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SESSIONAL PAPER

Mortality experience of long-term care residents of Bupa care homes over the period 2016–2019

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Abstract
As the population ages, the provision of adult long-term care (LTC) is one of the major challenges facing the UK and other developed nations. LTC funding for the elderly is complex, reflecting the range and level of services provided, with the total cost depending on the duration of LTC required. Institutional care settings (e.g., nursing/residential care homes) represent the most expensive form of LTC. Planning and funding for institutional LTC requires an understanding of the factors affecting the mortality (and hence duration and cost of care) of such LTC recipients. Using data provided by Bupa, one of the largest LTC providers in Britain, this paper investigates factors affecting the mortality of residents of institutional LTC facilities over the period 2016-2019. Consistent with existing research, most residents were female and had a higher average age profile compared with male residents. For those residents who died during the investigation period, the average length of stay was approximately 1.6 times longer for females relative to males. For both males and females, new residents experienced higher mortality in the first-year post admission compared to existing residents. Variations in the mortality of the residents were analysed by condition, funding status and care type on admission.

Keywords: Long-term care; mortality

1. Introduction

As the population ages, the provision of adult long-term care (LTC) is one of the major challenges facing the UK and other developed nations. Improvements in life expectancy since the start of the twentieth century have led to an aging population and, correspondingly, an increase in the need for LTC provision for the elderly. Funding for LTC for the elderly is complex, reflecting the range and level of services provided, with the total cost depending on the duration of LTC required. Institutional care settings (e.g., nursing and residential care homes) represent the most expensive forms of LTC, accounting for approximately 50% of total LTC spending in OECD countries (OECD, 2021a). In 1981, the proportion of the UK population aged 85 and over, the age group most likely to require LTC, was approximately 1%. By 2021 this had risen to 2.5% and is projected to rise to 4.3% by 2045 (ONS, 2022). Using data provided by Bupa, one of the largest providers of residential and nursing care in Britain, this paper investigates the factors affecting the mortality (and hence duration and cost of care) of residents of institutional LTC facilities for the elderly in Britain over the period 2016 to 2019 (i.e., pre Covid-19).

LTC involves a variety of services designed to meet a person's health or personal care needs when they can no longer perform everyday activities on their own (National Institute on Aging, 2024). LTC facilities refer to nursing and residential care facilities that provide accommodation and LTC as a package for dependant individuals (OECD, 2021b). Functional and/or cognitive

impairments are the primary reasons for admissions to nursing homes (Luppa et al., 2010; Salminen et al., 2020). Significant factors increasing the likelihood of admission to a nursing home include older age, female gender, living alone and isolation (Villeneuve et al., 2020, Berete et al., 2022, Zimmermann, 2022). The impact of socio-economic status on nursing home admissions is ambiguous, with some studies indicating a negative correlation between admission and socio-economic status (Gaugler et al., 2007; Nihtilä & Martikainen, 2007; Zimmermann, 2022) and others indicating no or low correlation (Van den Bosch et al., 2013). Dementia followed by stroke are the primary medical diagnoses amongst nursing home residents (Luppa et al., 2010; Toot et al., 2017; Huyer et al., 2020; Van Rensbergen & Nawrot, 2010). Recent research by Bladt et al. (2023) identifies duration of care as the main factor affecting the overall cost of institutional care. Duration of institutional LTC depends on age and level of dependency, with females typically experiencing longer care durations relative to males (Forder & Fernandez, 2011; Vossius et al., 2022; Bladt et al., 2023).

Those entering residential LTC are more frail than the average population of the same age and hence experience higher mortality (Kojima et al. 2018). A report by the Office for National Statistics (ONS) in England and Wales on life expectancy at older ages (65+) in care homes recorded lower life expectancy among care home residents relative to the general population, with females experiencing a greater gap and the gap decreasing (for both males and females) with increasing age. For example, for age group 85–89 in 2021/22 the difference in life expectancy between care home and non-care home residents in England and Wales was 4.7 years for males and 5.5 years for females (ONS, 2023). Comparison of ONS figures for life expectancy at older ages in care homes in 2011/12 and 2021/22 showed a drop in life expectancy over the ten-year period for both males and females with females experiencing a greater drop relative to males (ONS, 2021, 2023).

According to a report by the OECD (OECD, 2021a), spending on LTC across the OECD countries accounted for approximately 1.5% of Gross Domestic Product (GDP) in 2019. The spending ranged from 4.1% of GDP in the Netherlands to 0.1% of GDP in Mexico, with the UK at the higher end of the scale, spending approximately 2.25% of GDP on LTC in 2019. The report estimated that more than half of the spending on LTC across the OECD countries occurred in residential care facilities.

The cost of residential LTC is typically split between care (personal and nursing) costs and hotel (e.g., accommodation and food) costs. Funding for LTC varies between the constituent countries of the UK. In England, Wales and Northern Ireland, total (care plus hotel) LTC costs are means-tested, except for those who qualify for care under the NHS continuing healthcare programme. The NHS continuing healthcare programme meets the total care costs of those with complex, long-term healthcare needs who are assessed as having a "primary health need" for care (NHS CHC, 2024). In Scotland, personal and nursing care is free for those assessed by the local authority as in need of such care, but hotel-type costs for residential LTC are means-tested. In 2022, the upper and lower thresholds for state funding for LTC in England and Northern Ireland were £14,250 and £23,250, with those above the upper threshold paying the full cost of their LTC, those below the lower threshold having the full cost of their LTC met by the local authority, and those between the upper and lower thresholds contributing in part to their LTC. In Scotland, the corresponding thresholds were £18,500 and £29,750 and in Wales a single threshold of £50,000 applied. A report by the National Audit Office (2018) indicated that approximately 44% of older people in independent sector care homes (which comprise the vast majority of LTC facilities) in the UK pay for their own care (self-funders), and that this varied considerably by region. For example, in England, the proportion of self-funders ranged from 23% in the North-East to 62% in the South-East.

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The 2010 Dilnot Commission (Commission on Funding of Care and Support, 2011), which was tasked with making recommendations on the reform of adult social care in England, highlighted the fact that uncertainty around future LTC requirements meant individuals were at risk of potentially very high care costs, and had limited ability to purchase financial protection against these costs. Included in the commission's recommendations was the introduction of a cap in England on the amount that individuals would have to spend on care costs over their lifetime. Following delays in its implementation, a lifetime cap of £86,000 on personal and nursing care costs was due to come into effect in England in October 2025, together with increases to the means-tested thresholds. The lifetime cap of £86,000 did not include the hotel costs (also referred to as daily living costs) associated with LTC. These were set at a national notional amount in England of £200 per week in 2021–2022 prices (GOV.UK, 2022). Analysis by Warren (2022) indicated that despite the proposed introduction of the lifetime cap and the increase to the thresholds in England, the risk of catastrophic care costs for some individuals in England would remain. However, following the UK general election in July 2024, the new Labour government cancelled the introduction of the lifetime care cap, and it is unclear at the time of writing what, if anything, will replace it.

This paper contributes to understanding the potential costs of LTC by analysing the duration of care and the mortality experience of residents of Bupa care homes in Britain over the period 2016 to 2019 by condition (frail elderly/dementia/end of life) on admission, funding status on admission and care type (residential/nursing) on admission. By presenting mortality rates and care durations for various resident profiles it is hoped that the paper will help both individuals and the government plan for future care needs and associated costs. The paper is organised as follows: Section 2 describes the data used in the analysis, Section 3 analyses the duration or length of stay for those residents who died over the period 2016–2019, Section 4 analyses the mortality experience of Bupa residents over the same period. Finally, Section 5 concludes with a discussion of the results.

2. Data

Bupa is one of largest providers operating in the UK care home market. The market is highly fragmented with, according to a recent report by Savills (2022), the five largest operators (of which Bupa is one) accounting for only 13% of the market. Bupa provided data on the care duration and mortality experience of adult residents of its LTC facilities in Britain over the period 2016 to 2019 (i.e., pre COVID-19) for this analysis. The majority (over 90%) of Bupa care homes are located in England, of which approximately half are located in London and the South East. The data were for permanent residents only. Data were provided on the number of deaths and exposure for residents split by age, gender, duration (years since admission), condition on admission (frail elderly, dementia or end-of-life care), care type on admission (residential or nursing) and funding status on admission (self-funded/private or local authority funded/public). Only a small proportion of residents were admitted with a mixture of public and private funding, and these have been excluded from the analysis.

Table 1 presents the average age of new Bupa residents split by condition, care type and funding status over the period 2016–2019 for males and females respectively. Admission age is typically in the early to mid-80s with males having a younger average age profile on admission compared to females – males are approximately 3.8 years younger than females on admission overall. For both males and females, the average age on admission for publicly funded residents is lower than that for privately funded residents – 5.7 years and 3.9 years lower for males and females, respectively. The average age on admission is lower for residents with dementia compared to the frail elderly, while residents admitted for nursing care are, on average, younger than those admitted for residential-type care.

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Table 1. Average age of new residents of Bupa care facilities over the period 2016–2019 for males and females, respectively

		All		Publicly Funded		Privately Funded	
		Male	Female	Male	Female	Male	Female
All		82.9	86.7	80.3	84.6	86.0	88.5
Condition on admission	Frail Elderly	83.6	87.4	80.0	85.0	86.8	89.1
	Dementia	82.0	85.5	80.9	84.6	83.7	86.6
	End-of-Life Care	80.4	83.5	79.6	82.6	85.7	88.4
Care type on admission	Residential	85.0	87.6	82.6	85.5	86.2	88.5
	Nursing	82.2	86.2	79.9	84.4	85.9	88.4

Table 2 presents the total exposure and corresponding deaths by age group for males and females respectively over the period 2016–2019. The total exposure represents the combined exposure by condition on admission (frail elderly, dementia and end-of-life care), funding status on admission (public and private) and care type on admission (nursing and residential). The exposures represent annual exposures with exposure years calculated from the date of admission to, or the anniversary of the date of admission to, the Bupa facility (akin to policy year type rate intervals). The exposure was calculated using the initial exposed to risk method for exposure years commencing between 01/01/2016 and 01/01/2019. Deaths were calculated consistently, with age representing age last birthday on admission to, or on the anniversary of admission to, the Bupa facility. The total exposure for females is over twice that for males, with the difference in exposure increasing with age. Figures 1, 2 and 3 present the breakdown of the total exposure by condition on entry, funding status on entry and care type on entry.

Table 2. Exposure and deaths for Bupa residents by age group and gender for the period 2016–2019

	Exposure			Deaths		
	Male	Female	Combined	Male	Female	Combined
Under 80	2,123	2,497	4,620	967	927	1,894
80–84	1,373	2,421	3,794	665	872	1,537
85–89	1,588	3,723	5,311	860	1,418	2,278
90–94	1,243	3,690	4,933	734	1,475	2,209
95+	469	2,122	2,591	279	996	1,275
Total	6,796	14,454	21,250	3,505	5,688	9,193

Figure 1 presents the total exposure split by condition on entry and age group for males and females respectively. The graphs show that the frail elderly constitute the largest proportion of the exposure with the proportion increasing with age.

Figure 2 presents the total exposure split by funding status on entry and age group for males and females respectively. The proportion of self-funders increases with age. For the youngest age group, those aged under 80, just under 80% of the exposure applies to publicly funded residents. In contrast, for the oldest age group, aged 95 and above, approximately 60% of the exposure applies to privately funded residents.

Figure 3 presents the total exposure split by care type on entry and age group for males and females respectively. Residents admitted for nursing care comprise the majority of the exposure,

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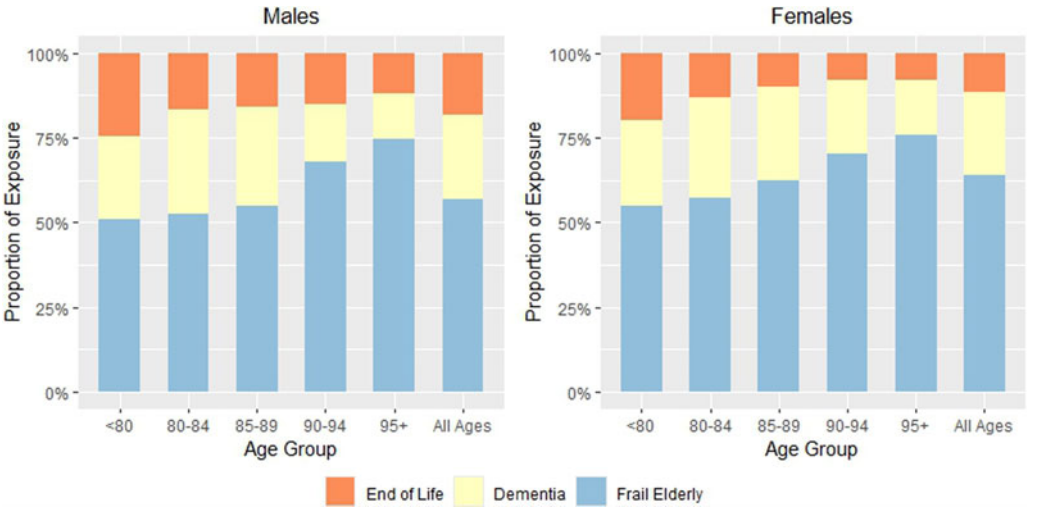

Figure 1. Proportion of exposure by condition on admission and age group for the period 2016–2019 for males and females, respectively.

