# *Projections of Use of Hospital and Long-term Institutional Care Services among Older People in Finland*

*Mike Murphy, London School of Economics*

*Work undertaken with Pekka Martikainen, University of Helsinki*

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# *Introduction*

- Health care needs and use depend on sex, age and health/disability status etc.
- Per capita use of health care services by both men and women rises sharply with age
- It is unclear whether health status will improve or deteriorate
- A widely-used assumption in projections is that demand for health care remains constant within each sex and age group

# *Introduction (contd.)*

- People's health care needs are higher as they approach death.
- Part of older age groups' higher use reflects the greater number of people close to death as well as age related health care needs.
- Acute health care usage is strongly associated with proximity to death.
- For social care, it is less clear whether use depends more on proximity to death or age.

# *Age and proximity to death as determinants of health service use*

- The costs of acute care are strongly associated with proximity to death, regardless of age at death.
- Analysis of demographic pressures that ignores specific costs in the last year of life (i.e. the costs of death) risks overstating its impact.

# *Proximity to Death*

- Demographic changes have had less of an impact on health spending than many people tend to think. There is a widening body of evidence which shows that proximity to death has a larger impact on health care costs than age. On average, around a quarter of all the health care someone consumes in their lifetime is consumed in the last year of their life.

(Wanless Interim Report p20)

# *Use of care towards the end of life*

- Less is known about long-term care
- The results have clear implications for the patients concerned about quality of life, policy makers estimating care costs, and clinicians responsible for end-of-life care decisions

# *Data source*

- A 40 % random sample of the Finnish population aged 65 and older at the end of 1997 followed to death in 1998–2003 or to the end of 2003.
- Use of hospital and long-term institutional care was assessed up to seven years prior to death or end of follow-up.
- The total sample size was 301 263 persons of whom 73 451 died during follow-up
- The outcome measure is days spent in hospital/long term care

# *Definitions of long-term institutional care & hospital care*

- Days in long-term care includes days spent in nursing homes, service homes with 24-hour assistance, and rehabilitation care (lasting for over 90 days or confirmed by a long-term care decision).
- Hospital care refers to days spent in either a hospital or a health centre, and included both overnight stays and day surgery.
- Total care refers to the sum of the two groups above

# *Method of analysis*

- To show the population-level effect of changing mortality, we calculate the expected number of days in care for a population of 100,000 people at age 65 with a particular mortality regime.
- Overall lifetime average number of care days is the sum of total days spent by those who die at each age above 65, weighted by the number of the original cohort who die at each age.
- The weights are the number of deaths at a given age, the d(x) (“curve of deaths”) values.

# *Model (for each sex)*

- Multinomial vector generalised additive model (VGAM)
- Dependent variable 3-fold type of care (Hospital, LTC, Home)

# *Model (for each sex)*

logit(D(a,p,c)) = s(a) * s(p) * Decedent

Where:

a age (years)

p proximity to death (years)

s() spline smoothing function

c type of care (Hospital, LTC, Home)

Decedent Categorical variable indicating death in current year

D(a,p,c) annual days in type c by b person at age a, with actual or expected p years before death

# *Life Table (for each sex)*

For those aged x at 31.12.1997 (baseline) who died in the intervening period to 1.1.2004, the exact age at death is known

For survivors  to 1.1.2004, the expected age at death is $x + 6 + e_{x+6}$.

Cohort life table with on annual rates of improvement of α in the central mortality rate at age x, mx,

$m_x(\alpha) = m_x(0)\exp(-\alpha(x-65))$.

# *Method of analysis*

The life table provides the distribution of deaths by age and also by proximity to death. From these data, it is possible to calculate the expected number of days spent at each age above 65 to the highest age in the life table (ω - which we set at 115) for a person alive at age 65.

