deaths within the community could account for over 50% of all deaths (combined home and care home deaths across all projected scenarios; 46.7%-55.2%). Additional and effective provision of community capacity could decrease hospital deaths to 40.8%. However, with the continuing lack of sustainable social care resourcing, hospital deaths are likely to increase, accounting for approximately 51.7% of deaths. These findings for Northern Ireland align with death projections across Scotland,<sup>20</sup> England and Wales,<sup>2</sup> which reported a significant increase in people dying outside hospital by 2040. In addition, such forecasts are aligned with other ageing countries.<sup>21</sup> Collectively, these studies draw attention to the urgent need for a shift of care and resources into care within the community across the United Kingdom.

However, despite an integrated structure for Health and Social Care in Northern Ireland, services for those at the end-of-life face a number of significant challenges. Issues with identification of palliative care needs and other barriers, such as challenges eliciting advance care planning discussions, mean that not every patient who could benefit from a palliative approach to their care in Northern Ireland receives it. This is evident, for instance, in the low number of people on the Northern Ireland Palliative Care Register relative to rates of chronic and incurable illness.

The underfunding of community services and other issues, including the care workforce, are significant problems in Northern Ireland<sup>22</sup> and it has been recognized that 'radical' reform is needed to Northern Ireland's adult social care system in order to deliver higher-quality, sustainable services and an experienced and skilled workforce which is properly valued.<sup>23</sup> While community care, specifically the care home setting, will become increasingly important for end-of-life care—particularly in the context of the growing prevalence of dementia—the social care resourcing settlement in Northern Ireland has not kept pace with the growth in demand arising from demographic changes. For example, the number of nursing home beds in Northern Ireland increased by 10% between 2008 and 2018, but this is less than half the percentage growth of the 65+ population.<sup>11</sup> The issue is also evident from the significant number of delayed hospital bed days attributable to shortages of domiciliary care packages and care home beds. In 2017/18, lack of domiciliary care packages was the single biggest cause of delayed bed days across Northern Ireland, accounting for 12,940 delayed bed days, with the shortage of care home beds accounting for a further 7,775 delayed bed days.<sup>24</sup> In the context of the issues outlined above, it will be a concern that the delivery of social care reform proposals, as set out under the Power to People report, has been assigned an amber risk warning in terms of potential delay due to the coronavirus disease-2019 (COVID-19) outbreak.<sup>23</sup>

Moreover, an ever-growing number of people are becoming carers in Northern Ireland, with an estimated 22% of adults now providing unpaid care.<sup>25</sup> This carries a significant additional burden for carers and families including mental illness and worsened physical health as a result of caring<sup>26</sup>—particularly for those carers who themselves are aged 65+ and may also be coping with their own health complaints.<sup>27</sup> Despite this impact, Northern Ireland is lagging behind the rest of the UK in terms of updated strategies and legislation to support informal carers; unlike Scotland and England, which have taken measures including granting new rights to carers<sup>22</sup> and introduced additional financial supports.

The current COVID-19 pandemic has further underlined the pre-existing problems facing community care, particularly within the care home setting. NIRSA reported, as of 21<sup>st</sup> August 2020, care home deaths accounted for 40.3% (n=351) of COVID-19 related deaths. In addition, deaths of care home residents during the pandemic accounted for 49.5% of all COVID-19 related deaths in Northern Ireland (81.4% occurring in care homes and 18.6% in hospital). A similar trend was reported<sup>28</sup> showing dying in care homes trebled during the first 10-weeks of the COVID-19 pandemic in England and Wales.

Notwithstanding the COVID-19 pandemic, healthy life expectancy has increased, but not as much as life expectancy overall. This means more people are dying older and spending more years in poor health.<sup>15</sup> To meet the increased population palliative care needs, Finucane et al<sup>20</sup> identified opening a realistic debate on death, dying and bereavement within society, which previous policies have precluded to, as a key priority.<sup>29</sup> However, despite efforts from the Department of Health, Public Health Agency and other stakeholders, Northern Ireland has made limited progress in this area.