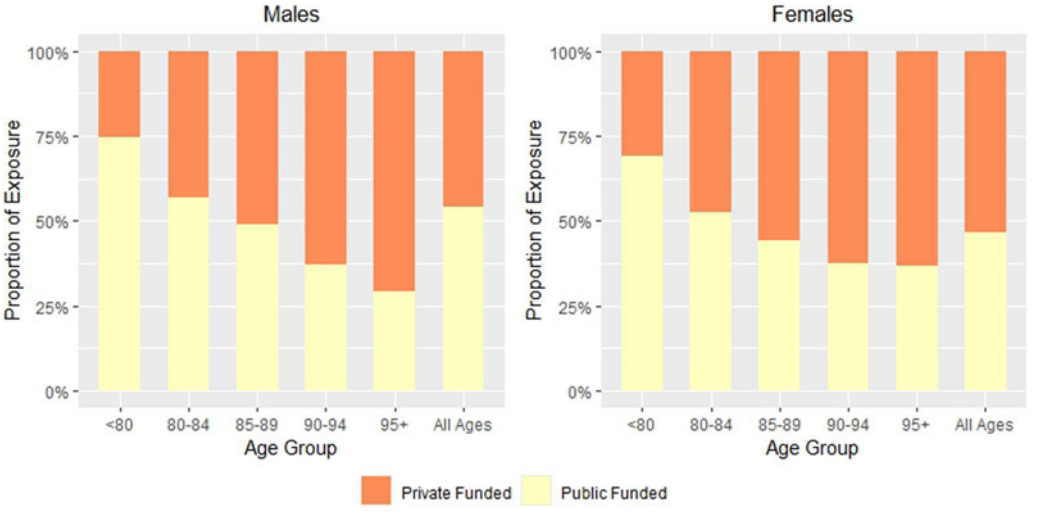

Figure 2. Proportion of exposure by funding status on admission and age group for the period 2016–2019 for males and females, respectively.

though the proportion of residents admitted for residential care tends to increase with age. A slightly greater proportion of female residents in each age group are admitted for residential care compared to males.

3. Duration of LTC for Deceased Bupa Residents

Figure 4 presents the distribution of the duration (length of stay) of those residents of Bupa LTC facilities who died over the period 1/1/2016–31/12/2019 for males and females respectively. In total 12,242 residents died over the period – 4,692 males and 7,550 females. The average age at death was 83.5 for males and 87.0 for females and the average length of stay prior to death was 397 days and 636 days for males and females respectively.

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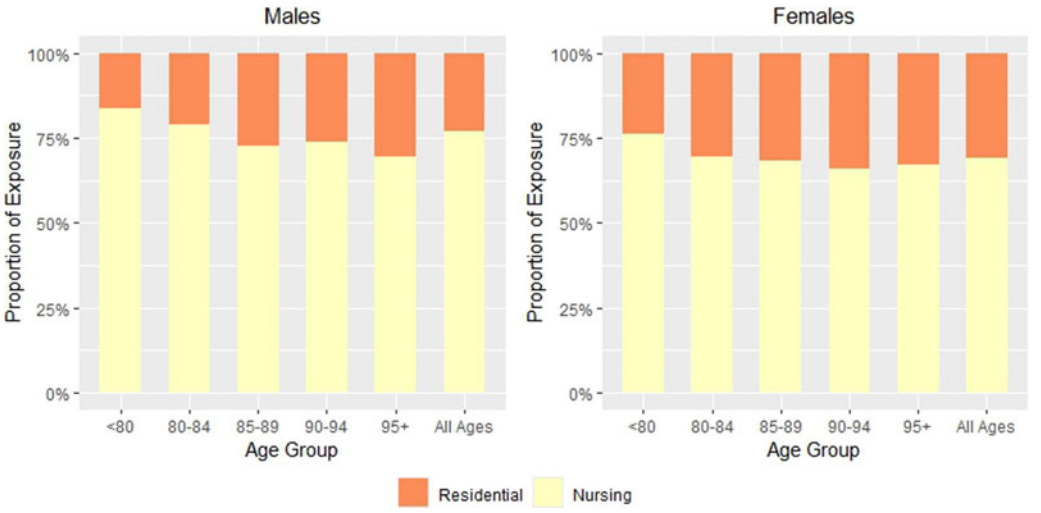

Figure 3. Proportion of exposure by care type on admission and age group for the period 2016–2019 for males and females, respectively.

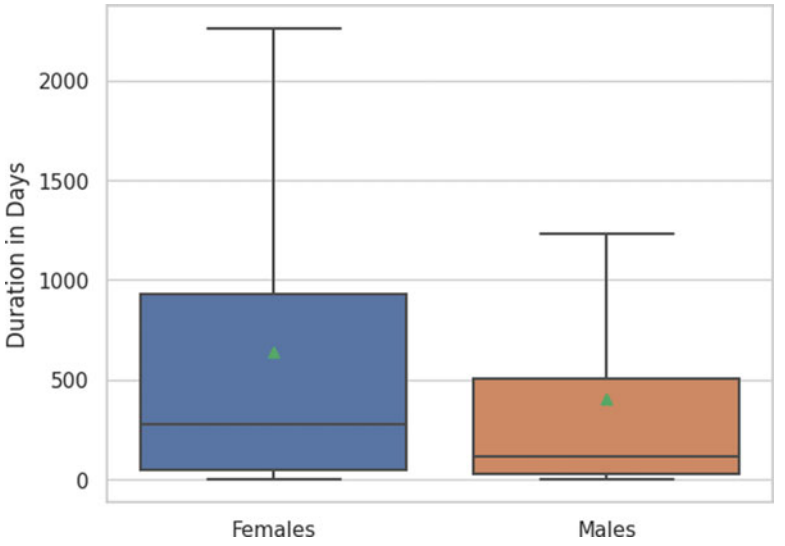

Figure 4. Box plot of duration in days in Bupa LTC facilities for those residents who died over the period 2016–2019 for males and females, respectively, showing the mean, median, interquartile range and range.

Duration varies according to condition on admission, funding status on admission and care type on admission. Figures 5, 6 and 7 present the corresponding duration distributions for males and females by condition on admission, funding status on admission and care type on admission. From Figure 5 it can be seen that, based on condition on admission, residents diagnosed with dementia have the longest length of stay, while, as expected, those admitted for end-of-life care have the shortest duration. From Figure 6, it can be seen that, based on funding status on admission, privately funded residents have longer care durations compared to publicly funded residents. Finally, as expected, Figure 7 shows that residents admitted for residential care tended to have longer durations relative to those admitted for nursing care. In each case, females show a longer average duration of care and a greater variance in care duration relative to males.

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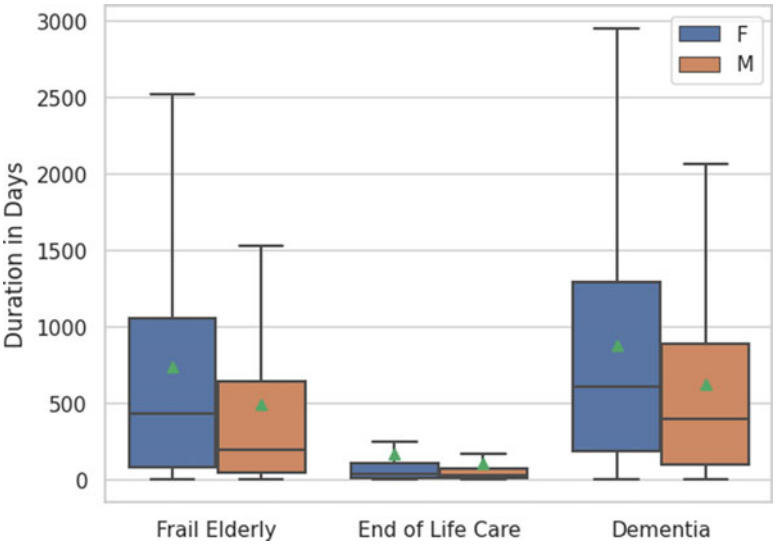

Figure 5. Box plot of duration in days in Bupa LTC facilities by condition on admission for those residents who died over the period 2016–2019 for males and females respectively, showing the mean, median, interquartile range and range.

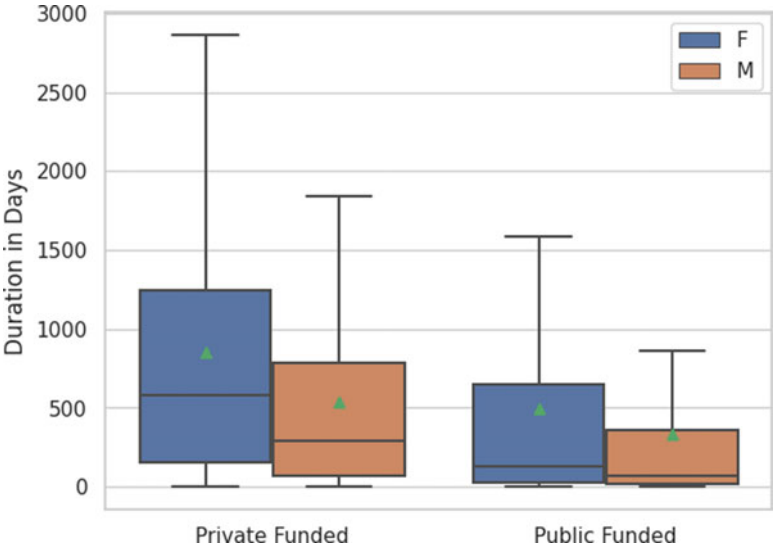

Figure 6. Box plot of duration in days in Bupa LTC facilities by funding status on admission for those residents who died over the period 2016–2019 for males and females respectively, showing the mean, median, interquartile range and range.

Duration varies by age at death and Figure 8 presents the mean or average duration of stay in days in Bupa LTC facilities by age group at death and condition on admission for those residents who died over the period 01/01/2016–31/12/2019. For residents admitted for end-of-life care the duration of stay remains relatively stable relative to age at death, with the exception of those who died aged 95 and over, who show an increase in average duration of stay. For females, those admitted as frail elderly show an increasing average duration of stay with age of death. In general, the same pattern can be seen for females admitted with dementia, with the exception of those who died prior to age 80. Male residents admitted with dementia or as frail elderly exhibit a different pattern of average duration of stay prior to death by age group – in

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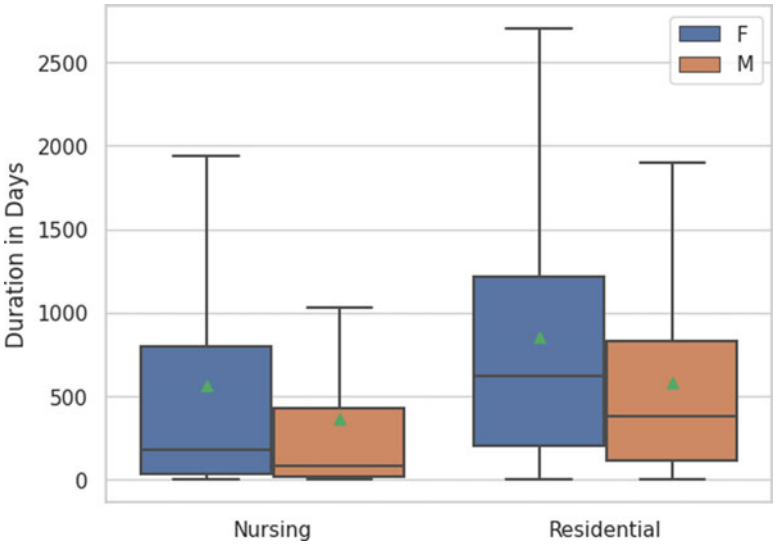

Figure 7. Box plot of duration in days in Bupa LTC facilities by care type on admission for those residents who died over the period 2016–2019 for males and females respectively, showing the mean, median, interquartile range and range.

general, the average duration of stay falls as age group at death increases, before finally rising again for those who die aged in their 90s. However, it should be noted that male residents admitted as frail elderly show relatively small variability in average duration of stay by age group at death.

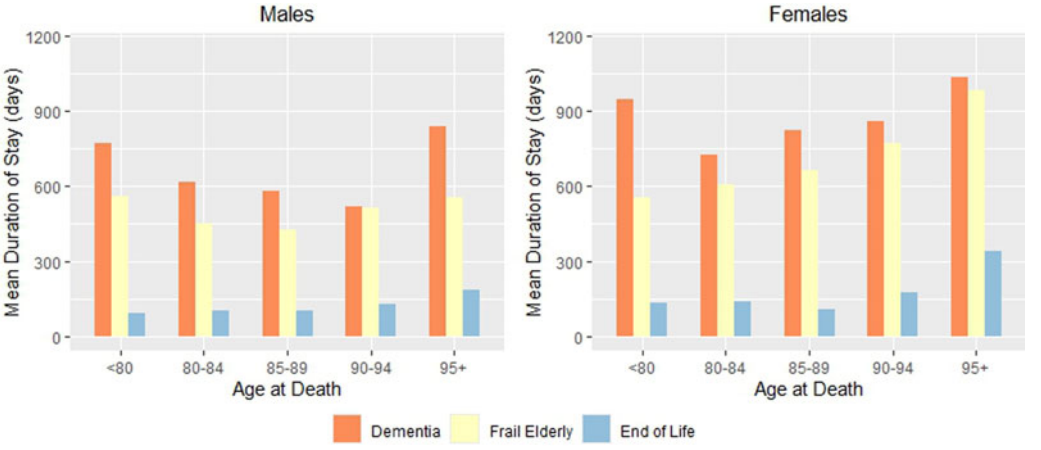

Figure 8. Mean duration of stay in days for Bupa residents who died over the period 2016–2019 by age group at death and condition on admission for males and females respectively.