# *Method of analysis*

With the following notation:

c(a,A) estimated annualised number of days in hospital or LTC by men or women aged a who die at age A (note c(a,A) = 0 for A<a)

d(A) number of deaths occurring at age A

The total number of days in care by the population is

$$c(.,.) = \int_{65}^{\omega} da \int_{65}^{\omega} dA c(a, A) d(A)$$

# Method of analysis

**The total lifetime number of days in care from age 65 by people dying at age A is**

$$c(.,A) = d(A)\int_{65}^{\omega} dac(a,A)$$

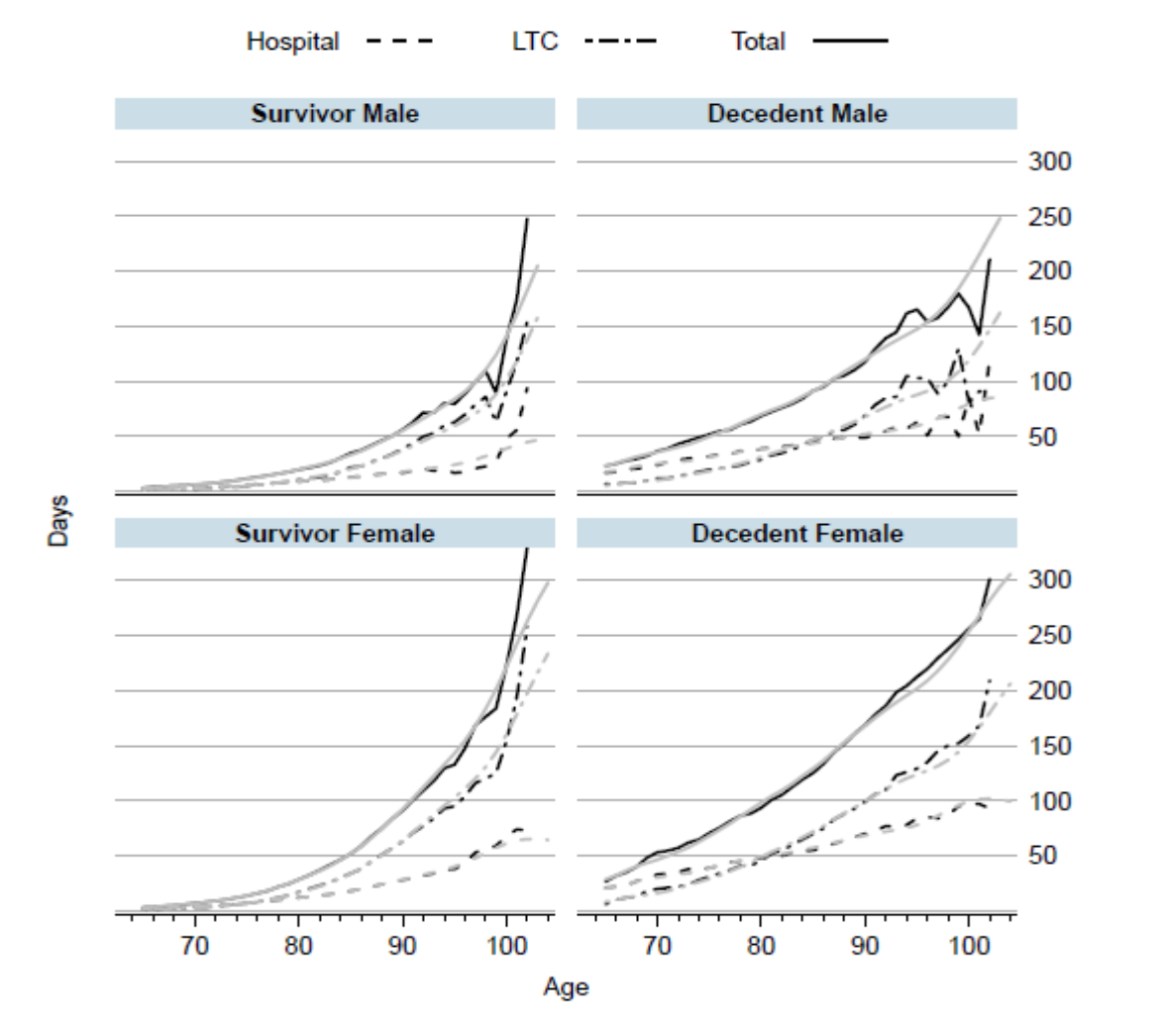
**The total number of days in care by the population alive at age a is**