Overall, this Northern Ireland research identified key priorities similar to the Scottish place of death trends research<sup>20</sup>: (i) action to ensure health and social care services for those at the end-of-life are fully resourced and sustainable, in order to meet patient needs across care settings, (ii) focus on building supports and resilience for informal carers, and (iii) opening a realistic debate on death, dying and bereavement within society, which previous policies have precluded to. However, as previously discussed, Northern Ireland has additional challenges at policy, commissioning and service delivery levels which require urgent attention in order to meet these priorities. Palliative and end-of-life care research in Northern Ireland also lags behind the rest of the UK, with a lack of outcome-based studies. Palliative care research across Ireland has consisted of mostly needs-based and small-scale studies, with a lack of literature on minority groups such as those living in transitional housing, with mental health problems, pre-existing disabilities, homeless people and those who identify as LGBTQ+.<sup>14</sup> As research is vital for informing policy and decision-making, funding for community-based palliative and end-of-life care research also needs to be a key priority going forward.

## CONCLUSION

This study highlights the increasing need for end-of-life care over

the next 20-years, particularly within community settings across the UK. Death at an increasing age has serious implications for end-of-life care provision, and it is unclear at present whether health and social care services in Northern Ireland, as they are currently constituted and resourced, will be sufficient to meet future demand. This study's place of death projections, current policy and research evidence further demonstrate that Northern Ireland requires urgent prioritization for community care resourcing, and increased research capacity to ensure community settings can meet the fundamental care and specialist support needs of those at the end-of-life.

## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

## REFERENCES

1. Roser M, Ortiz-Ospina E, Ritchie H. Life expectancy. Our World in Data. 2013. Web site. <https://ourworldindata.org/life-expectancy>. Accessed August 25, 2020.
2. Bone AE, Gomes B, Etkind SN, Verne J, Murtagh FE, Evans CJ, et al. What is the impact of population ageing on the future provision of end-of-life care? Population-based projections of place of death. *Palliat Med.* 2018; 32(2): 329-336. doi: [10.1177/0269216317734435](https://doi.org/10.1177/0269216317734435)
3. Northern Ireland Statistics and Research Agency. 2018-Based Population Projections For Northern Ireland. 2018. Web site. <https://www.nisra.gov.uk/publications/2018-based-population-projections-northern-ireland>. Accessed August 25, 2020.
4. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: A cross-sectional study. *Lancet.* 2012; 380(9836): 37-43. doi: [10.1016/S0140-6736\(12\)60240-2](https://doi.org/10.1016/S0140-6736(12)60240-2)
5. Department of Health. Health and Wellbeing 2026 - Delivering Together. 2017. Web site. <https://www.health-ni.gov.uk/publications/health-and-wellbeing-2026-delivering-together>. Accessed August 30, 2020.
6. World Health Agency. Palliative Care. 2017. Web site. <https://www.who.int/news-room/fact-sheets/detail/palliative-care>. Accessed August 10, 2020.
7. Hospice UK. Developing the hospice workforce. Web site. <http://www.hospiceuk.org/what-we-offer/workforce-and-hr-support/developing-the-hospice-workforce>. Accessed August 10, 2020.
8. Gardiner C, Ryan T, Gott M. What is the cost of palliative care in the UK? A systematic review. *BMJ Support Palliat Care.* 2018; 8(3): 250-257. doi: [10.1136/bmjspcare-2018-001519](https://doi.org/10.1136/bmjspcare-2018-001519)
9. Petrova M, Riley J, Abel J, Barclay S. Crash course in EPaCCS (Electronic Palliative Care Coordination Systems): 8 years of successes and failures in patient data sharing to learn from. *BMJ Support Palliat Care.* 2018; 8(4): 447-455. doi: [10.1136/bmjspcare-2015-001059](https://doi.org/10.1136/bmjspcare-2015-001059)
10. Public Health England. Cost-effective Commissioning of End of Life Care.: Understanding the health economics of palliative and end of life care. 2017. Web site. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/612377/health-economics-palliative-end-of-life-care.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/612377/health-economics-palliative-end-of-life-care.pdf). Accessed August 30, 2020.
11. The Regulation and Quality Improvement Authority. Review of the Implementation of Palliative and End of Life Strategy. 2010. Web site. <https://www.rqia.org.uk/RQIA/files/1c/1c349f45-1c38-49bb-aceb-e6a363f4c5ad.pdf>. Accessed August 21, 2020.
12. McIlpatrick S, Hasson F, McLaughlin D, Johnston G, Roulston A, Rutherford L, et al. Public awareness and attitudes toward palliative care in Northern Ireland. *BMC Palliat Care.* 2013; 12(1): 34. doi: [10.1186/1472-684X-12-34](https://doi.org/10.1186/1472-684X-12-34)
13. Dixon J, King D, Matosevic T, Clark M, Knapp M. Equity in the provision of palliative care in the UK: Review of evidence. 2015. Web site. <https://www.mariecurie.org.uk/globalassets/media/documents/policy/campaigns/equity-palliative-care-uk-report-full-lse.pdf>. Accessed August 30, 2020.
14. Hasson F, Nicholson E, Muldrew D, Bamidele O, Payne S, McIlpatrick S. International palliative care research priorities: A systematic review. *BMC Palliat Care.* 2020; 19(1): 16. doi: [10.1186/s12904-020-0520-8](https://doi.org/10.1186/s12904-020-0520-8)
15. Tin S, Wiwanitkit V. Preference of the place of death. *Indian J Palliat Care.* 2015; 21(1): 121. doi: [10.4103/0973-1075.150205](https://doi.org/10.4103/0973-1075.150205)
16. Bannon F, Cairnduff V, Fitzpatrick D, Blaney J, Gomes B, Gavin A, et al. Insights into the factors associated with achieving the preference of home death in terminal cancer: A national population-based study. *Palliat Support Care.* 2018; 16(6): 749-755. doi: [10.1017/S1478951517000876](https://doi.org/10.1017/S1478951517000876)
17. Woo JA, Maytal G, Stern TA. Clinical challenges to the delivery of end-of-life care. *Prim Care Companion J Clin Psychiatry.* 2006; 8(6): 367-372. doi: [10.4088/pcc.v08n0608](https://doi.org/10.4088/pcc.v08n0608)
18. Public Health Agency. Experience of bereavement: The perspective of family, carers and staff. 2018. Web site. <https://www.publichealth.hscni.net/news/views-sought-experience-bereavement>. Accessed August 2, 2020.
19. Ali M, Capel M, Jones G, Gazi T. The importance of identifying preferred place of death. *BMJ Support Palliat Care.* 2019; 9(1): 84-91. doi: [10.1136/bmjspcare-2015-000878](https://doi.org/10.1136/bmjspcare-2015-000878)
20. Finucane AM, Bone AE, Evans CJ, Gomes B, Meade R, Higginson IJ, et al. The impact of population ageing on end-of-life care in Scotland: Projections of place of death and recommenda-