4. Mortality Experience of Bupa Residents

The mortality experience of the Bupa residents was analysed for ages 80–95 over the period 01/01/2016–31/12/2019. Residents admitted for end-of-life care experience significantly higher mortality compared to other residents, with over 80% of such residents dying within one year of admission. Consequently, residents admitted for end-of-life care were excluded from the mortality experience analysis.

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For all resident deaths over the period 2016–2019. Table 3 presents the proportions of deaths that occurred in each year post admission to the Bupa LTC facility. From Table 3 we can see that almost 60% of male deaths and 50% of female deaths occurred in the first-year post admission with the number of deaths declining in each subsequent year post admission. Given the low number of deaths in subsequent years it was not possible to analyse the mortality experience for these years separately. Consequently, mortality was analysed, separately, for year 1 post admission and for subsequent years post admission in aggregate, denoted as year 2+ post admission.

Table 3. Proportion of deaths over the period 2016–2019 by year post admission to Bupa LTC facility for males and females, respectively

	Year 1	Year 2	Year 3	Year 4	Year 5+
Males	59%	17%	9%	7%	8%
Females	47%	18%	12%	8%	16%

The crude mortality rates were calculated for exposure years commencing between 1/1/2016 and 1/1/2019, where an exposure year commenced on the date of admission or on the anniversary of the date of admission to the Bupa LTC facility. The year 1 post admission crude mortality rates, $q_{x,1}$, were calculated as follows:

$$q_{x,1} = \frac{d_{x,1}}{E_{x,1}}$$

where $q_{x,1}$ represents the crude mortality rate for those aged x last birthday on admission, $d_{x,1}$ represents the number of deaths in year 1 for those aged x last birthday on admission, and $E_{x,1,}$ represents the initial exposed to risk for year 1 for new residents who were admitted aged x last birthday between 1/1/2016 and 1/1/2019.

The year 2+ post admission crude mortality rates, $q_{x,2+}$, were calculated as follows using data for exposure years, greater than 1, commencing between 1/1/2016 and 1/1/2019:

$$q_{x,2+} = \frac{\sum_{i=2}^{20} d_{x,i}}{\sum_{i=2}^{20} E_{x,i}}$$

where $q_{x,2+}$, represents the crude mortality rate for those aged x last birthday at the start of the exposure year (i.e. on the anniversary of admission), $d_{x,i}$ represents the number of deaths in exposure year i for those aged x last birthday at the start of exposure year i, and $E_{x,i,}$ represents the initial exposed to risk for residents aged x last birthday at the start of exposure year i. The maximum exposure year for this cohort of residents was 20 years.

Figures 9 and 10 present the year 1 post admission and the year 2+ post admission crude mortality rates and corresponding 95% confidence intervals for ages 80–95 for the period 2016–2019 for males and females respectively. The confidence intervals assume that deaths follow a normal distribution and are calculated using the formula:

$$\frac{Deaths}{Exposure} \pm 1.96\frac{\sqrt{Deaths}}{Exposure}$$

As expected, mortality rates tend to increase with age, with the exception of females who exhibit relatively flat mortality in the first-year post admission. The mortality gap between males and females is greater in year 1 compared to year 2+ post admission. The data underlying the graphs in Figures 9 and 10 are provided in the Appendix.

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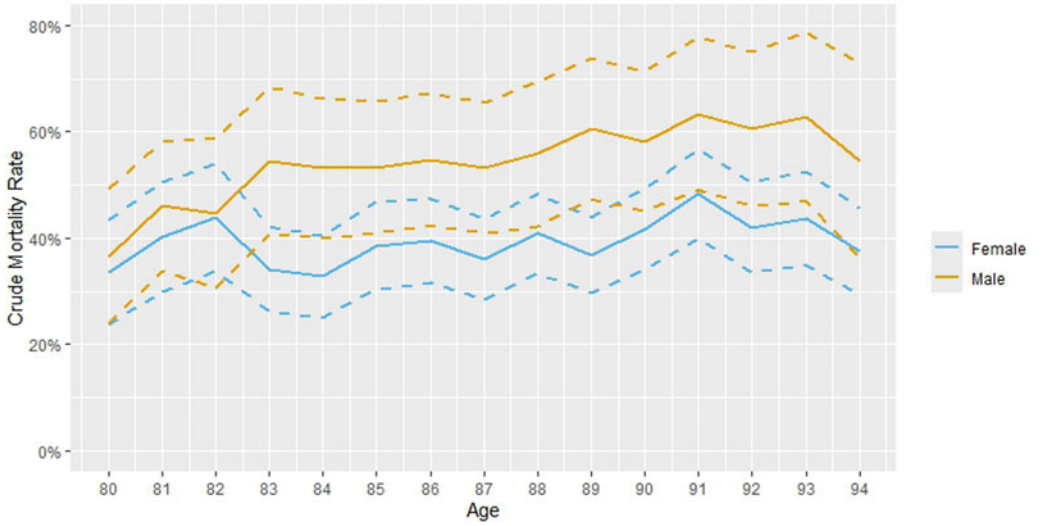

Figure 9. Year 1 post admission crude mortality rates (solid lines) and corresponding 95% confidence intervals (dashed lines) for the period 2016–2019 for male and female residents respectively.

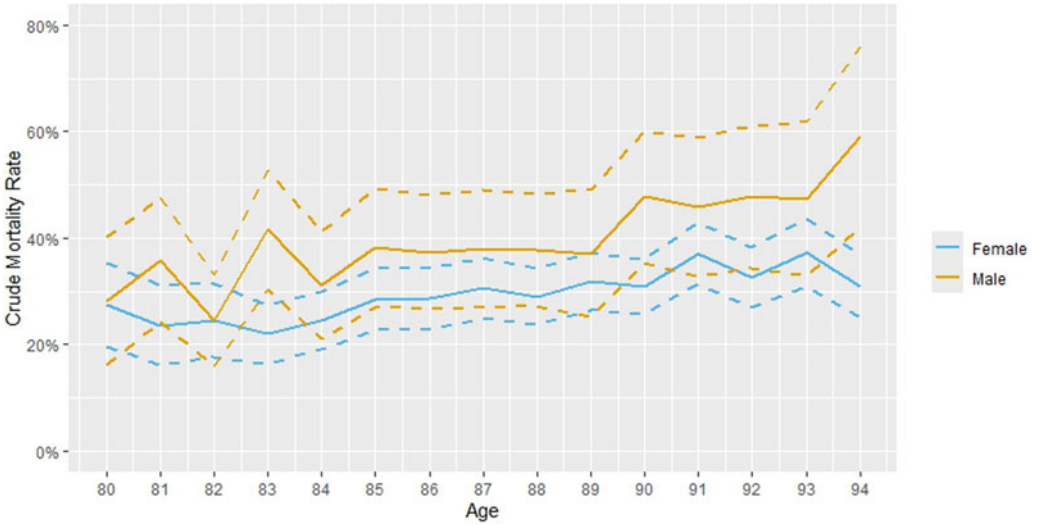

Figure 10. Year 2+ post admission crude mortality rates (solid lines) and corresponding 95% confidence intervals (dashed lines) for the period 2016–2019 for males and females respectively.

Section 4.1 considers the impact on the crude mortality rates by five-year age group of condition on admission, funding status on admission and care type on admission.

4.1. Mortality by Condition, Funding Status and Care Type on Admission

Figure 11 presents the crude mortality rates by five-year age group by condition on admission (frail elderly or dementia) for males and females respectively. Residents diagnosed as "frail elderly" experience higher mortality in year 1 compared to residents admitted with dementia for both males and females. For year 2+ post admission, residents diagnosed with dementia show the higher mortality with the exception of the youngest age group (80–84).

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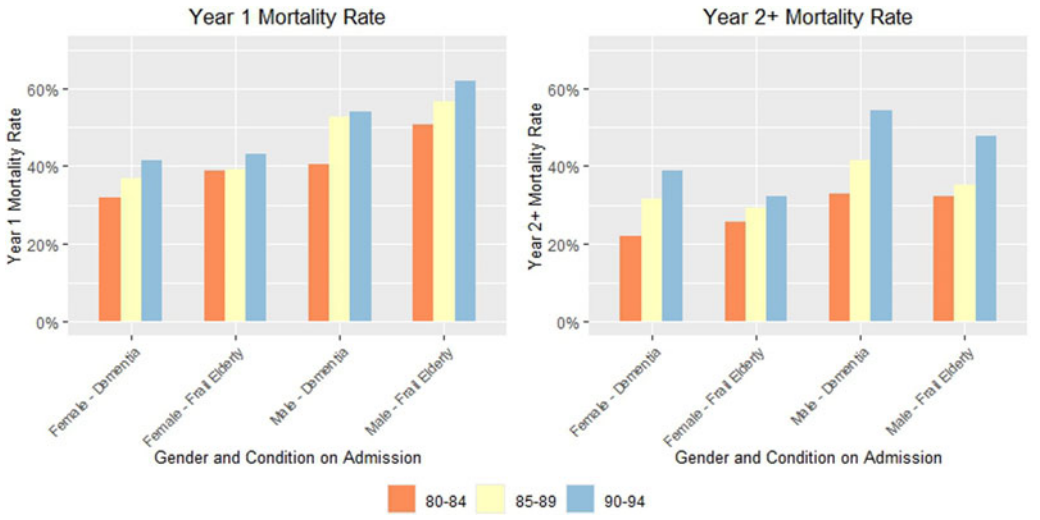

Figure 11. Crude mortality rates by gender, age group and condition on admission for Bupa residents in year 1 and year 2+ post admission.

Figure 12 presents the crude mortality rates by five-year age group by funding status on admission (publicly funded or privately funded) for males and females respectively. With one exception (males in age group 80–84 in year 2+), publicly funded residents experience higher mortality relative to privately funded residents with the gap greatest in year 1.

Figure 12. Crude mortality rates by gender, age group and funding status on admission for Bupa residents in year 1 and year 2+ post admission.

Figure 13 presents the crude mortality rates by five-year age group by care type on admission (residential care or nursing care) for males and females respectively. As expected, the mortality for those admitted for nursing care is higher than that for residents admitted for residential care in all cases, with the gap greatest in year 1 post admission.

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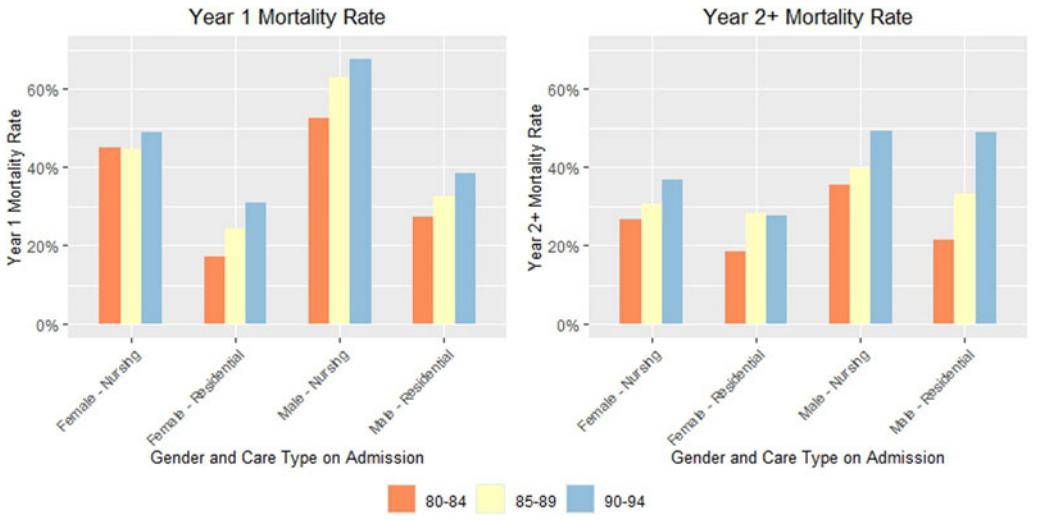

Figure 13. Crude mortality rates by gender, age group and care type on admission for Bupa residents in year 1 and year 2+ post admission.

5. Discussion

Planning and funding for institutional LTC requires an understanding of the factors affecting the mortality, and hence duration, of care of LTC recipients. Using data provided by Bupa, we investigated the impact of age, gender, duration since admission, condition on admission, care type on admission and funding status on admission on the mortality of Bupa residents over the period 2016–2019. Consistent with existing research, the majority of residents were female and had a higher average age profile compared with male residents. The majority of residents were diagnosed as "frail elderly" on admission for both males and females. Similarly, the majority of residents were admitted for nursing care though the proportion admitted for residential care increased with age. The average length of stay was approximately 1.6 times longer for females than males for those residents who died during the period 2016–2019.