$$c(a,.) = \int_{65}^{\omega} dAc(a,A)d(A)$$

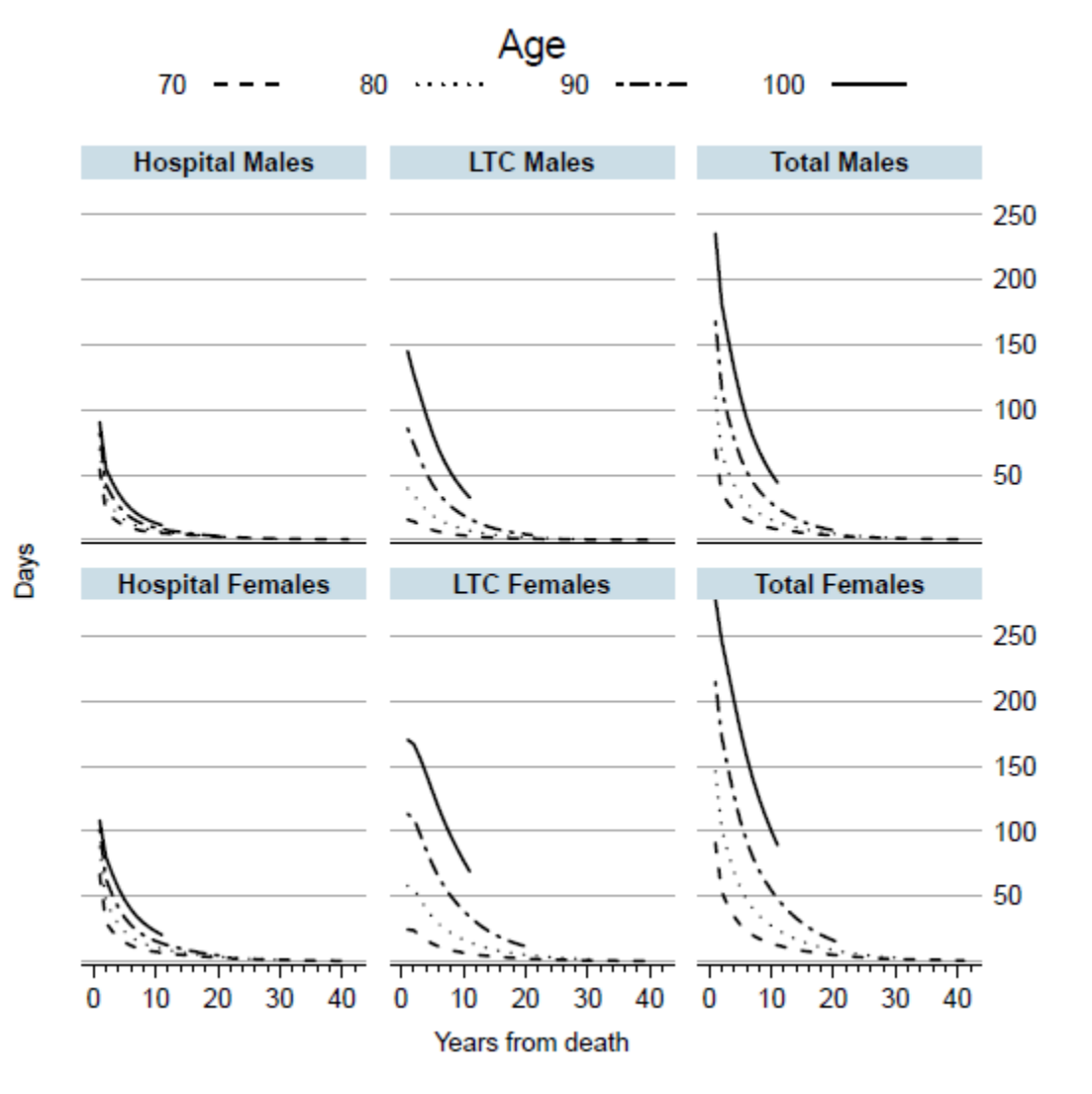
# *Method of analysis*

- **“Care-free” life expectancy**
- **Service use as measure of health status**
- **The total lifetime number of years in care from age 65**