tions for future service provision. *BMC Palliat Care.* 2019; 18(1): 112. doi: [10.1186/s12904-019-0490-x](https://doi.org/10.1186/s12904-019-0490-x)

21. Sarmento VP, Higginson IJ, Ferreira PL, Gomes B. Past trends and projections of hospital deaths to inform the integration of palliative care in one of the most ageing countries in the world. *Palliat Med.* 2016; 30(4): 363-373. doi: [10.1177/0269216315594974](https://doi.org/10.1177/0269216315594974)

22. Nuffield Trust. Change of collapse: Lessons from the drive to reform health and social care in Northern Ireland. 2019. Web site. <https://www.nuffieldtrust.org.uk/files/2019-07/nuffield-trust-change-or-collapse-web-final.pdf>. Accessed August 30, 2020.

23. Kelly D, Kennedy K. Power to people: Proposals to reboot adult care and support. In: *Expert Advisory Panel On Adult Care And Support*. Northern Ireland. 2020.

24. Marie Curie. Every minute matters: The impact of delayed discharges from hospital on terminally ill people in Northern Ireland. 2019. Web site. <https://www.mariecurie.org.uk/globalassets/media/documents/policy/policy-publications/2019/every-minute-matters-the-impact-of-delayed-discharges-from-hospital-on-terminally-ill-people-in-northern-ireland.pdf>. Accessed August 2, 2020.

25. Carers Week. Carers Week 2020 Research Report. The Rise in The Number Of Unpaid Carers During The Coronavirus (CO-

VID-19) Outbreak. 2020. Web site. [https://www.carersuk.org/images/CarersWeek2020/CW\\_2020\\_Research\\_Report\\_WEB.pdf](https://www.carersuk.org/images/CarersWeek2020/CW_2020_Research_Report_WEB.pdf). Accessed August 2, 2020.