Analysis of the mortality experience over the period for age group 80–95 showed that new residents experienced higher mortality in their first-year post admission compared to existing residents for both males and females. The mortality gap between male and female residents was greater in year 1 relative to subsequent years. As expected, residents admitted for nursing care experienced higher mortality relative to those admitted for residential care (for both year 1 and year 2+ post admission). In general, publicly funded residents showed higher mortality relative to privately funded residents. The impact of condition on admission on mortality varied over time – residents admitted as frail elderly experienced higher mortality than those admitted with dementia in the first-year post admission, with the situation reversing in subsequent years, when residents with dementia experienced higher mortality. Future work aims to provide a multivariate analysis of the impact of the factors on the length of stay and mortality experience of the Bupa residents to understand interactions between the factors and trends over time.

The proportion of deaths in care homes increases with age. Analysis of deaths by location of occurrence in England and Wales in 2019 showed that for ages 80+, 26% of all male deaths and 38% of all female deaths occurred in a nursing home. Dementia accounted for 36% and 42% of deaths amongst nursing home residents aged 80+ in 2019 in England & Wales for males and females respectively. Furthermore, 70% of all female deaths due to dementia in England and Wales in 2019 occurred in nursing homes. The corresponding percentage for males was 59%. Dementia is a significant factor currently affecting both admission to and mortality in nursing homes. Recent research has indicated that the incidence rate for dementia has dropped for more recent cohorts

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compared to earlier cohorts in high-income countries (GBD, 2022). As discussed in the 2020 report of the Lancet Commission on dementia intervention, prevention and care (Livingstone *et al*., 2020), this decline in the incidence rate for dementia is mainly attributed to educational, socio-economic, health care and lifestyle changes. However, increases in obesity, diabetes and declining physical activity in these countries may reverse this decline. In contrast, research by Chen et al. (2023) noted that in England and Wales, while dementia incidence declined in the first decade of the 21st century, a pattern of increasing dementia incidence was noted after 2010, which may indicate a qualitative change in the long-term trend. Ongoing research into the treatment and prevention of dementia will ultimately impact on the profile of nursing home residents.

LTC for the elderly continues to evolve. Currently, the vast majority of LTC is provided informally – typically by family and friends, generally without pay and mainly by women. According to a report by CarersUK (www.carersuk.org), the estimated economic value of the care provided by unpaid carers in the UK in 2015 was £132 billion (Buckner & Yeandle, 2015). However, the need for formal LTC is expected to increase in the future due to declining family size, increased geographic mobility and increased female labour force participation (OECD, 2017). Despite the fact that countries are increasingly moving towards home based and community based LTC, residential LTC facilities remain an important element of LTC and will continue to do so in the future (Spasova et al., 2018). While the COVID-19 pandemic had a devastating impact on residents in nursing homes, it has led to an increased focus on the importance of monitoring and improving care nationally for nursing home residents. As discussed in a paper by the British Geriatrics Society (British Geriatrics Society, 2021), innovations in care for nursing home residents introduced during the pandemic could, if maintained, "represent a significant improvement on what was in place prior to the pandemic." Examples include closer alignment of general practice with care homes, augmented approaches to health care delivery in nursing homes, increased focus on routine data in care homes and increased expenditure on care home research. The paper lists 11 recommendations for improving the healthcare delivered in nursing homes. Such recommendations, if supported and implemented by the various UK nations, could improve the quality of life and ultimately the life expectancy of UK nursing home residents in the future.

Institutional care remains an important element of LTC services for the elderly. As the population ages it becomes increasingly important to understand the factors affecting the cost of and provision of such services. By analysing the factors affecting the mortality of residents of Bupa LTC facilities, and hence indirectly the cost of such LTC, it is hoped that more accurate LTC funding models can be developed that will ultimately improve the provision of care for the elderly.

Acknowledgements. This paper is an output of the Mortality Research Steering Committee of the Institute and Faculty of Actuaries, UK. The authors and the Mortality Research Steering Committee would like to acknowledge and thank Adele Groyer, FIA, who sadly passed away earlier this year, whose inspiration and knowledge played a significant role in the production of this paper. The authors and the Mortality Research Steering Committee of the Institute & Faculty of Actuaries, UK would like to thank Bupa for kindly providing the data for this analysis.

References

Berete, F., Demarest, S., Charafeddine, R., De Ridder, K., Vanoverloop, J., Van Oyen, H., Bruyère, O., & Van der Heyden, J. (2022). Predictors of nursing home admission in the older population in Belgium: A longitudinal follow-up of health interview survey participants. *BMC Geriatrics*, **22**(1), 807. https://doi.org/10.1186/s12877-022-03496-4

Bladt, M., Fuino, M., Shemendyuk, A., & Wagner, J. (2023). Modelling the burden of long-term care for institutionalised elderly based on care duration and intensity. *Annals of Actuarial Science*, **17**(1), 83–117.

British Geriatrics Society. (2021). *Ambitions for change: Improving healthcare in care homes. Position statement by the British Geriatrics Society*. British Geriatrics Society. https://www.bgs.org.uk/resources/ambitions-for-change-improving-healthcare-in-care-homes#anchor-nav-contributors

Buckner, L., & Yeandle, S. (2015). *Valuing Carers 2015. The rising value of carers' support*. Carers UK. https://www.carersuk.org. https://www.carersuk.org/media/5r1lcm2k/cuk-valuing-carers-2015-web.pdf

https://doi.org/10.1017/S1357321725100184 Published online by Cambridge University Press

Chen, Y., Bandosz, P., Stoye, G., Liu, Y., Wu, Y., Lobanov-Rostovsky, S., French, E., Kivimaki, M., Livingston, G., Liao, J., & Brunner, E.J., (2023). Dementia incidence trend in England and Wales, 2000–19, and projection for dementia burden to 2040: Analysis of data from the English Longitudinal Study of Ageing. *The Lancet Public Health*, **8**(11), e859–e867.

Commission on Funding of Care and Support. (2011). *Fairer Care Funding – The Report of the Commission on Funding of Care and Support (The Dilnot Report)*. The Stationery Office.

Forder, J., & Fernandez, J.L. (2011). *Length of stay in care homes. A report commissioned by Bupa Care Services*, PSSRU Discussion Paper 2769, PSSRU.

Gaugler, J.E., Duval, S., Anderson, K.A., & Kane, R.L. (2007). Predicting nursing home admission in the U.S: A meta-analysis. *BMC Geriatrics*, **7**(13). https://doi.org/10.1186/1471-2318-7-13

GBD. (2022). Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: An analysis for the Global Burden of Disease Study 2019. GBD 2019 Dementia Forecasting Collaborators. *The Lancet Public Health*, **7**(2), E105–E125. https://doi.org/10.1016/S2468-2667(21)00249-8

GOV.UK. (2022). *Policy Paper. Adult social care charging reform: Further details*. Prime Minister's Office, 10 Downing Street, Cabinet Office, Dept. Health and Social Care. Updated 8 March 2022. https://www.gov.uk/government/publications/build-back-better-our-plan-for-health-and-social-care/adult-social-care-charging-reform-further-details

Huyer, G., Brown, C.R.L., Spruin, S., Hsu, A.T., Fisher, S., Manuel, D.G., Bronskill, S.E., Qureshi, D., & Tanuseputro, P. (2020). Five-year risk of admission to long-term care home and death for older adults given a new diagnosis of dementia: A population-based retrospective cohort study. *Canadian Medical Association Journal*, **192** (16) E422–E430 https://doi.org/10.1503/cmaj.190999

Kojima, G., Iliffe, S., & Walters K. (2018). Frailty index as a predictor of mortality: A systematic review and meta-analysis. *Age and Ageing*, **47**(2), 193–200. https://doi.org/10.1093/ageing/afx162

Livingstone, G., Hutley, J., Sommerlad, A., Ames, D., Ballard, D., Banerjee, S., Brayne, C., Burns, A., Cohen-Mansfield, J., Cooper, C., Costafreda, S.G., Dias, A., Fox, N., Gitlin, L.N., Howard, R., Kales, H.C., Kivimaki, M., Larson, E.B., Ogunniyi, A., Orgeta, V., Ritchie, K., Rockwood, K., Sampson, E.L., Quincy, Samus., Schneider, L.S., Selbaek, G., Teri, L., Mukadam, N. (2020). Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet*, **396**(10248), 413–446.

Luppa, M., Luck, T., Weyerer, S., König, H-H., Brähler, E., & Riedel-Heller, S.G. (2010) Prediction of institutionalization in the elderly. A systematic review. *Age and Ageing*, **39**(1) 31–38. https://doi.org/10.1093/ageing/afp202

National Audit Office. (2018). *Adult social care at a glance*. National Audit Office. https://www.nao.org.uk/wp-content/uploads/2018/07/Adult-social-care-at-a-glance.pdf

National Institute on Aging. (2024). *What is long-term care?* National Institute on Aging. https://www.nia.nih.gov/health/long-term-care/what-long-term-care

NHS CHC. (2024). *NHS continuing healthcare*. NHS CHC. https://www.nhs.uk/conditions/social-care-and-support-guide/money-work-and-benefits/nhs-continuing-healthcare/

Nihtilä, I., & Martikainen, P. (2007) Household income and other socio-economic determinants of long-term institutional care among older adults in Finland. *Population Studies*, **61**(3) 299–314. https://doi.org/10.1080/00324720701524193

OECD. (2017). Chapter 11 Ageing and long-term care. Informal carers. In *Health at a Glance 2017: OECD Indicators*. OECD Publishing. https://doi.org/10.1787/health_glance-2017-78-en

OECD. (2020). *Spending on long-term care. Brief November 2020*. OECD Health/Aging and Long-Term Care. https://www.oecd.org/health/health-systems/Spending-on-long-term-care-Brief-November-2020.pdf

OECD. (2021a). Chapter 10 Ageing and Long-Term Care. Long-term care spending and unit costs. In *Health at a Glance 2021: OECD indicators*. OECD Publishing. https://doi.org/10.1787/ae3016b9-en

OECD. (2021b). Chapter 10 Ageing and Long-Term Care. Long-term care settings. In *Health at a Glance 2021: OECD indicators*. OECD Publishing. https://doi.org/10.1787/ae3016b9-en

ONS. (2021). *Life expectancy in care homes, England & Wales: 2011 to 2012*. Office for National Statistics. https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/articles/lifeexpectancyincarehomesenglandandwales/2011to2012

ONS. (2022). National population projections: 2020-based interim. Office for National Statistics. ~https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2020basedinterim#:~:text = More%20people%20at%20older%20ages,of%20the%20total%20UK%20population

ONS. (2023). *Life expectancy in care homes, England & Wales: 2021 to 2022*. Office for National Statistics. ~https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/articles/lifeexpectancyincarehomesenglandandwales/2021to2022#:~:text = 1.,years%20and%20over%20for%20males

Salminen, M., Laine, J., Vahlberg, T., Viikari, P., Wuorela, M., Viitanen, M., & Viikari, L. (2020). Factors associated with institutionalization among home-dwelling patients of Urgent Geriatric Outpatient Clinic: A 3-year follow-up study. *European Geriatric Medicine*, **11**, 745–751. https://doi.org/10.1007/s41999-020-00338-7

Savills (2022). *UK and European Care Homes 2022. The countercyclical asset class?* Savills Operational Capital Markets. https://pdf.euro.savills.co.uk/portugal/uk-and-european-care-homes-report-q4-2022.pdf

Spasova, S., Baeten, R., Coster, S., Ghailani, D., Pena-Casas, R., & Vanhercke, D. (2018). *Challenges in long-term care in Europe. A study of national policies 2018*. European Commission.

Toot, S., Swinson, T., Devine, M., Challis, D., & Orrell, M. (2017). Causes of nursing home placement for older people with dementia: A systematic review and meta-analysis. *International Psychogeriatrics*, **29**(2), 195–208. https://doi.org/10.1017/S1041610216001654

Van den Bosch, K., Geerts, J., & Willemé, P. (2013). Long-term care use and socio-economic status in Belgium: A survival analysis using health care insurance data. *Arch Public Health*, **71**(1). https://doi.org/10.1186/0778-7367-71-1

Van Rensbergen, G., & Nawrot, T. (2010). Medical conditions of nursing home admissions. *BMC Geriatrics* **10**(46). https://doi.org/10.1186/1471-2318-10-46

Villeneuve, R., Meillon, C., Bergua, V., Tabue-Teguo, M., & Amieva, H. (2020). Influence of pre-admission factors on quality of life and adaptation in nursing home residents with dementia: The QOL-EHPAD study protocol. *BMC Geriatrics* **20**(92). https://doi.org/10.1186/s12877-020-1434-2

Vossius, C., Bergh, S., Selbæk, G., Benth, J.S., Myhre, J., Aakhus, E., & Lichtwarck, B. (2022). Mortality in nursing home residents stratified according to subtype of dementia: A longitudinal study over three years. *BMC Geriatrics* **22**(282). https://doi.org/10.1186/s12877-022-02994-9

Warren S. (2022). The cap on care costs: What does the government proposal mean? The Kings Fund. https://www.kingsfund.org.uk/blog/2022/03/cap-care-costs-what-does-government-proposal-mean

Zimmermann, J. (2022). Individual characteristics associated with the utilization of nursing care in the very old population: A cross-sectional study. *BMC Geriatrics* **22**, 763. https://doi.org/10.1186/s12877-022-03448-y

Appendix A

Data underlying the graphs in Section 4 for Figures 9 and 10, respectively.