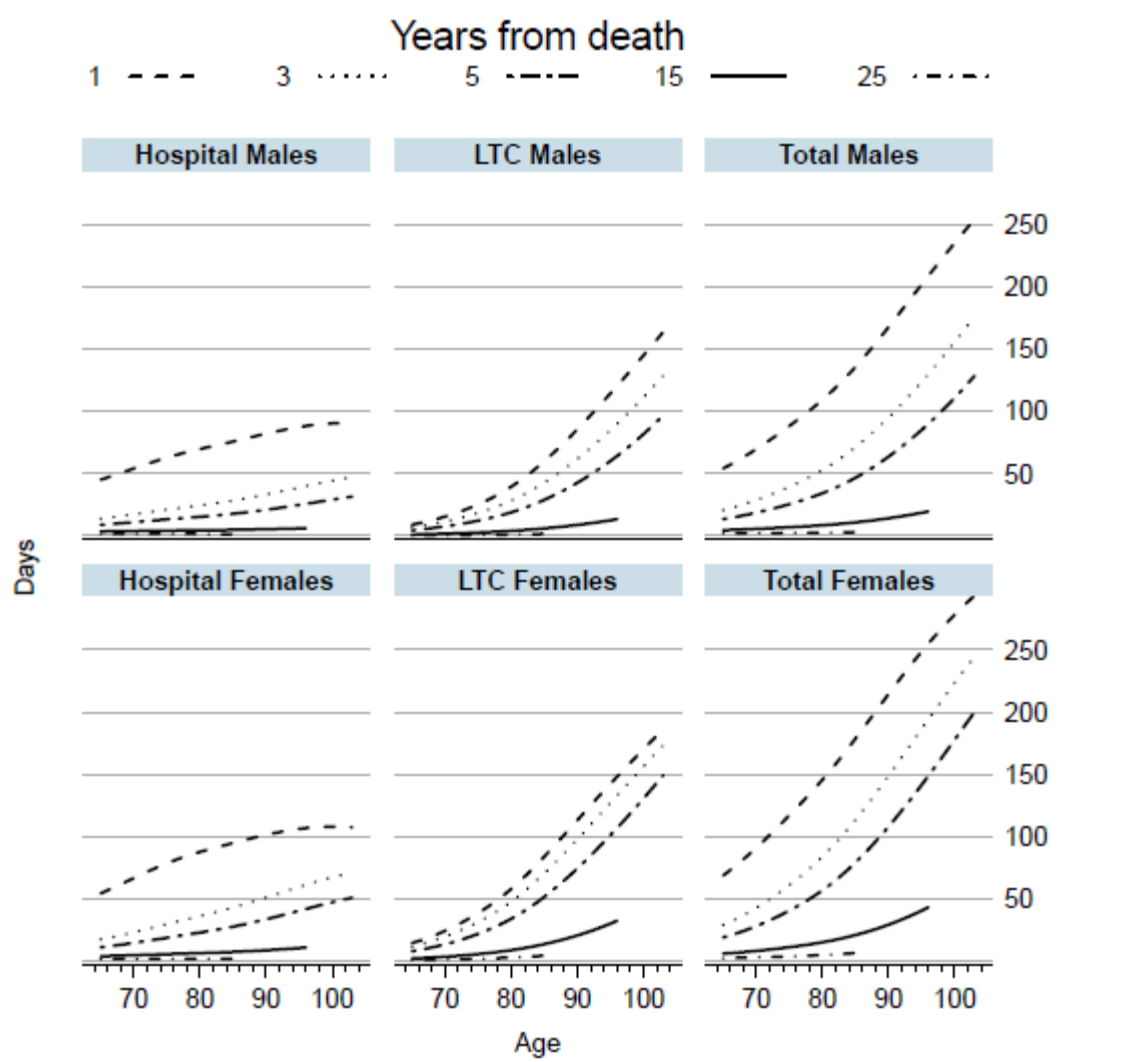
# *Annual days in care by sex, age and survival status in next 12 months, Finland 1998-2003*



