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Introduction

- Growing evidence: increasing HCE in context of population ageing not solely driven by advanced age, but also by the fact that older people are closer to death
- HC costs at the end of life (inpatient care) main contributor to overall HCE
- HC costs not distributed evenly over an individual's life
- TTD research aims to attribute these costs correctly going beyond population ageing
- Zweifel et al (1999): age is insignificant predictor for HCE when TTD is accounted for: 'red herring' argument

Introduction

- Multitude of statistical/econometric methods, populations, HC settings and countries to explain relationship between age, TTD and HCE
- Difficult to draw conclusions and translate findings between HC systems (countries)
- Important to quantify the extent to which population ageing might impact on future HCE
- HCE projections: possible overestimation of future costs if TTD is not accounted for
- In order to fully explain driving factors behind HCE at the end of life in Scotland : representative sample of Scottish population

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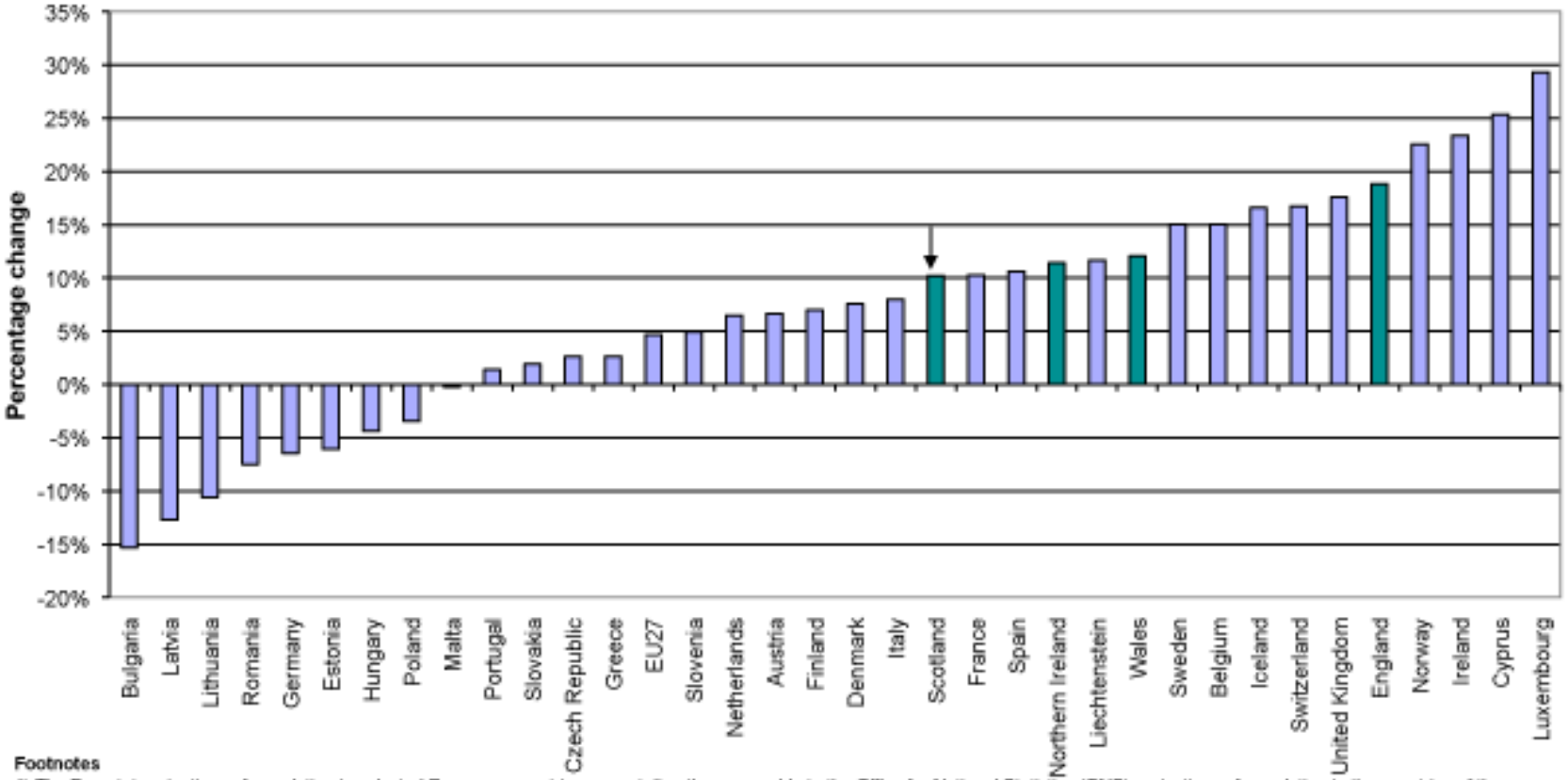
Research Aim