Table A1. Data underlying Figure 9

Year 1 Post Admission Crude Mortality Rates										
	80	81	82	83	84	85	86	87	88	89
Females	33.60%	40.20%	43.90%	34.10%	32.70%	38.60%	39.60%	35.90%	40.80%	36.80%
Males	36.60%	46.00%	44.60%	54.60%	53.10%	53.30%	54.80%	53.20%	53.20%	55.80%
	90	91	92	93	94					
Females	41.70%	48.30%	42.00%	43.60%	37.50%					
Males	58.20%	63.30%	60.60%	62.80%	54.60%					

Table A2. Data underlying Figure 10

Year 2+ Post Admission Crude Mortality Rates										
	80	81	82	83	84	85	86	87	88	89
Females	27.50%	23.60%	24.50%	21.90%	24.60%	28.50%	28.60%	30.60%	29.00%	31.90%
Males	28.20%	35.90%	24.40%	41.60%	31.10%	38.20%	37.40%	38.00%	37.70%	37.10%
	90	91	92	93	94					
Females	30.90%	37.10%	32.50%	37.30%	30.90%					
Males	47.80%	45.90%	47.70%	47.40%	59.20%					

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Appendix B

The following is a transcription of the IFoA sessional event and Q&A held on Thursday 5 September 2024. The event was presented by Dr Mary Hall and Andrew Barry, the authors of the paper, and chaired by Sacha Dhamani. A recording of the sessional event is freely available on the IFoA Virtual Learning Environment (vle.actuaries.org.uk).

The Moderator (Mr S. Dhamani, F.I.A.): I am Sacha Dhamani. We will be discussing a paper containing analysis of the mortality experience of residents in care homes.

Understanding care mortality is important, both for determining appropriate public policy with respect to care provision, and for the wider understanding of longevity. In an aging society, an increasing proportion of the population will need care and there is a lack of understanding and analysis in this area. For many years actuaries have relied on a 2011 paper based on Bupa experience. The updated analysis presented in this paper is the result of a collaboration between Bupa and the IFoA's Mortality and Morbidity Research Steering Committee (MRSC).

Dr Mary Hall, Andrew Barry and Tom Kenny will be discussing the paper.

Dr Mary Hall is an Associate Professor in the School of Mathematical Sciences at Dublin City University. Her research interests are in the areas of mortality and mobility modelling, focusing on actuarial applications. She has published in a number of actuarial science journals and she is currently a member of the MRSC in the UK and the Demographic Committee of the Society of Actuaries in Ireland.

Andrew Barry is the head of Pricing Innovation at Bupa, where an elite team focuses on enhancing pricing processes through cutting-edge technologies. With over 20 years' experience in financial services, including financial planning, stockbroking, pensions, and life insurance, Andrew has worked with prominent companies such as Zurich, Nationwide Building Society and Sun Life. His commercial acumen, customer-centric approach and deep understanding of customer behaviour drives impactful pricing solutions. He is renowned for building and leading high-performance teams. Andrew (Barry) combines analytical expertise with innovative strategies to enhance market value and competitiveness.

Tom Kenny is a qualified actuary with over 23 years' experience in financial services. He is the Group Property and Credit Risk Director at Just Group, where he is responsible for the management of property and credit across the group's balance sheet. This includes setting the lending policy and property risk appetite in respect to the funding of lifetime mortgages, including considering the impact of climate risk. Tom is a member of the IFoA Life Board. He is chair of the Social Care Working Party, chair of the Solvency UK task force, and the past chair of the Equity Release Mortgages Working party at the IFoA. Tom has co-authored several papers on social care and insurance solutions for care, including analysis of prior social care reform proposals.

Dr M. Hall, F.I.A.: This is joint work between the IFoA's Mortality Research Steering Committee (MRSC) and Bupa, looking at factors affecting the mortality experience of residents of Bupa long-term care facilities over the period from 2016 to 2019. I would like to thank Bupa for kindly agreeing to participate in this research and providing the data for analysis.

I would like to acknowledge Adele Groyer from the IFoA Social Care Working Party for her significant contribution to the production of this paper, from the initial design through to analysis and write-up. Sadly, Adele passed away earlier this year.

As the population ages, the provision of adult long-term care is one of the major challenges facing the UK and other developed nations. Pre-pandemic (2019) life expectancy in England and Wales was approximately 79 years for males and 83 years for females. Compared to the beginning of the twentieth century, this is an increase in life expectancy of over 30 years. These improvements in life expectancy have led to an aging population, and a corresponding increase in the need for long-term care provision.

Improvements in life expectancy are expected to continue. The proportion of the UK population currently aged 85 and over, the age group most likely to need residential long-term care, is projected to increase from approximately 2.5% of the population in 2020 to 4.3% of the population by 2045. Thus, there will be an increase in demand for long-term care in the future.

Long-term care covers a range of services designed to meet a person's health or personal care needs, when they can no longer perform everyday activities on their own. Long-term care covers home-based care, community care (adult day care centres, for example) and long-term care facilities that provide accommodation and care as a package. Our research focuses on long-term care facilities. The terminology in respect of long-term care facilities varies, and the terms "nursing home," "care home," "residential home" and "institutional long-term care" all refer to long-term care facilities.

The risk factors for admission to long-term care facilities are as follows:

- Older age – the likelihood of admission increases with age.
- Female gender – more females are admitted to LTC facilities than males.
- Other risk factors – living alone and isolation, for example.

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Research on the impact of socioeconomic status on admission is ambiguous, with no definite correlation between socioeconomic class and the likelihood of admission. In general, the most common medical diagnosis amongst long-term care residents is dementia, and stroke is the second most common. Once admitted, the primary factors affecting the duration of care are age and level of dependency, with females typically experiencing longer care durations than males.

Funding for long-term care for the elderly is complex. It reflects the range and level of services provided, with the total cost depending on the duration of long-term care required. OECD (2021b) reports that in 2019 spending on long-term care across OECD countries accounted for approximately 1.5% of GDP. The spending ranged from 4.1% of GDP in the Netherlands to 0.1% in Mexico, with the UK at the higher end of the scale, spending 2.5% of GDP on long-term care.

Long-term care facilities providing nursing and residential care, which are the focus of this research, represent the most expensive form of care. The OECD report estimated that more than half of the spending on long-term care across OECD countries occurred in these long-term care facilities.

Costs in long-term care facilities are typically split between care costs (personal and nursing care costs, for example) and hotel-type costs (such as accommodation and food). Funding for long-term care varies across the UK. In England, Wales and Northern Ireland, total long-term care costs (care and hotel-type costs) are means tested. In Scotland, only the hotel-type costs for residential long-term care are means tested. Personal and nursing care is free for those assessed as needing such care by the local authority.

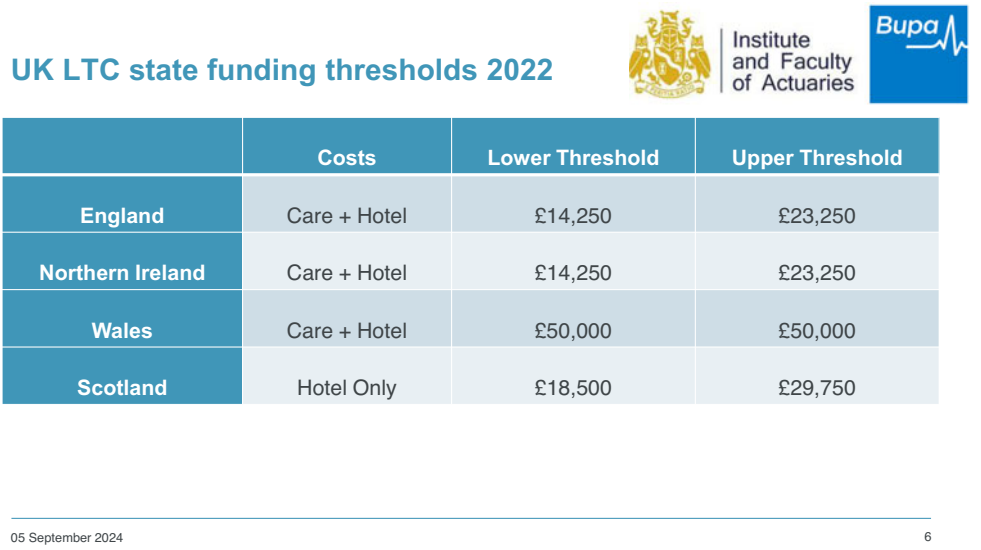

Figure B1. UK long-term care state funding thresholds 2022.

Figure B1 shows the thresholds for state funding for long-term care in the UK, as of 2022. Those with savings above the upper threshold paid the full cost of the care and those with savings below the lower threshold had the full cost of their long-term care met by the local authority. Those between the upper and lower thresholds contributed in part to their long-term care. In Wales, a single threshold applies. The means testing in England, Wales and Northern Ireland does not apply to those who qualify for care under the NHS Continuing Healthcare Programme. The NHS Continuing Healthcare Programme meets the total care costs of those with complex long-term healthcare needs who are assessed as having a primary health need for care.

A report by the National Audit Office in 2018 indicated that approximately 44% of older people in independent sector care homes in the UK pay for their own care. These are "self-funders" and the percentage varied considerably by region. For example, in England, the proportion of self-funders ranged from about 23% in the North East to 62% in the South East.

Long-term care costs can be a significant financial burden for individuals and families. Over the years, there have been various government commissions and initiatives aimed at reforming the provision of adult social care in the UK. The 2010 Dilnot Commission was tasked with making recommendations for the reform of adult social care in England. The Commission highlighted that uncertainty around future long-term care requirements meant that individuals were at risk of potentially very high care costs, and had limited ability to purchase financial protection against those costs. The Commission's recommendations included the introduction of a cap on the amount that individuals would have to spend on care costs over

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their lifetime. The proposal was accepted and a lifetime cap of £86,000 for personal and nursing care costs was expected to come into effect in England in 2025, together with increases to the state funding thresholds for long-term care. The lifetime cap of £86,000 did not include the hotel-type costs associated with long-term care.

Despite those proposed changes, research indicated that the risk of catastrophic care costs for some individuals in England would remain. In July 2024, the government decided not to go ahead with the lifetime care cap in England and it is currently unclear what, if anything, will replace it. Funding for long-term care in the UK continues to be a major issue for the government, and for society in general.

To plan and fund for long-term care, you need an understanding of the factors affecting the mortality, and hence the duration of care, for long-term care recipients. In the paper, we analysed the duration of care and the mortality experience of Bupa care home residents over the period 2016 to 2019. We hope that, by presenting mortality rates and care durations for various resident profiles, the research will help both individuals and the government to plan for future care needs.

Andrew (Barry) will present the results.

Mr A. Barry, F.I.A.: Before looking at the data, I will start with the framing and some key definitions and assumptions. Our research looked at how certain factors, based on information captured on admission, influenced the length of stay in a Bupa care home.

We only looked at permanent residents, and individuals accessing respite care or short-term residence were excluded from the data. We looked at the period from 2016 to 2019 and included individuals who were admitted as permanent residents during that time. We are going to present the results from two areas of interest. The first is the average number of days that the residents were in the care home before they passed away, and the second is the crude mortality rates.

The factors that were captured on admission were:

- Age
- Gender disclosed
- Conditions on admission (dementia, end-of-life care and frail elderly)
- Care required (nursing or residential)
- Funding status (private or public).

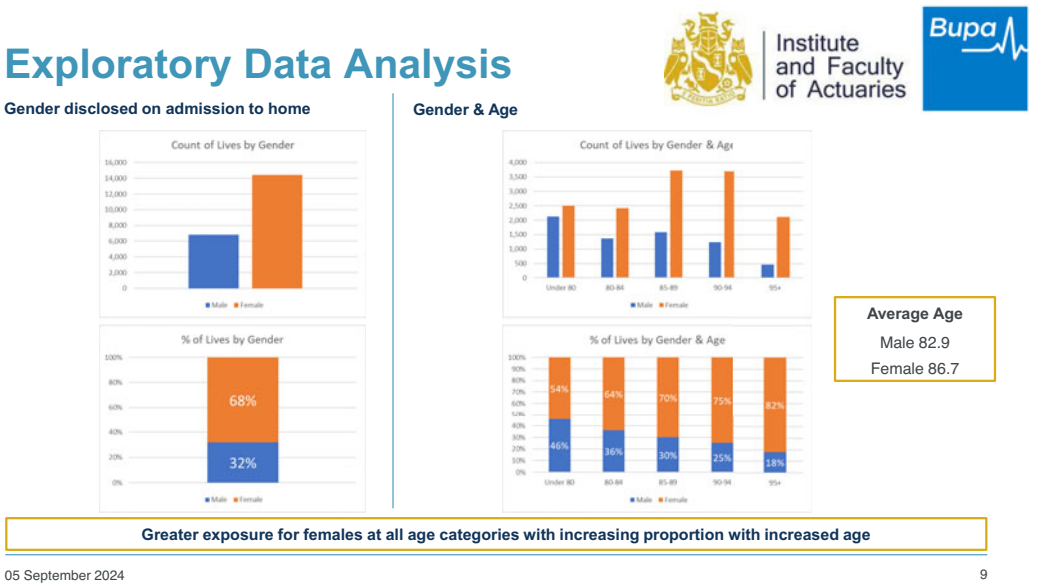

Figure B2. Exploratory data analysis – gender split.