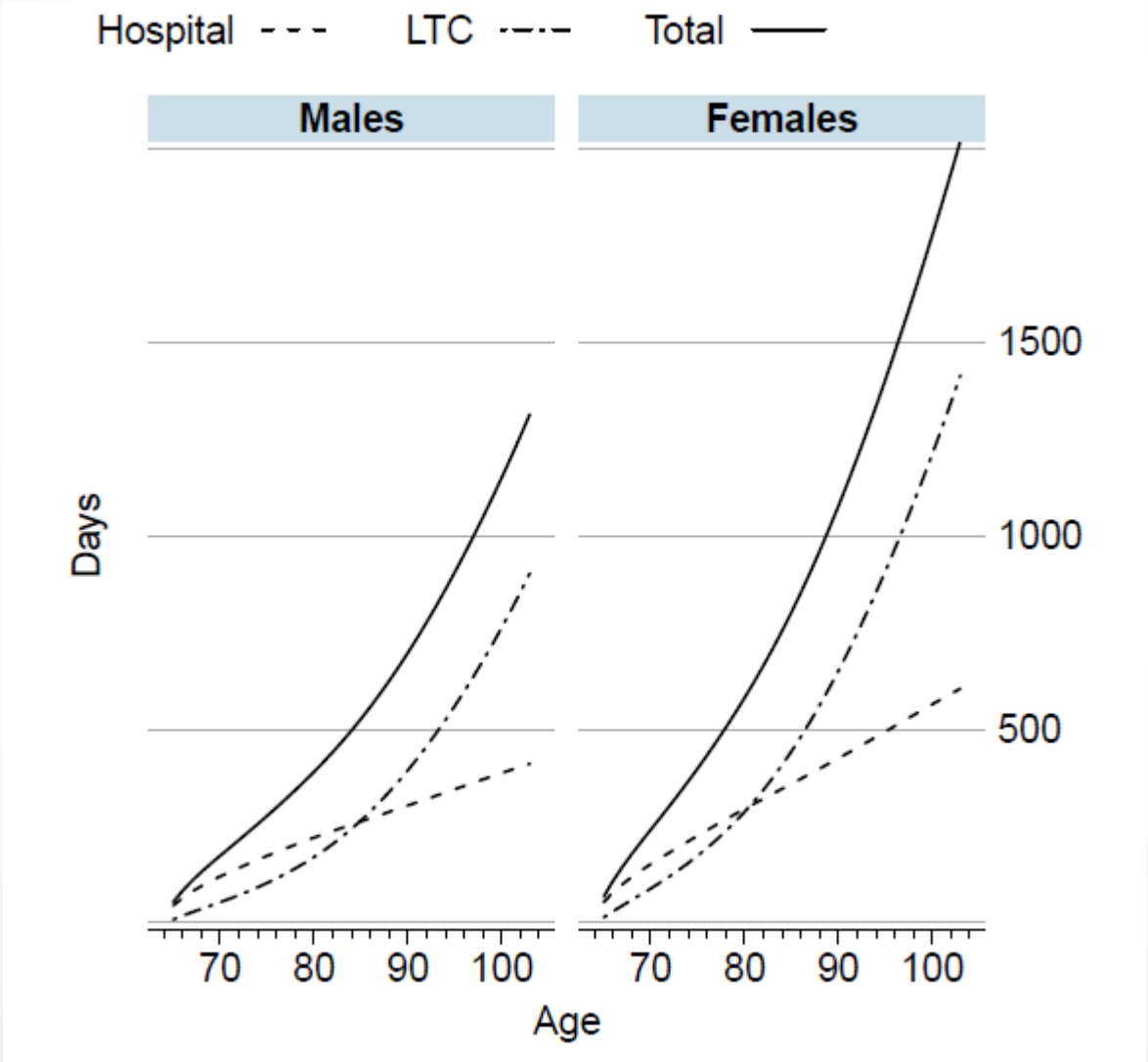
# Estimated average annual days in care by sex and proximity to death, for selected ages