26. Grande G, Rowland C, van den Berg B, Hanratty B. Psychological morbidity and general health among family caregivers during end-of-life cancer care: A retrospective census survey. *Palliat Med.* 2018; 32(10): 1605-1614. doi: [10.1177/0269216318793286](https://doi.org/10.1177/0269216318793286)

27. Marie Curie, Carers NI. Lost Retirement: The Impact On Older People Of Caring For Someone With A Terminal Illness. UK; 2018. Web site. <https://www.mariecurie.org.uk/globalassets/media/documents/policy/policy-publications/lost-retirement-the-impact-on-older-people-of-caring-for-someone-with-a-terminal-illness.pdf>. Accessed August 30, 2020.

28. Bone AE, Finucane AM, Leniz J, Higginson IJ, Sleeman KE. Changing patterns of mortality during the COVID-19 pandemic: Population-based modelling to understand palliative care implications. *Palliat Med.* 2020; 34(9): 1193-1201. doi: [10.1177/0269216320944810](https://doi.org/10.1177/0269216320944810)

29. Marie Curie. Difficult conversations with dying people and their families. 2014. Web site. <https://www.mariecurie.org.uk/globalassets/media/documents/policy/policy-publications/march-2014/difficult-conversations-with-dying-people-and-their-families.pdf>. Accessed August 30, 2020.

# SUPPLEMENTARY TABLES

**SUPPLEMENTARY TABLE I**

Years	Age	All										Female					Male				
		All	Female	Male	Hospital	Care Home	Own Home	Hospice	All Other Places	Hospital	Care Home	Own Home	Hospice	All Other Places	Hospital	Care Home	Own Home	Hospice	All Other Places		
2004	0 to 4	144	67	77	121	0	17	2	4	58	0	7	1	1	63	0	10	1	3		
	5 to 14	29	11	18	16	0	8	0	5	5	0	3	0	3	11	0	5	0	2		
	15 to 44	612	223	389	213	3	221	18	157	99	1	85	8	30	114	2	136	10	127		
	45 to 64	2150	819	1331	1005	48	806	139	152	403	23	279	78	36	602	25	527	61	116		
	65 to 74	2697	1153	1544	1458	166	815	175	83	643	90	314	86	20	815	76	501	89	63		
	75 to 84	4813	2447	2366	2723	783	1075	128	104	1364	511	467	62	43	1359	272	608	66	61		
	85+	3909	2699	1210	1911	1340	571	39	48	1251	1055	340	21	32	660	285	231	18	16		
	Total	14354	7419	6935	7447	2340	3513	501	553	3823	1680	1495	256	165	3624	660	2018	245	388		
	0 to 4	156	66	90	140	0	14	1	1	58	0	7	0	1	82	0	7	1	0		
	5 to 14	36	17	19	20	0	12	1	3	11	0	5	0	1	9	0	7	1	2		
2005	15 to 44	679	198	481	226	0	250	24	179	85	0	75	15	23	141	0	175	9	156		
	45 to 64	2090	786	1304	930	42	806	159	153	367	20	291	79	29	563	22	515	80	124		
	65 to 74	2542	1085	1457	1424	136	742	134	106	657	66	267	60	35	767	70	475	74	71		
	75 to 84	4698	2409	2289	2733	637	1063	162	103	1407	389	485	74	54	1326	248	578	88	49		
	85+	4023	2706	1317	2033	1270	625	34	61	1303	952	393	20	38	730	318	232	14	23		
	Total	14224	7267	6957	7506	2085	3512	515	606	3888	1427	1523	248	181	3618	658	1989	267	425		
	0 to 4	146	61	85	123	0	16	1	6	51	0	7	1	2	72	0	9	0	4		
	5 to 14	45	20	25	25	1	13	3	3	12	0	7	1	0	13	1	6	2	3		
	15 to 44	688	221	467	222	3	248	21	194	87	3	76	15	40	135	0	172	6	154		
	45 to 64	2189	842	1347	968	35	859	138	189	437	10	284	75	36	531	25	575	63	153		
2006	65 to 74	2538	1066	1472	1397	128	771	153	89	628	57	298	54	29	769	71	473	99	60		
	75 to 84	4631	2364	2267	2723	658	1013	127	110	1392	386	472	60	54	1331	272	541	67	56		
	85+	4295	2896	1399	2247	1286	674	47	41	1411	998	432	26	29	836	288	242	21	12		
	Total	14532	7470	7062	7705	2111	3594	490	632	4018	1454	1576	232	190	3687	657	2018	258	442		
	0 to 4	143	58	85	120	0	21	1	1	50	0	7	1	0	70	0	14	0	1		
	5 to 14	29	11	18	13	0	9	0	7	5	0	5	0	1	8	0	4	0	6		
	15 to 44	687	203	484	234	6	255	17	175	94	3	67	12	27	140	3	188	5	148		
	45 to 64	2221	840	1381	974	31	868	164	184	408	15	299	81	37	566	16	569	83	147		
	65 to 74	2476	1050	1426	1314	145	780	153	84	579	60	317	65	29	735	85	463	88	55		
	75 to 84	4696	2328	2368	2665	669	1119	145	98	1287	421	511	72	37	1378	248	608	73	61		
2007	85+	4397	2951	1446	2200	1408	693	43	53	1368	1096	429	23	35	832	312	264	20	18		
	Total	14649	7441	7208	7520	2259	3745	523	602	3791	1595	1635	254	166	3729	664	2110	269	436		