- High relevance for resource allocation and budget planning
- Currently no consideration of potentially lower costs for the oldest age groups at the end of life
- Generate empirical evidence of distribution of future HCE under two different scenarios:
  - i) 'demographic approach', assuming constant age profiles for HCE over time
  - ii) 'TTD approach', taking into account both age and proximity to death

Population Projections

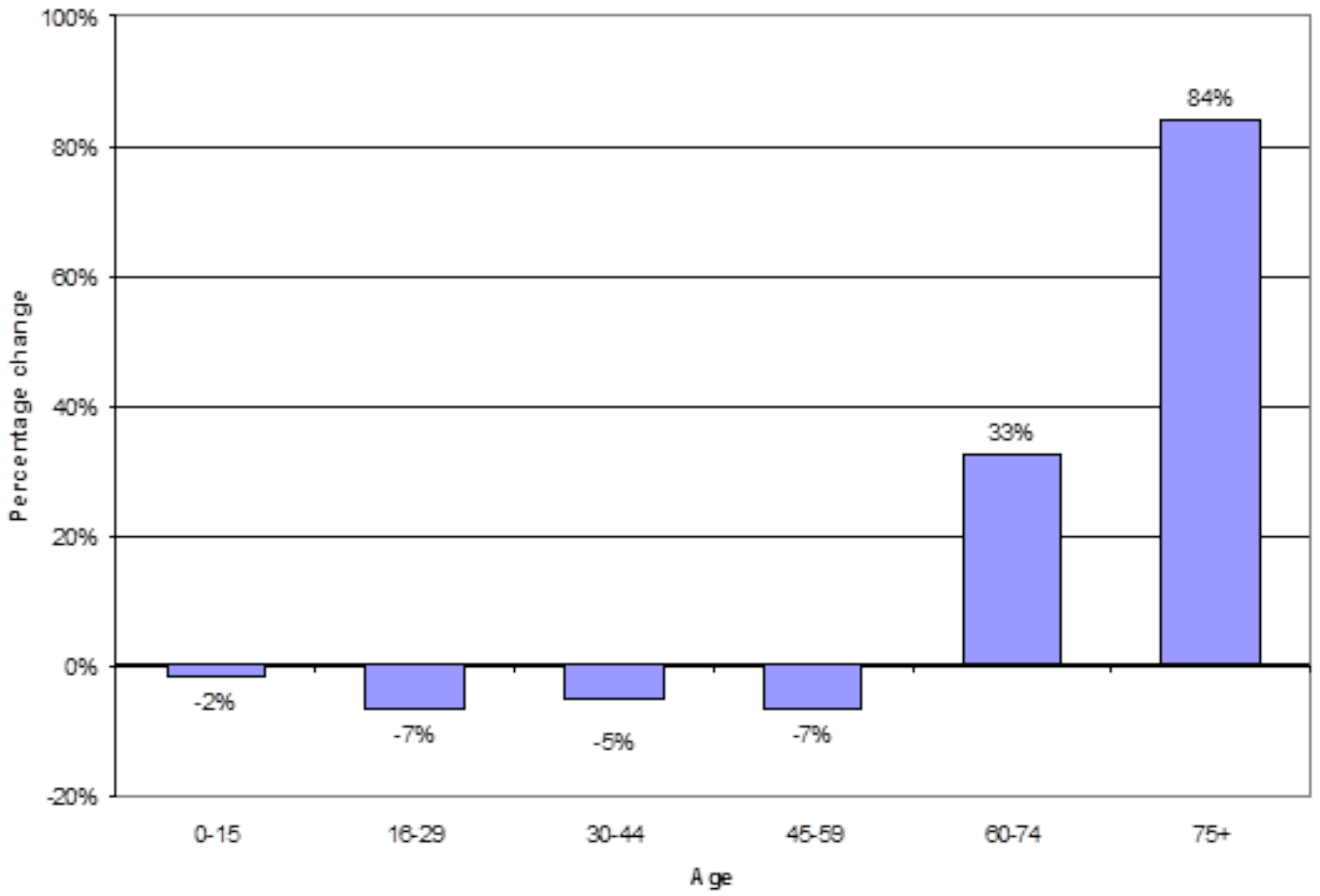


Footnotes

1) The Eurostat projections of population in selected European countries are not directly comparable to the Office for National Statistics (ONS) projections of population in the countries of the UK. The Eurostat projections are based on estimates of the population at 1 January while the ONS projections are based on estimates of the population at 30 June. The methodologies in determining the underlying fertility, mortality and migration assumptions also differ.

2) More information on the Eurostat projections can be found on the Eurostat website.

Population Projections



Projected percentage change in Scotland's population by age group, 2008-2033, (GROS, 2010)

Methods

- Data: SLS linked to hospital admissions (SMR01) and death records
- HCE in the last 5 years (20 quarters) of life for individuals aged 45+
- Inclusion of surviving sample members
- Inclusion of periods (quarters) without hospital admissions (zero costs)
- Costing method: Healthcare Resource Groups (HRGs) as the basis on which unit costs are assigned to a Continuous Inpatient Stay (CIS)

Methods

- Association between HC costs and TTD, accounting for: age, sex, socio-economic status (Carstairs deprivation score quintiles), health status and year of admission is determined by two processes:
  - First: access to HC services, i.e. utilisation
  - Second: costs incurred given positive utilisation
- Two-part model (probit; GLM with Gamma distribution and log link)
- Inclusion of surviving sample members requires use of survival analysis to predict TTD