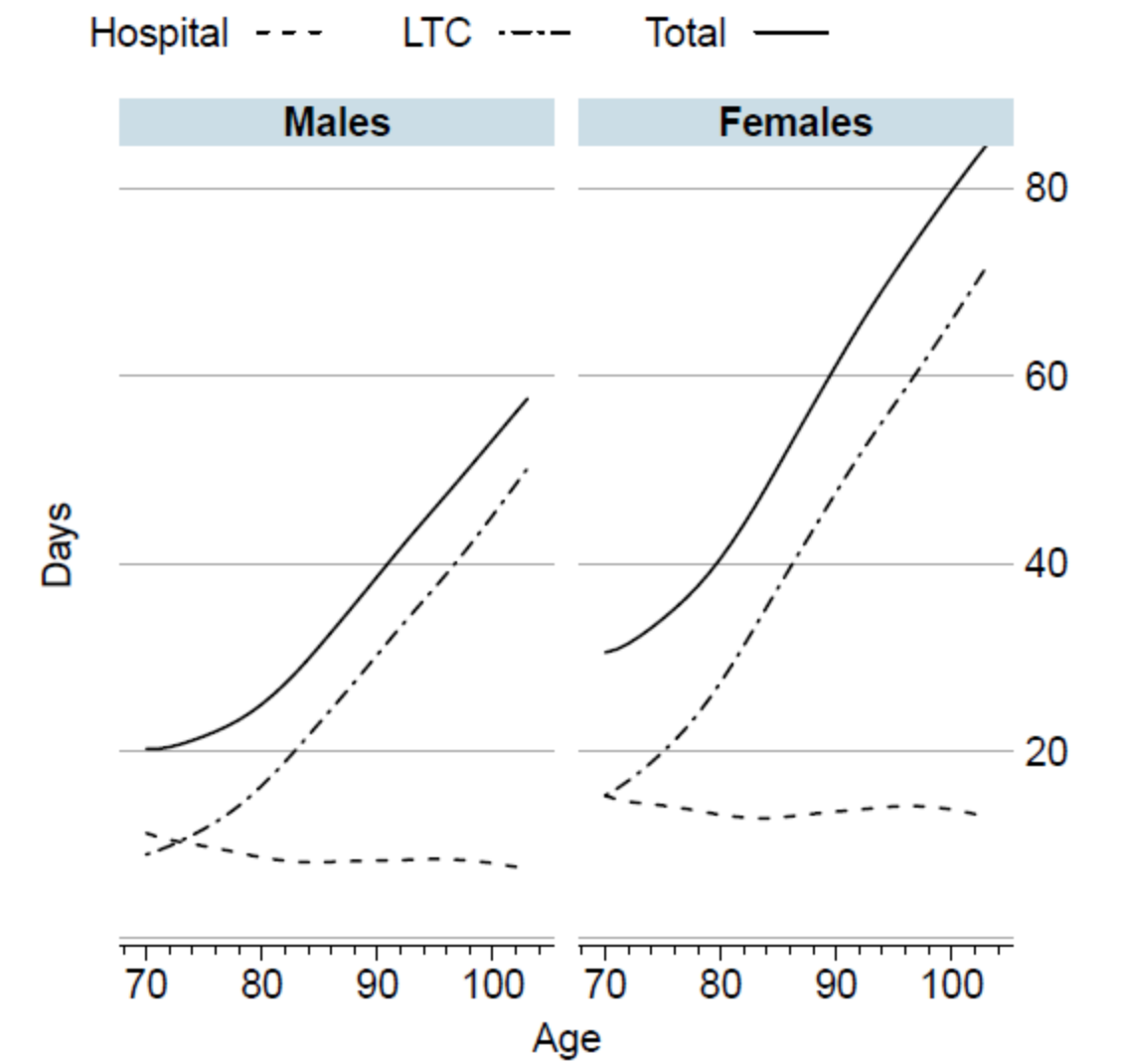
# Estimated annual average days in care by sex and age for selected years before death