We observed around 30,000 lives within Bupa care homes over the period 2016 to 2019. 68% of those lives were female and 32% were male. We split the data by gender and age and found that, most commonly, males were under age 80 on admission, and females were admitted in their 80s and early 90s. The second set of charts in Figure B2 show the split between males and females by age on admission. For residents under 80 years on admission, the male/female split is almost 50/50, whereas those residents who were 95 years and above on admission were predominantly female. The average age difference between males and females on admission was about four years.

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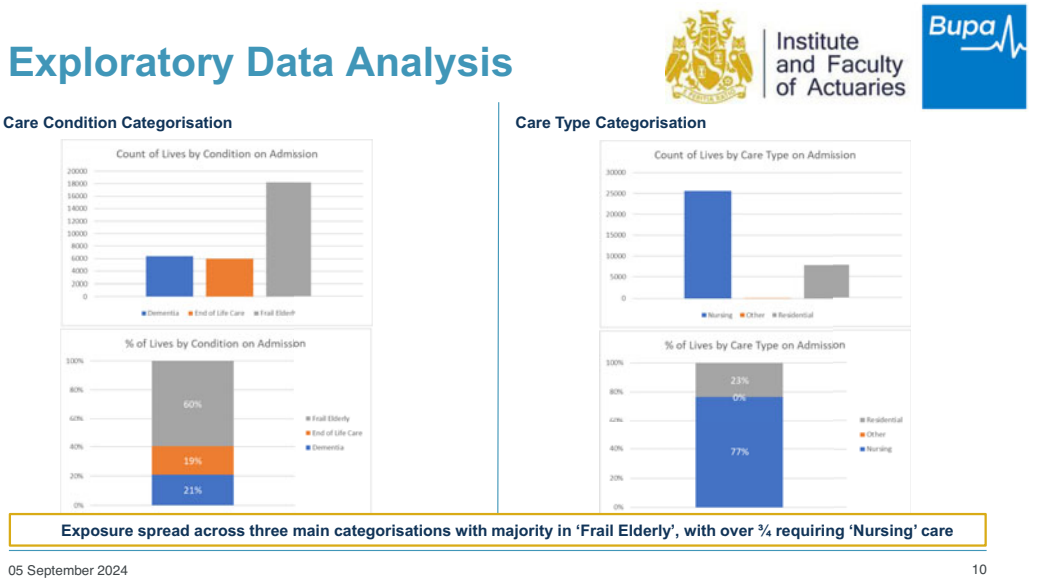

Figure B3. Exploratory data analysis – condition on admission.

We also split the data by condition on admission as shown in Figure B3. Most Bupa residents, around 60%, were classed as "frail elderly" on admission. There was a roughly even split across the "dementia" and "end of life care" categorisations for the remaining 40% of residents. We also found that 77% of residents required some form of nursing care. Figure B3 also shows a small number of residents categorised as "other," which represents some of the younger people coming into the care homes.

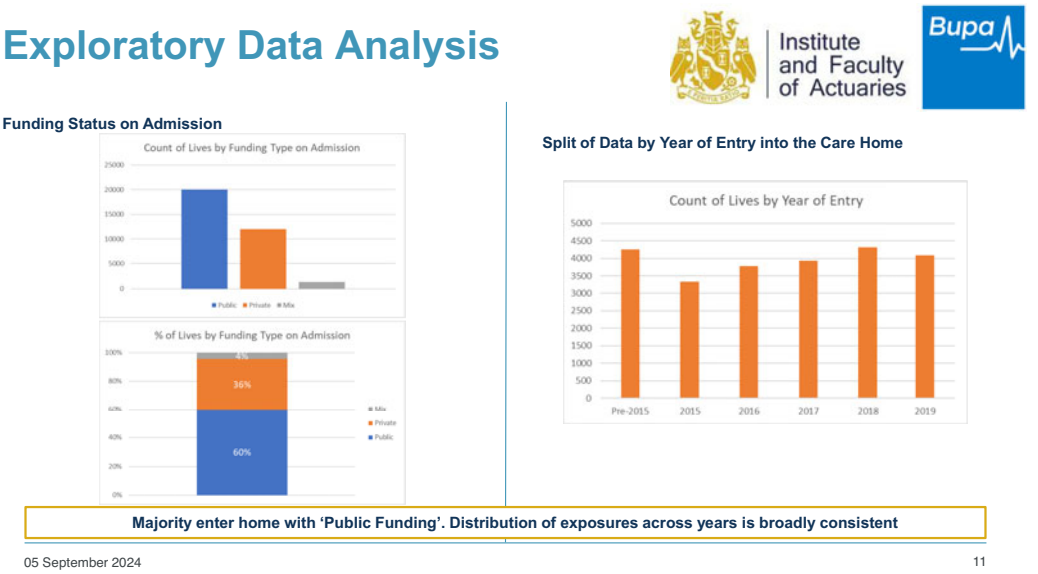

Figure B4. Exploratory data analysis – funding status on admission.

Figure B4 shows funding status on admission. 60% of admissions were funded through public money and 36% were privately funded, and the remaining 4% were a mixture. Figure B4 also shows the count of lives by year of entry. The chart shows a slight skew on the left-hand side. This represents residents who entered before our analysis period but were within the care home during the observation period.

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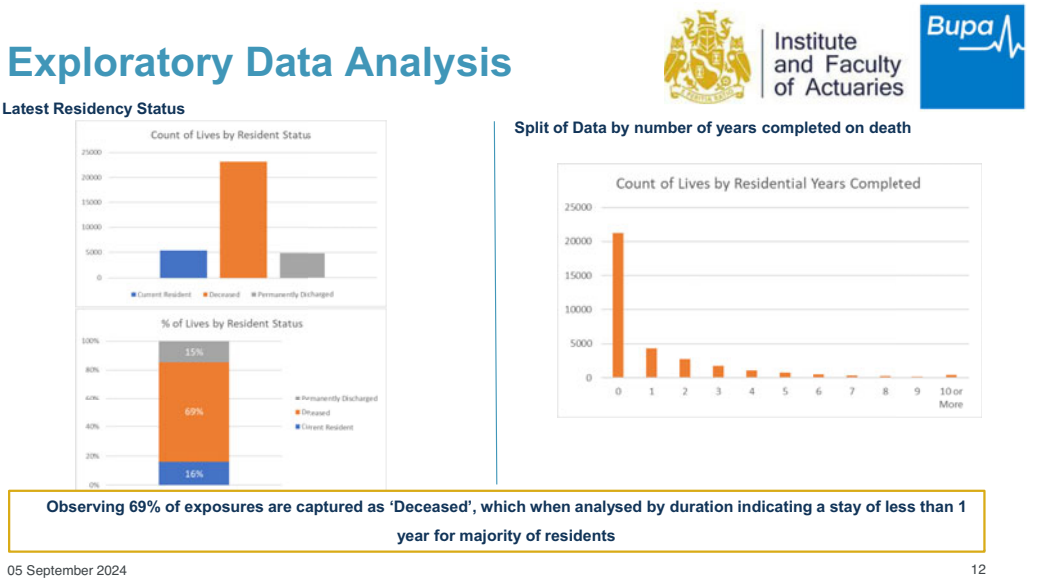

Figure B5. Exploratory data analysis – death, discharge and survival.

During the observation period, 69% of residents passed away. 15% of residents were discharged into other homes and the remaining 16% of residents were still in the care homes at the end of the observation period. You can see in Figure B5 that, at the time of death, the vast majority of residents had not been in the care homes for more than 12 months. This demonstrates that those admitted to care homes are often in severe ill health.

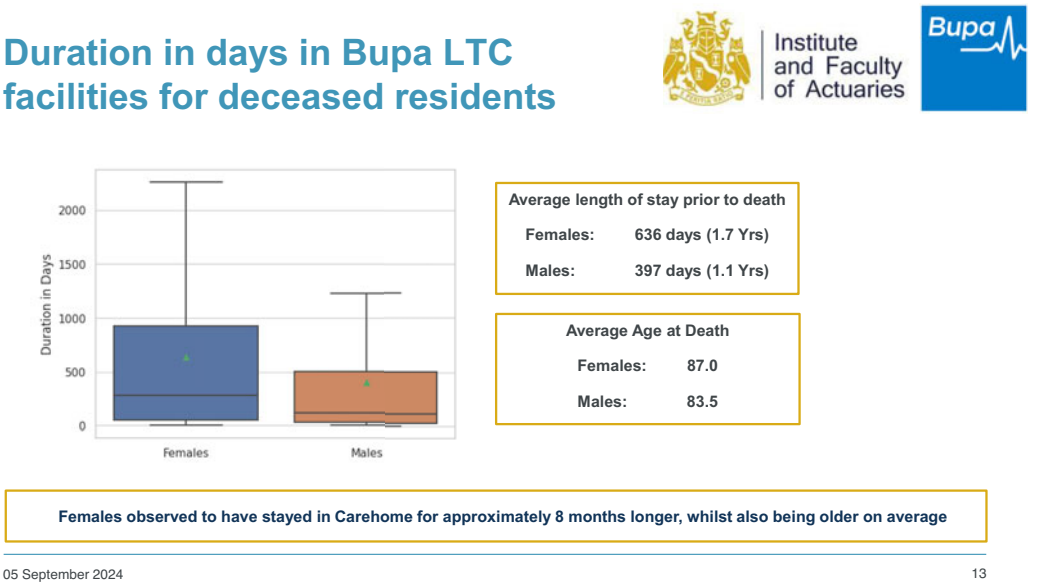

Figure B6. Duration of stay for deceased residents.

In Figure B6 the duration of stay in the care homes for residents who died during the observation period is plotted. Figure B6 shows box and whisker plots. 75% of the data lies in the boxes. The horizontal lines in the boxes show the medians, and the means are shown by the green triangles. There is a strong skew from the short durations demonstrated by the median being close to the lower bounds, and the mean being dragged higher due to the longer tails of the durations. Males stay in the care homes for around eight months less than females on average, and the average age at death is 87 years for females and 83.5 years for males.

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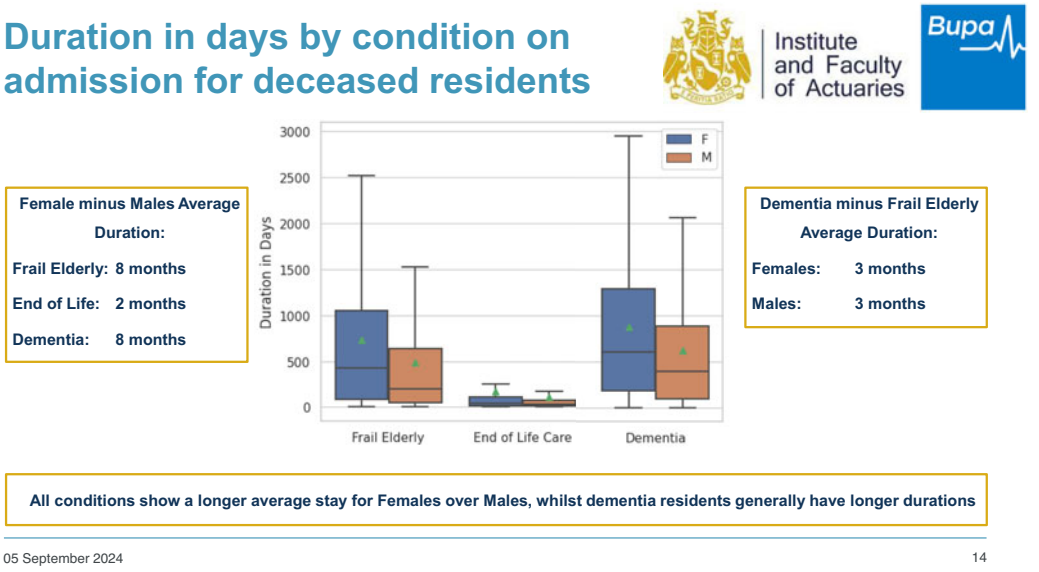

Figure B7. Duration of stay for deceased residents by condition on admission.

We have also split the data by condition on admission. In Figure B7, you can see that those admitted for end-of-life care have short durations. Overall, we did not see many residents stay for long periods, demonstrating the ill health issue. For the "frail elderly" and "dementia" categorisations, the durations are much longer. If we look at females admitted as "frail elderly" or "dementia," they stayed around eight months longer than males, on average, who had the same categorisation. We also found that, for both males and females, residents with dementia, although suffering a mental disability, were in the care homes for around 3 months more on average than those classed as "frail elderly" on admission.