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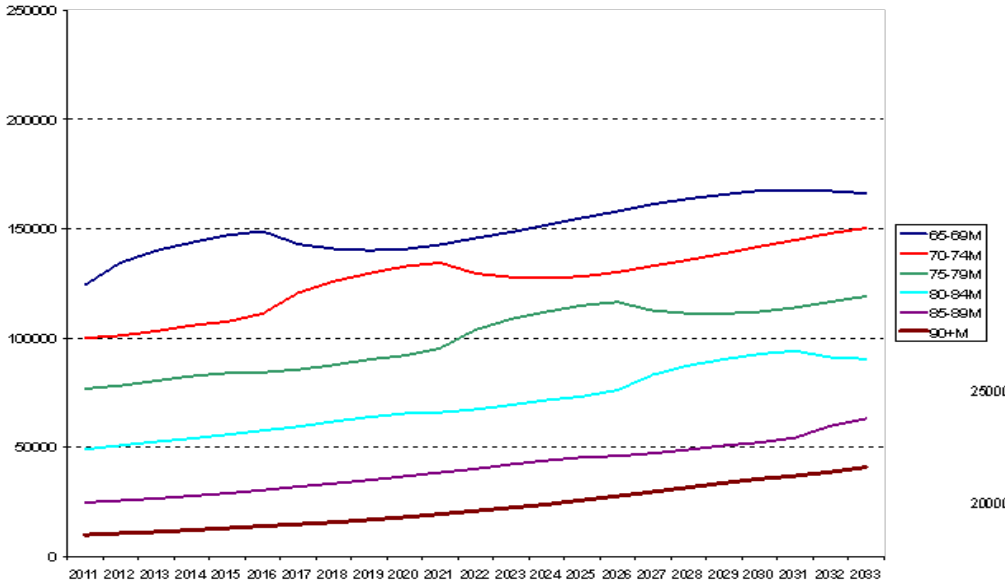
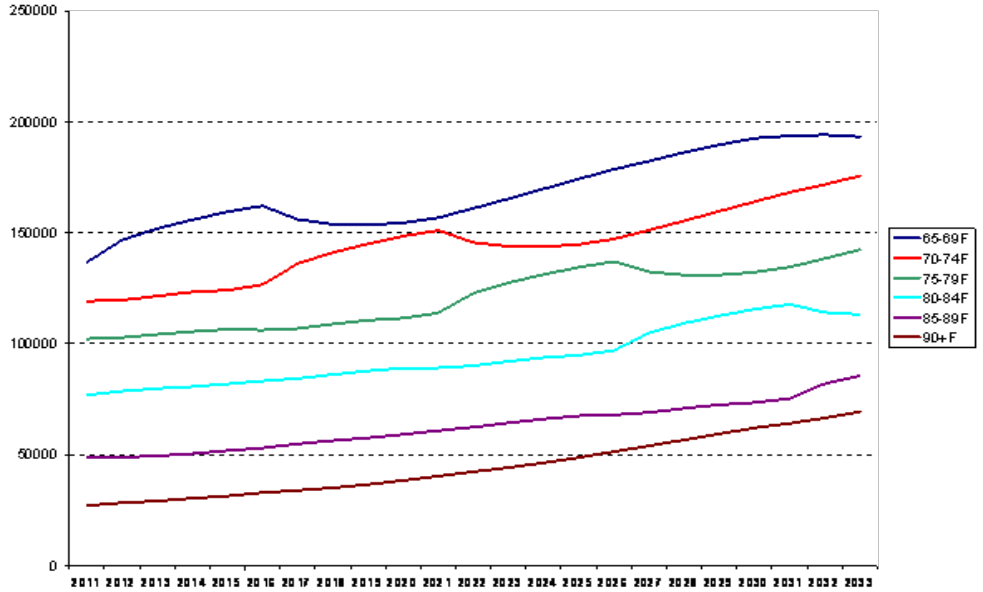