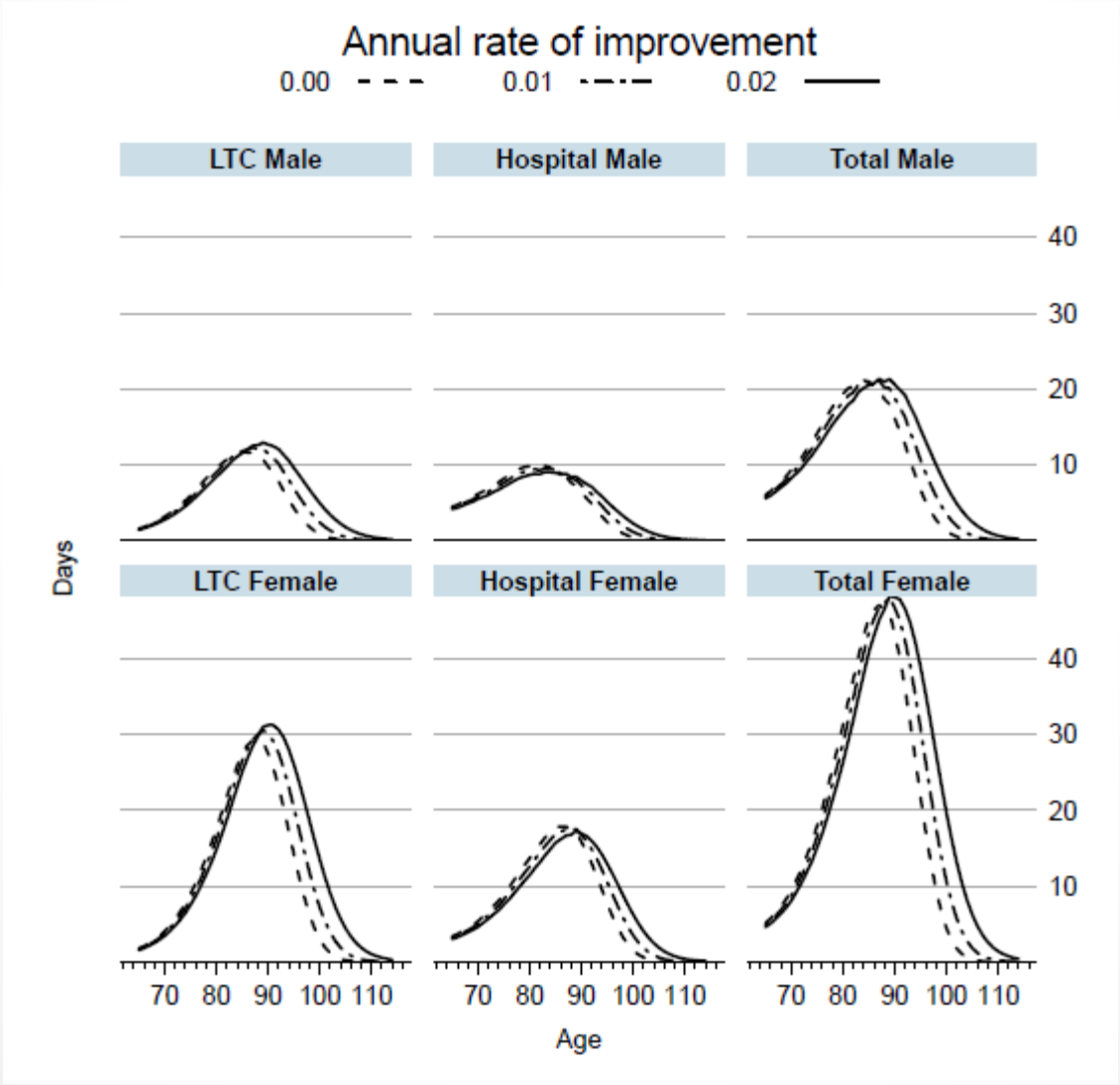
# *Total days in hospital and LTC per person from age 65 by sex and age at death, Finland 1998-2003*