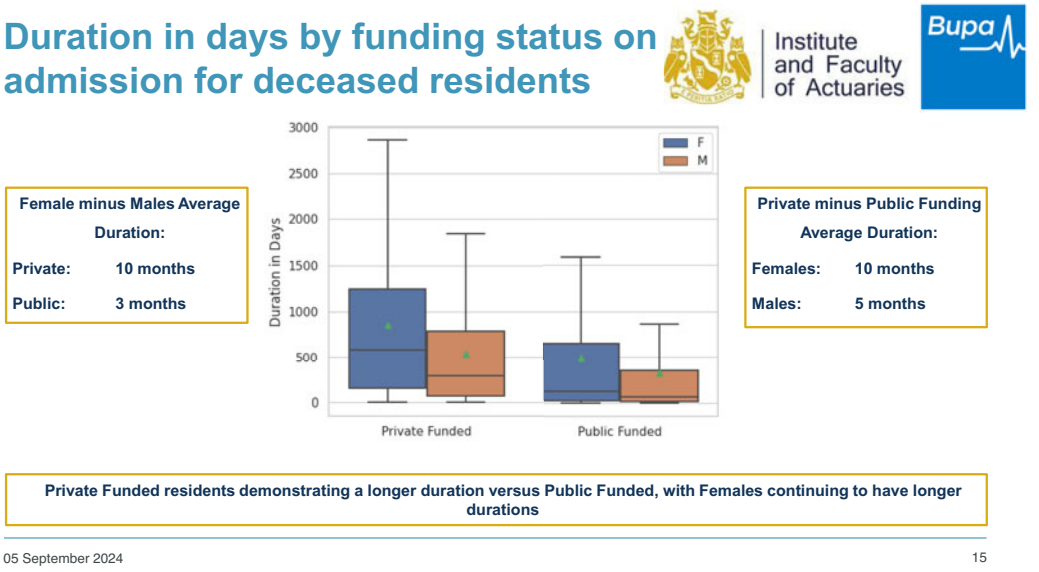

Figure B8. Duration of stay for deceased residents by funding status on admission.

We saw that privately funded residents and female residents stayed for longer durations in care homes. As you can see in Figure B8, the durations for the public funded residents are a lot shorter. There may be some additional ill-health coming through in the public funded side, when compared to the private, but we also saw that private funded residents were slightly

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older. There is a difference in durations between private and public funded females and males. For females, the average difference in duration between funding methods is ten months and for males it is five months.

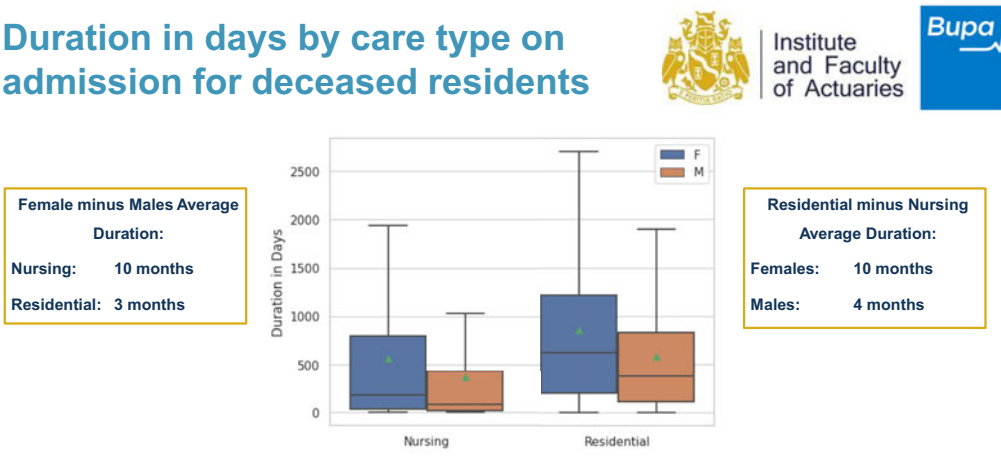

Figure B9. Duration of stay for deceased residents by care type on admission.

Finally, we looked at the differences in duration of stay based on care type on admission. The hypothesis here is that if you are being admitted for nursing, you are in worse health than those admitted for residential care. That is what you see in the distributions in Figure B9. To be clear, the care type is determined on admission. If they are admitted for residential care and move to nursing later, they will be captured under the residential category.

We then looked at the mortality experience. We predominantly analysed the older population, the 80 to 95-year-olds for the period, and removed the residents categorised as "end-of-life," due to the very short durations. Instead, we focus on understanding some of the dynamics in the other areas. We split the mortality rates into two categories. The first category, "year 1 post admission," looks at the residents who died within one year of admission. The second category, "year 2+ post admission," looks at residents who died more than one year after admission.

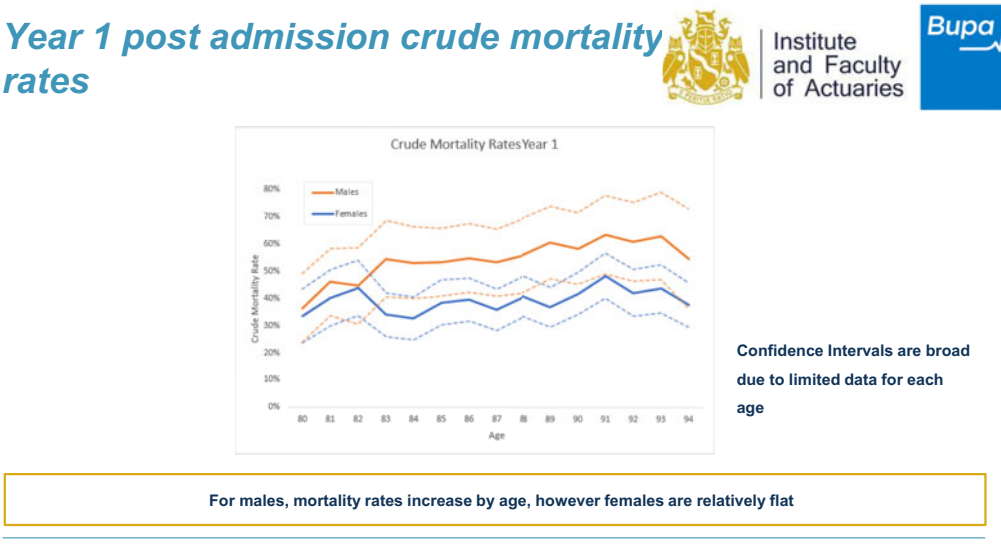

Figure B10. Year 1 post admission crude mortality rates.

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Figure B10 presents the crude mortality rates for year 1 post admission, and the confidence intervals are fairly broad. This shows that when we start to dig into particular age groups and particular conditions, we start to lose a little bit of credibility in terms of quantity of data. The chart shows an increase in trend through the ages, with males being higher than females. For ages above 82–83 years, the first year mortality rate is above 50% for males, and around 35–40% for females. These rates are fairly flat. From general life mortality experience we might expect these to be increasing in later years, but, for our care home population, this is not really the case.

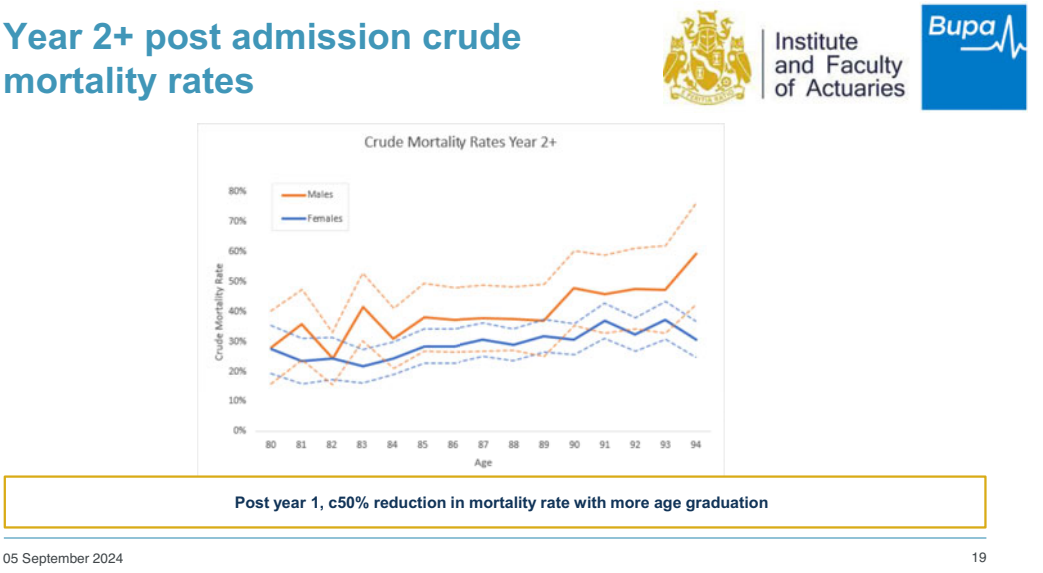

Figure B11. Year 2+ post admission crude mortality rates.

Figure B11 shows the second category, "year 2+ post admission," and there is a little bit of volatility. There is more age graduation, but again we have observed that the mortality rates across the ages are a lot flatter than you might expect. This demonstrates that age becomes less relevant within the care home setting because people are admitted with differing conditions.

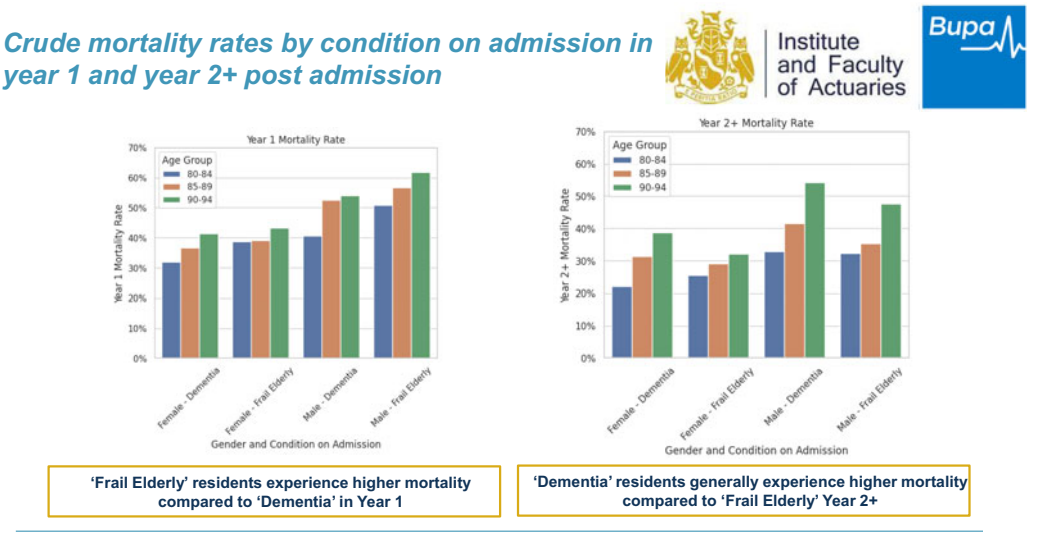

Figure B12. Crude mortality rates by condition on admission in year 1 and year 2+ post admission.

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In Figure B12, we have split the results by gender and condition on admission, and by three key age categories. Overall, the year one mortality rates were higher for males. We found that the mortality rate in the first year was higher for the frail elderly condition, compared to those with dementia on admission, for both males and females. Interestingly, you do not see that same pattern in the year 2+ mortality rates, where the rates for dementia are higher than for the frail elderly category.

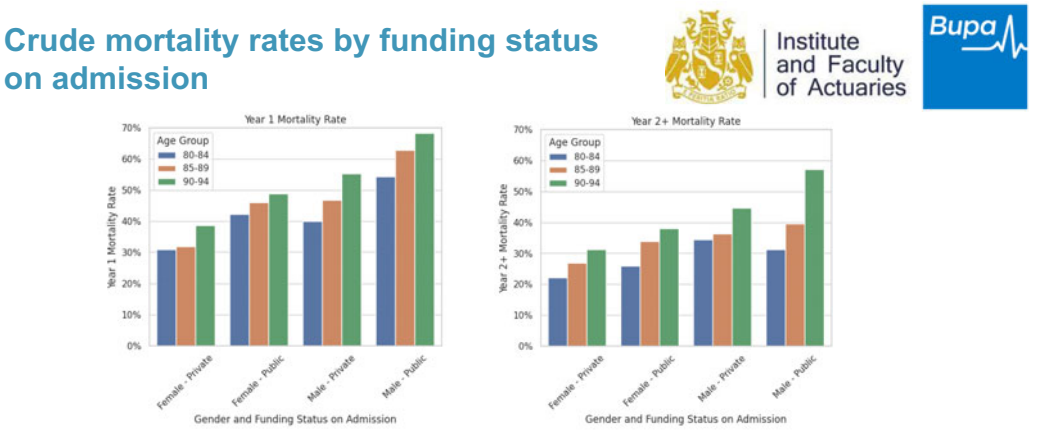

Figure B13. Crude mortality rates by funding status on admission in year 1 and year 2+ post admission.

Figure B13 shows charts with the data split by funding status on admission. The general trend here is that publicly funded residents have a higher mortality rate both in year one and year 2+. Again, the rates for males are significantly higher than for females. We can start to quantify the differences between the different funding statuses and gender. In year 2+, the mortality rates are a lot lower, and the relative rates of mortality are persistent across the different funding methods.