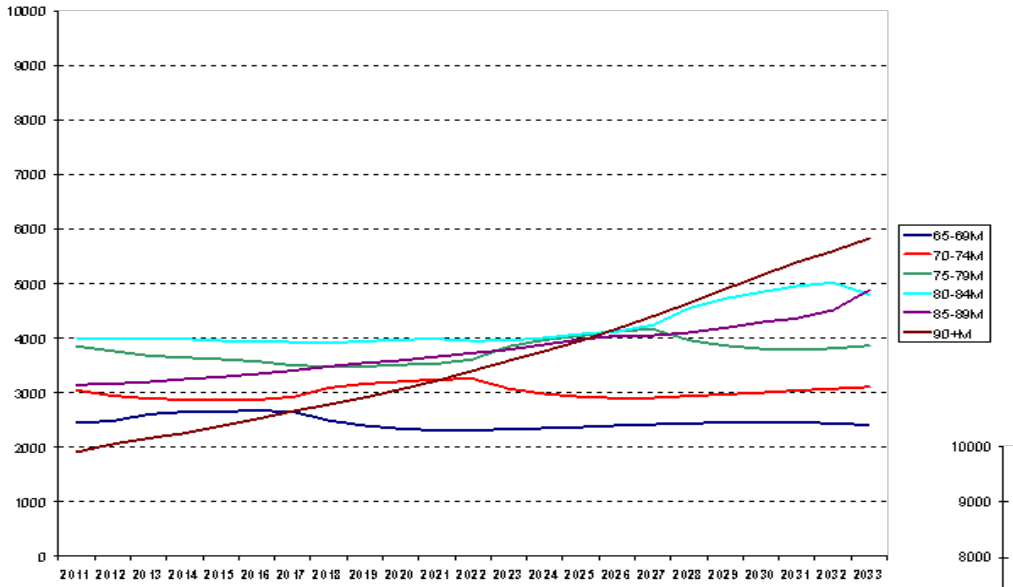
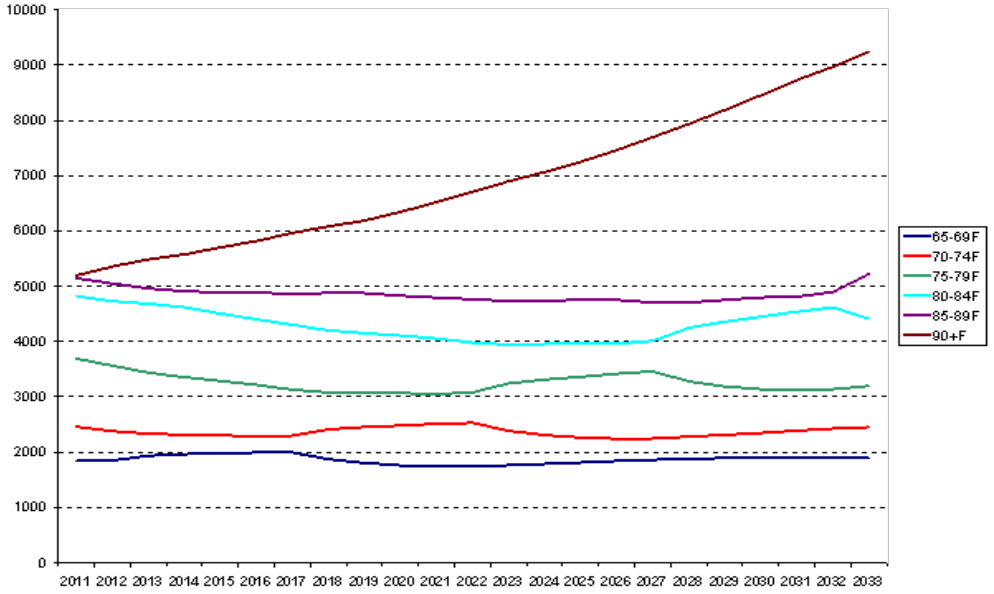
Projected number of males and females (65+)