2008	0 to 4	145	69	76	136	0	6	3	0	62	0	4	3	0	74	0	2	0	0
	5 to 14	37	13	24	28	0	9	0	0	9	0	4	0	0	19	0	5	0	0
	15 to 44	717	230	487	200	3	292	31	191	83	2	93	19	33	117	1	199	12	158
	45 to 64	2132	864	1268	958	48	865	135	126	420	23	326	67	28	538	25	539	68	98
	65 to 74	2584	1053	1531	1360	125	845	179	75	553	57	344	75	24	807	68	501	104	51
	75 to 84	4611	2333	2278	2576	691	1103	148	93	1277	429	513	71	43	1299	262	590	77	50
	85+	4681	3118	1563	2257	1560	748	54	62	1395	1190	460	34	39	862	370	288	20	23
	Total	14907	7680	7227	7515	2427	3868	550	547	3799	1701	1744	269	167	3716	726	2124	281	380
	0 to 4	153	74	79	135	0	15	2	1	62	0	12	0	0	73	0	3	2	1
	5 to 14	28	11	17	16	0	7	0	5	7	0	2	0	2	9	0	5	0	3
2009	15 to 44	685	220	465	237	5	249	25	169	96	1	85	15	23	141	4	164	10	146
	45 to 64	2132	863	1269	960	51	834	163	124	404	20	325	87	27	556	31	509	76	97
	65 to 74	2539	1124	1415	1327	127	883	134	68	609	55	360	72	28	718	72	523	62	40
	75 to 84	4427	2228	2199	2465	666	1056	140	100	1233	413	470	63	49	1232	253	586	77	51
	85+	4449	2979	1470	2215	1392	736	41	65	1423	1043	456	20	37	792	349	280	21	28
	Total	14413	7499	6914	7355	2241	3780	505	532	3834	1532	1710	257	166	3521	709	2070	248	366
	0 to 4	165	77	88	152	0	12	1	0	71	0	6	0	0	81	0	6	1	0
	5 to 14	26	13	13	15	0	4	2	5	7	0	2	2	2	8	0	2	0	3
	15 to 44	694	229	465	207	2	281	25	179	92	2	87	15	33	115	0	194	10	146
	45 to 64	2167	870	1297	999	50	825	137	156	450	21	301	69	29	549	29	524	68	127
2010	65 to 74	2606	1061	1545	1382	143	857	155	69	584	70	305	80	22	798	73	552	75	47
	75 to 84	4268	2129	2139	2369	638	1023	146	92	1186	395	425	74	49	1183	243	598	72	43
	85+	4531	3012	1519	2187	1476	770	35	63	1358	1121	469	19	45	829	355	301	16	18
	Total	14457	7391	7066	7311	2309	3772	501	564	3748	1609	1595	259	180	3563	700	2177	242	384
	0 to 4	128	50	78	115	0	11	2	0	46	0	4	0	0	69	0	7	2	0
	5 to 14	17	8	9	8	0	6	1	2	3	0	4	1	0	5	0	2	0	2
	15 to 44	639	194	445	219	6	267	8	139	84	2	87	4	17	135	4	180	4	122
	45 to 64	2072	817	1255	976	45	766	166	119	422	21	270	80	24	554	24	496	86	95
	65 to 74	2457	1044	1413	1244	177	801	148	87	549	82	318	72	23	695	95	483	76	64
	75 to 84	4223	2109	2114	2262	677	1058	138	88	1132	405	463	68	41	1130	272	595	70	47
2011	85+	4668	3064	1604	2156	1591	827	38	56	1346	1194	470	19	35	810	397	357	19	21
	Total	14204	7286	6918	6980	2496	3736	501	491	3582	1704	1616	244	140	3398	792	2120	257	351