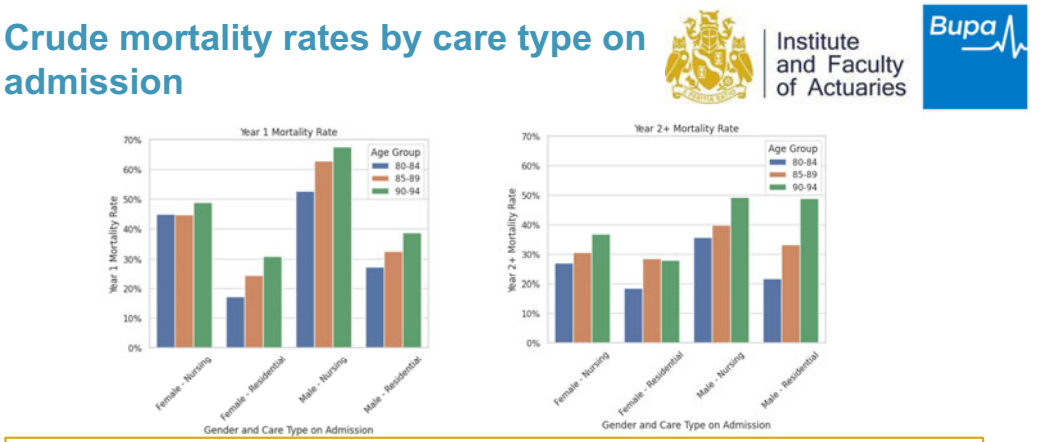

Figure B14. Crude mortality rates by care type on admission in year 1 and year 2+ post admission.

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Figure B14 shows the data split by type of care required on admission. You start to see some stark contrasts in the year one mortality rate. There is less graduation between the ages for females requiring nursing care and the mortality rates for males requiring nursing care are significantly higher than those for both males and females together requiring residential care. This gives an indication that people who are being admitted for nursing care are in significantly worse health than the residential patients.

The year 2+ mortality rates are slightly more even. The rates for nursing care residents have come down significantly and the rates for residential care are similar to those for year one for females, and not too dissimilar to those for males. The key change is the significant drop in mortality rates for nursing care residents. For nursing care residents who have been in the care home for a year, the mortality rate reduces significantly for year 2+.

Dr Hall: There are more detailed results presented in the paper. The data available on residents of long-term care institutions currently tends to be limited in nature, and that limits opportunities for research and analysis of the factors affecting long-term care.

In this investigation, we have been able to use data from Bupa care homes to examine the factors affecting the mortality experience and the duration of care for residents of long-term care institutions. We are grateful to Bupa for providing the data. Ultimately, by analysing such factors, it is hoped that more accurate long-term care funding models can be developed that will improve the provision of care for the elderly.

To summarise some of the results, we saw that, consistent with existing research, most Bupa care home residents were female and had a higher average age profile and longer average duration of stay than male residents. For those residents who died during the investigation, the average length of stay was approximately 1.6 times longer for females than males. It should be noted that females are less likely to be able to afford institutional long-term care compared to their male counterparts, given lifetime gender differences in earnings, pensions and asset ownership.

We saw from Andrew (Barry)'s presentation that the mortality of the residents varied with duration. New residents or those in their first year since admission experienced higher mortality than existing residents of the same age. Due to limited data volumes, we could only analyse the mortality of residents in their first year and then mortality of residents in subsequent years in aggregate. It was not possible to determine if a longer reverse select period than one year applied.

We looked at how mortality varied by various factors. The analysis was very high level and only looked at crude mortality rates. However, the initial results were reasonable. In future, we would hope to extend the analysis to provide a multivariate analysis of the impact of the various factors. This would allow us to better understand the interactions between the factors and trends over time. More sophisticated models, for example, those examining transitions between care types, could also be considered depending on data availability.

The factors affecting long-term care will evolve over time. For example, dementia is currently a significant factor affecting admission and mortality in long-term care facilities. In 2019, for residents aged 80 plus in nursing homes in England and Wales, dementia accounted for 36% of male deaths and 42% of female deaths.

Future changes in the prevalence of dementia will affect the demand for long-term care. GBD 2019 Dementia Forecasting Collaborators (2022) and Livingstone *et al*., 2020) have indicated that the incidence rate for dementia has dropped for more recent cohorts compared to earlier cohorts in high-income countries. This decline is mainly attributed to educational, socio-economic, healthcare and lifestyle changes. On the flip side, however, increasing obesity, diabetes and declining physical activity in these countries may reverse this decline.

Trends in the incidence of dementia are not clear cut. Chen et al. (2023) note that in England and Wales, while dementia incidence declined in the first decade of the 21st century, a pattern of increasing dementia incidence was noted after 2010, which may indicate a qualitative change in the long-term trend. Ongoing research into the treatment and prevention of dementia will ultimately impact the need for long-term care and long-term care facilities in the future.

Currently, most long-term care is provided informally, typically by family and friends, generally without pay and mainly by women. However, the need for formal long-term care is expected to increase in the future due to various factors, such as declining family size, increased female labour force participation, and so on. While countries are increasingly moving towards home-based and community-based long-term care, residential long-term care facilities are expected to remain an important element of overall long-term care.

The Covid-19 pandemic had a devastating impact on residents of nursing homes. However, it has led to an increased focus on the importance of monitoring and improving care nationally for nursing home residents. If this momentum can be maintained in the future, it could have a significant impact on life expectancy in nursing homes.

Finally, a quick word on data quality. The lack of data in respect of long-term care facilities has long been a recognised problem, which only became more significant during the pandemic. There are major initiatives under way in the UK to improve the quality of such data, for example, the DACHA study (Developing resources And minimum data sets for Care Homes' Adoption). It aims to develop a minimum data set to facilitate care home research and innovation. You also have the Government's 2023 Road Map for Better Adult Social Care Data, which aims to improve the quantity and quality of care data available by joining up health and social care data. Improvements in data quality will allow for better modelling of long-term care in all its forms and hence improvements in planning and funding for long-term care, including residential care.

Mr T. P. J. Kenny, F.I.A.: I will share two perspectives. Firstly, I became involved with research on social care and the cost of care in March 2013. At that point in time, it was purely an intellectual curiosity for me. I was an actuary working in a pricing

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team and one of the products we priced was immediate needs annuities, which is a product for people in care homes. Since then, it has become more personal. My stepfather went through end-of-life care in 2014 and my mother has had her own journey through the social care system, starting with care at home in 2016 and then in a nursing home from 2022.

I think this paper is a welcome update to the Bupa paper published in 2011. Since 2011, there has not been anything published in the public domain that could help with more accurate modelling of the likely cost of care for someone in a residential or nursing home setting.

With better data, we can model the potential cost of care for individuals more accurately. The Social Care Working Party used the previous data set to assist with the modelling of the anticipated social care reform. In 2013–14, we used the previous data set to model the likelihood of someone benefiting from the care cap. We published information about there being, on average, a 13% chance of someone in England benefiting from the cap and there being quite significant regional variations. In the Northwest, there was a 7% chance of reaching the cap, and in the Southeast, a 22% chance. That is just one example of how that data can be used.

More recently, we have been exploring how potential insurance solutions could be developed to dovetail with any social care reforms. The social care reforms have been cancelled by the current government, but no doubt there will be more coming. There is an urgent need for social care reform, and so this is a vital update to the data that is available in the public domain.

There are lots of other initiatives going on. This is a welcome addition that should enable more accurate modelling and, when other data becomes available, help to look at how people transition through the care system. What we are trying to do within the Social Care Working Party is look at how can we model the transition from someone being relatively healthy in their early 60s to having care needs in later life. That would enable modelling of how needs and demand for care in later life could change with changing transition rates. What will a change in the prevalence of dementia mean for the demand on the care system in the future? There are lots of things we can do with better data.

The Moderator (introducing the Q&A session): Using this survey, could you estimate what proportion of people aged 85 plus would require residential long-term care?

Mr Barry: It is a challenge because of the size of the care home market. The care home market is highly fragmented. The top five providers, of which Bupa is one, make up about 11% of that market. We have a small sample and it would be a real challenge to be able to estimate that with this level of data. Tom (Kenny) alluded to the requirement to get more data, for example from local authorities to understand the admission rates for an area. Obtaining such data would be very welcome.

The Moderator: Are there any issues of representation between the analysis that you have done? Would you consider it a fair and reasonable sample that could be extrapolated to the wider care population, or do you think there are systemic differences that we should expect to see between the two?

Mr Barry: It is as fair as it can be, given the size of the market. However, there will be some variations. For example, there may be geographical locations where there are historic or commercial reasons for Bupa to operate there. However, I do not believe that there would be any key biases within the data.

Mr Kenny: Obviously, the quality of care that someone receives in their care home will have an impact. I would like to see the actuarial profession working with local authorities and the NHS, to see how we might improve our understanding of how the quality of care affects life expectancy. This may enable better understanding of policy measures and preventative measures that can be implemented to try to improve the situation. The Social Care Working Party is actively working on the important issue of engaging with local authorities around how can we demonstrate the value of better data.

Dr Hall: It would be helpful to understand what is driving that difference between year one and year 2+ mortality rates. Is it purely down to health? But is that not captured by other factors? Closer analysis of that data could inform social policy.

Moderator: Anthony Tull has spotted that the year 2+ mortality rate for publicly funded males aged 80 to 84 was lower than for privately funded males in the same cohort. Do you have any thoughts on that?

Mr Barry: We have not done multi-factor analysis. It could be the case that we have a spread of, say, nursing care conditions versus residential care in that area and some random variation. I could not go into detail about why that feature is here, but multi-factor analysis would draw those things out.

Dr Hall: The quantity of data could be low for the younger age group for privately funded residents. You wonder how credible the data would be for those residents.

The Moderator: Andrew Cairns is asking about survival analysis type approaches and generalised linear models. Mary (Hall), at the end of the presentation, mentioned multivariate and multi state models. Do you want to elaborate on that?

Dr Hall: This was a very high-level analysis. We wanted to make it quite broad and easily read for a very wide audience. Consequently, there is no actual modelling of the data. The analysis could be extended by carrying out some kind of multivariate analysis. Generalized Linear Models or Generalized Additive Models could be used to allow for interactions between the factors. This would depend on availability and resources, but it is something we would hope to proceed with. There are other, more sophisticated models available. Multi-state models, which model residents' pathways from admission through to death, could be used. We did consider developing those kinds of models at the start of this analysis. Survival analysis-type models would be an obvious choice. That data is now being collected, but perhaps was not collected for the cohort that we were analysing. I think that the analysis should be repeated, both with more sophisticated modelling techniques and with newer data sets. There is a lot of scope for further modelling, depending on resources and availability. For example, it is important to see how trends are emerging or changing post-pandemic.

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Moderator: Were you able to calculate mortality rates for younger ages or was there not enough data to get credible results?

Mr Barry: The data for residents aged under 80 had quite a long span and it was difficult to cut at an appropriate point. We left it out to focus on those aged over 80, who make up 80% of the data, for data quality reasons.

Dr Hall: We looked at the data at younger ages and there was no pattern emerging. We focused on the older ages because there is more data for analysis.

Moderator: Will the data be publicly available or just the analysis in the paper?

Mr Barry: It will just be the analysis in the paper.

Moderator: When you were performing the analysis, did anything surprise you in the data or the results?

Dr Hall: When we were looking at the analysis of the data, I was quite pleased to see that we were getting results consistent with other research in terms of larger female population, females having a longer duration and the mortality gap between males and females. It does give confidence in the data when you are getting consistent results. Now that we have done the underlying high-level analysis, and have got reasonable results, we should make every effort to bring it to the next level and do some more sophisticated modelling to bring out these issues.

Moderator: What could be done to expand the understanding of care difference beyond the scope of this paper?

Mr Kenny: The social care reforms that were anticipated with the Dilnot cap were cancelled in July. There is still a need to reform the social care system. There is underfunding, a rapidly aging society and changing levels of need. We should consider how that will look in the future and think around the sustainability of the current system and any reformed system. The actuarial profession should be well placed to help support policy makers with this. To enable that, a key element is helping to develop the data set, and once it is available, supporting the modelling. We should consider what the impact of any social care reforms could mean for the sustainability of the funding model and what role insurance could have in that. There are quite a few social care systems around the world where the insurance market has a role to play. They have different solutions to dovetail with those systems. That would be something I would expect the actuarial profession would help with. If we end up with a social care system that is not entirely funded by the state, the public needs to understand what that means for them so that they can plan and make provision. That is where we are going with the research that the Social Care Working party is trying to undertake. We are more than happy to collaborate with anyone that would like to participate and help us because it is such a big subject.

Moderator: How did this analysis compare with the previous research, such as average time spent in care, excluding end-of-life?

Dr Hall: I am not sure how comparable the data sets were in terms of excluding end-of-life. We have done no direct comparison. Now that we have done the first analysis, hopefully repeating the analysis will be a lot easier. It depends on getting data, but we need to start looking at trends, not just points in time with different data sets. I would like to do more sophisticated modelling, but as a minimum, just to repeat the analysis again now that we are a few years post-pandemic would be very beneficial.

Moderator: I would like to reiterate our thanks to Bupa, without whom we could not have produced this data. We are incredibly grateful to them for allowing this paper to be created and published. It will be an incredibly valuable resource. I would also like to thank Mary (Hall), Andrew (Barry) and Tom (Kenny) for sharing their thoughts and time today.

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