Projected number of deaths, males and females





Cost Estimates

- Cost estimates obtained from econometric model - stratified by gender, age group for demographic approach and also for remaining TTD (TTD approach)
- Quarterly estimates are aggregated to represent annual costs
- Costs multiplied by the respective population estimates for each gender, age group and TTD stratum
- Comparison of growth rate of costs from 2011 onwards between demographic and TTD approach – Does a simplified approach overestimate future HC costs and if so, what is the magnitude of the overestimation?

Demographic Approach

- HCE projections based on 2008 population estimates (NRS) up to 2033 (base year: 2011)
- Per capita HCE stratified by gender and age group - multiplied by population estimates stratified by gender and age group ⇨ Estimate of overall expected financial burden on population level
- Costs aggregated over gender and age group ⇨ Cost projection under simplified approach, accounting for demographic changes in population only

Total number of males/females in each age group projected to be living in Scotland up until 2033 * HCE (stratified by age & gender)

TTD Approach

- Projected population numbers (gender and age group) also stratified by remaining TTD (number of people in each group in their last five years of life)
- Each age stratified by TTD in years to obtain estimates of the population in each calendar year that is in their last year of life, penultimate year of life, etc., using projected number of deaths by age and gender for the years
- Number of individuals projected to be in a particular year before death (year 1 to 5):