2012	0 to 4	100	48	52	93	0	7	0	0	44	0	4	0	0	49	0	3	0	0
	5 to 14	31	7	24	16	0	11	3	1	5	0	2	0	0	11	0	9	3	1
	15 to 44	603	171	432	204	3	250	20	126	85	1	56	12	17	119	2	194	8	109
	45 to 64	2027	842	1185	925	49	791	139	123	394	27	316	73	32	531	22	475	66	91
	65 to 74	2469	1022	1447	1256	147	861	131	74	540	73	324	59	26	716	74	537	72	48
	75 to 84	4454	2248	2206	2376	747	1120	130	81	1160	451	533	63	41	1216	296	587	67	40
	85+	5072	3324	1748	2318	1762	884	47	61	1409	1309	541	25	40	909	453	343	22	21
	Total	14756	7662	7094	7188	2708	3924	470	466	3637	1861	1776	232	156	3551	847	2148	238	310
	0 to 4	129	56	73	118	0	7	4	0	52	0	4	0	0	66	0	3	4	0
	5 to 14	21	8	13	16	0	3	1	1	6	0	1	1	0	10	0	2	0	1
2013	15 to 44	576	190	386	198	3	240	20	115	82	1	77	11	19	116	2	163	9	96
	45 to 64	2084	821	1263	923	52	835	149	125	379	23	315	78	26	544	29	520	71	99
	65 to 74	2554	1057	1497	1319	179	847	141	68	556	71	344	66	20	763	108	503	75	48
	75 to 84	4457	2244	2213	2290	773	1177	128	89	1143	439	562	54	46	1147	334	615	74	43
	85+	5147	3331	1816	2330	1824	903	35	55	1421	1332	522	24	32	909	492	381	11	23
	Total	14968	7707	7261	7194	2831	4012	478	453	3639	1866	1825	234	143	3555	965	2187	244	310
	0 to 4	134	47	87	125	0	5	4	0	42	0	4	1	0	83	0	1	3	0
	5 to 14	26	12	14	18	0	4	4	0	8	0	1	3	0	10	0	3	1	0
	15 to 44	575	193	382	196	5	219	33	122	74	1	76	23	19	122	4	143	10	103
	45 to 64	2017	854	1163	900	61	790	161	105	413	33	299	90	19	487	28	491	71	86
2014	65 to 74	2569	1084	1485	1354	177	811	168	59	564	84	330	85	21	790	93	481	83	38
	75 to 84	4369	2206	2163	2277	758	1136	134	64	1145	457	508	64	32	1132	301	628	70	32
	85+	4988	3258	1730	2169	1808	923	41	47	1329	1305	569	21	34	840	503	354	20	13
	Total	14678	7654	7024	7039	2809	3888	545	397	3575	1880	1787	287	125	3464	929	2101	258	272
	0 to 4	138	59	79	128	0	7	3	0	54	0	3	2	0	74	0	4	1	0
	5 to 14	19	7	12	13	0	4	2	0	4	0	2	1	0	9	0	2	1	0
	15 to 44	595	189	406	233	6	214	24	118	99	1	63	9	17	134	5	151	15	101
	45 to 64	2141	896	1245	996	59	815	156	115	431	27	325	82	31	565	32	490	74	84
	65 to 74	2719	1154	1565	1423	194	898	148	56	597	92	372	78	15	826	102	526	70	41
	75 to 84	4430	2110	2320	2251	805	1170	136	68	1051	468	490	68	33	1200	337	680	68	35
2015	85+	5506	3538	1968	2409	2018	970	41	68	1430	1461	588	15	44	979	557	382	26	24
	Total	15548	7953	7595	7453	3082	4078	510	425	3666	2049	1843	255	140	3787	1033	2235	255	285

2016	0 to 4	124	61	63	112	0	5	4	3	53	0	3	3	2	59	0	2	1	1
	5 to 14	19	11	8	13	0	5	1	0	9	0	2	0	0	4	0	3	1	0
	15 to 44	559	188	371	188	3	225	16	127	84	0	72	7	25	104	3	153	9	102
	45 to 64	2098	870	1228	995	69	761	155	118	431	24	310	70	35	564	45	451	85	83
	65 to 74	2807	1210	1597	1434	208	929	162	74	624	105	375	81	25	810	103	554	81	49
	75 to 84	4354	2145	2209	2310	757	1104	122	61	1108	442	507	60	28	1202	315	597	62	33
	85+	5469	3515	1954	2310	1995	1058	54	52	1354	1459	631	32	39	956	536	427	22	13
	Total	15430	8000	7430	7362	3032	4087	514	435	3663	2030	1900	253	154	3699	1002	2187	261	281
	0 to 4	105	48	57	93	0	11	0	1	44	0	4	0	0	49	0	7	0	1
	5 to 14	26	13	13	18	0	6	2	0	9	0	3	1	0	9	0	3	1	0
2017	15 to 44	583	175	408	191	3	251	28	110	69	1	70	18	17	122	2	181	10	93
	45 to 64	2152	875	1277	982	53	847	162	108	446	20	307	80	22	536	33	540	82	86
	65 to 74	2786	1181	1605	1407	192	950	162	75	615	100	363	76	27	792	92	587	86	48
	75 to 84	4596	2205	2391	2409	785	1236	111	55	1099	453	573	57	23	1310	332	663	54	32
	85+	5788	3624	2164	2459	2085	1160	43	41	1400	1491	681	26	26	1059	594	479	17	15
	Total	16036	8121	7915	7559	3118	4461	508	390	3682	2065	2001	258	115	3877	1053	2460	250	275
	0 to 4	107	54	53	96	0	5	6	0	46	0	4	4	0	50	0	1	2	0
	5 to 14	22	8	14	13	0	5	3	1	3	0	2	3	0	10	0	3	0	1
	15 to 44	556	185	371	177	1	232	19	127	82	0	67	12	24	95	1	165	7	103
	45 to 64	2204	907	1297	981	52	872	167	132	444	20	325	82	36	537	32	547	85	96
2018	65 to 74	2717	1164	1553	1397	199	913	143	65	611	87	362	81	23	786	112	551	62	42
	75 to 84	4544	2180	2364	2400	787	1170	135	52	1100	450	542	66	22	1300	337	628	69	30
	85+	5772	3653	2119	2514	2053	1101	50	54	1436	1486	666	27	38	1078	567	435	23	16
	Total	15922	8151	7771	7578	3092	4298	523	431	3722	2043	1968	275	143	3856	1049	2330	248	288



# SUPPLEMENTARY TABLE 2

Number and Proportion of Deaths Occurring in each Setting 2004-2018										
Year	Hospital		Care Home		Own Home		Hospice		All Other Places	
	n	%	n	%	n	%	n	%	n	%
2004	7447	51.90%	2340	16.30%	3513	24.50%	501	3.50%	553	3.90%
2005	7506	52.80%	2085	14.70%	3512	24.70%	515	3.60%	606	4.30%
2006	7705	53.00%	2111	14.50%	3594	24.70%	490	3.40%	632	4.30%
2007	7520	51.30%	2259	15.40%	3745	25.60%	523	3.60%	602	4.10%
2008	7515	50.40%	2427	16.30%	3868	25.90%	550	3.70%	547	3.70%
2009	7355	51.00%	2241	15.50%	3780	26.20%	505	3.50%	532	3.70%
2010	7311	50.60%	2309	16.00%	3772	26.10%	501	3.50%	564	3.90%
2011	6980	49.10%	2496	17.60%	3736	26.30%	501	3.50%	491	3.50%
2012	7188	48.70%	2708	18.40%	3924	26.60%	470	3.20%	466	3.20%
2013	7194	48.10%	2831	18.90%	4012	26.80%	478	3.20%	453	3.00%
2014	7039	48.00%	2809	19.10%	3888	26.50%	545	3.70%	397	2.70%
2015	7453	47.90%	3082	19.80%	4078	26.20%	510	3.30%	425	2.70%
2016	7362	47.70%	3032	19.70%	4087	26.50%	514	3.30%	435	2.80%
2017	7559	47.10%	3118	19.40%	4461	27.80%	508	3.20%	390	2.40%
2018	7578	47.60%	3092	19.40%	4298	27.00%	523	3.30%	431	2.70%
Mean annual % change*	-0.31%		0.22%		0.18%		-0.01%		-0.08%	
*averaged over the 15 years (not age and gender specific)										