$$TTD_{1\text{-}5} = \text{Number of Deaths}_{\text{age/sex 2012-2016}}$$

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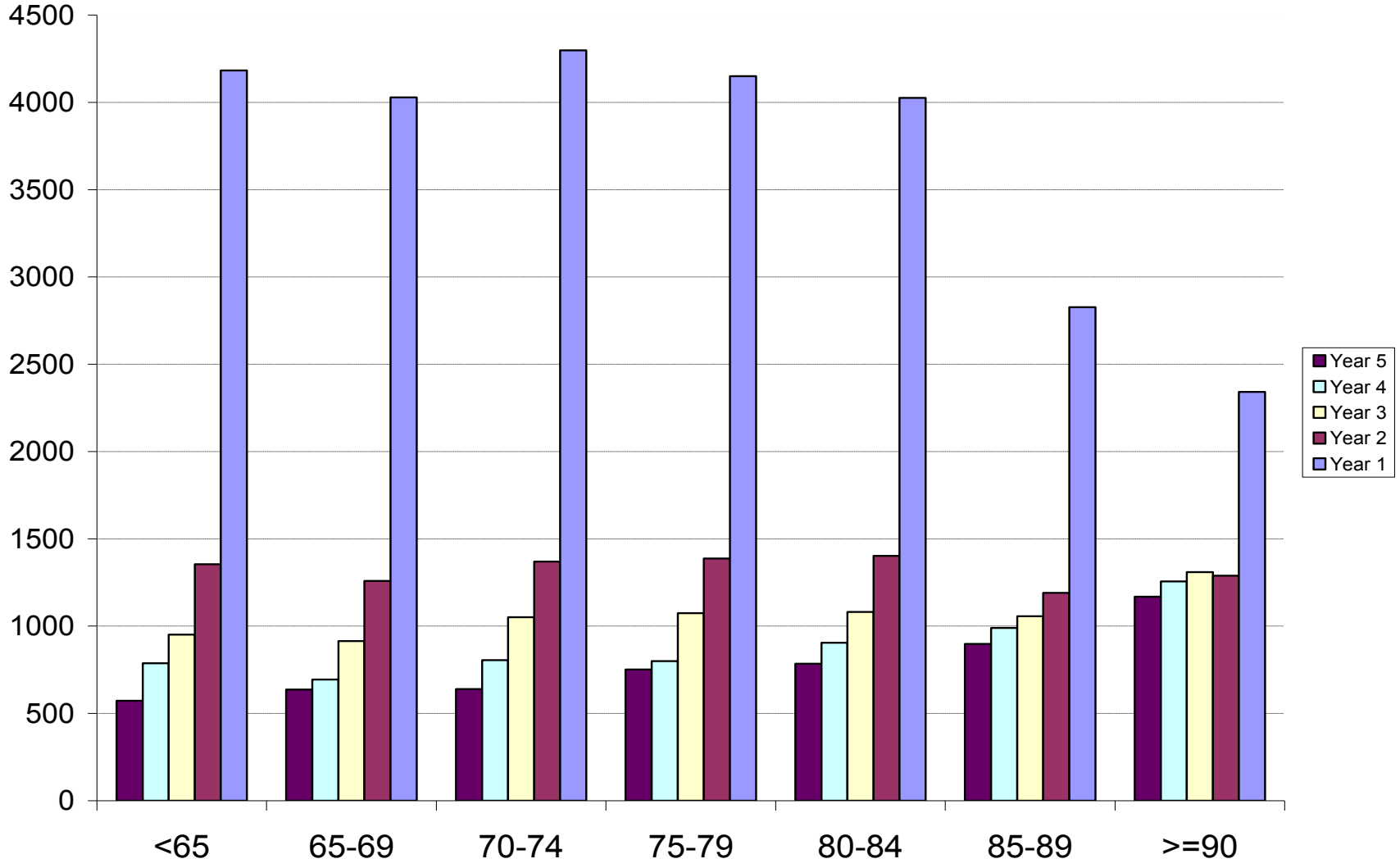
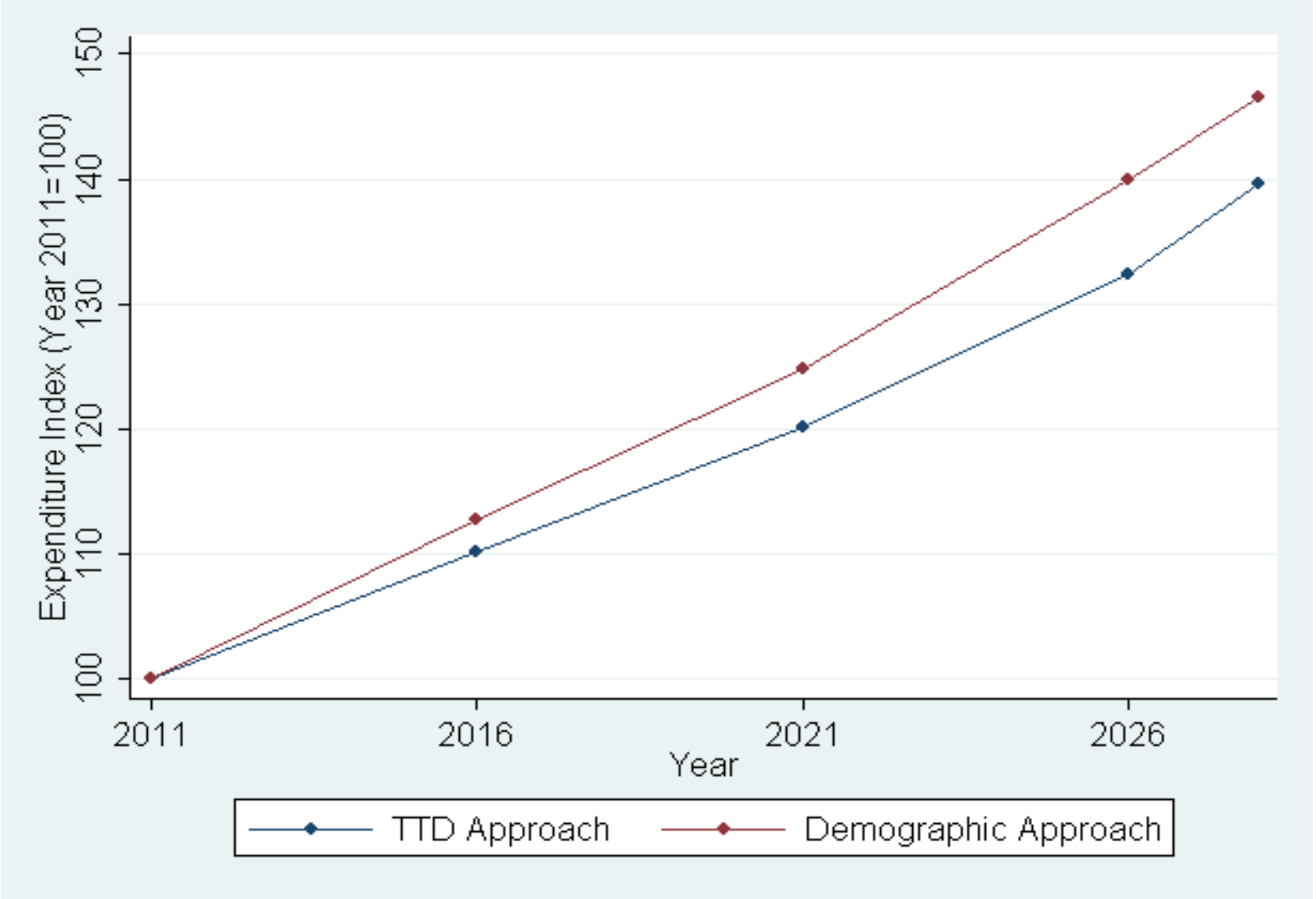
Results: Predicted costs by age & TTD, males



Results: HCE projections



Conclusions

- TTD, age at death and the interaction between these have a significant effect on HC costs
- With death as main contributing factor to HC costs, a lower number of deaths in the future will lead to decreasing costs of dying & lower HCE projections
- If death is postponed into older ages, HCE (and HC budgets) would not increase to the same extent if these factors were ignored; i.e. not accounting for proportion of population in their last year(s) of life when obtaining cost estimates

Conclusions

- Limitations: HC expenditure projections for 65+ and acute inpatient care only
- Country's demographic structure: differences between approaches will be larger if demographic changes occur more rapidly
- Policy Implications: Methods for allocating HC resources should include considerations of the effect of population ageing and TTD
- Partially counteracting effect that ageing population might have on HCE

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Acknowledgements

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TTD Approach