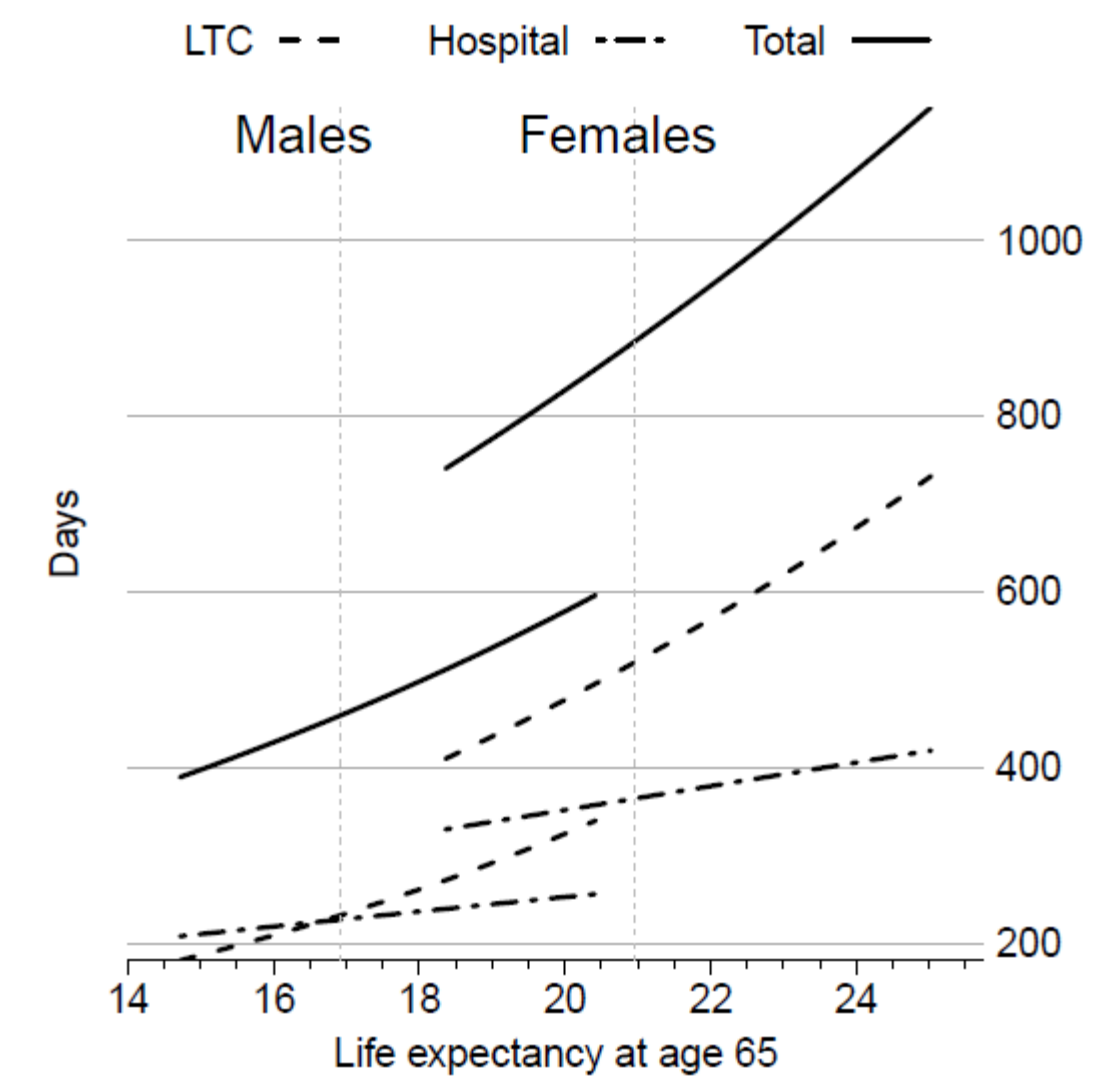
# *Estimated time in hospital and LTC from age 65 by sex and age at death, by additional lifetime days for a one-year increase in age at death*



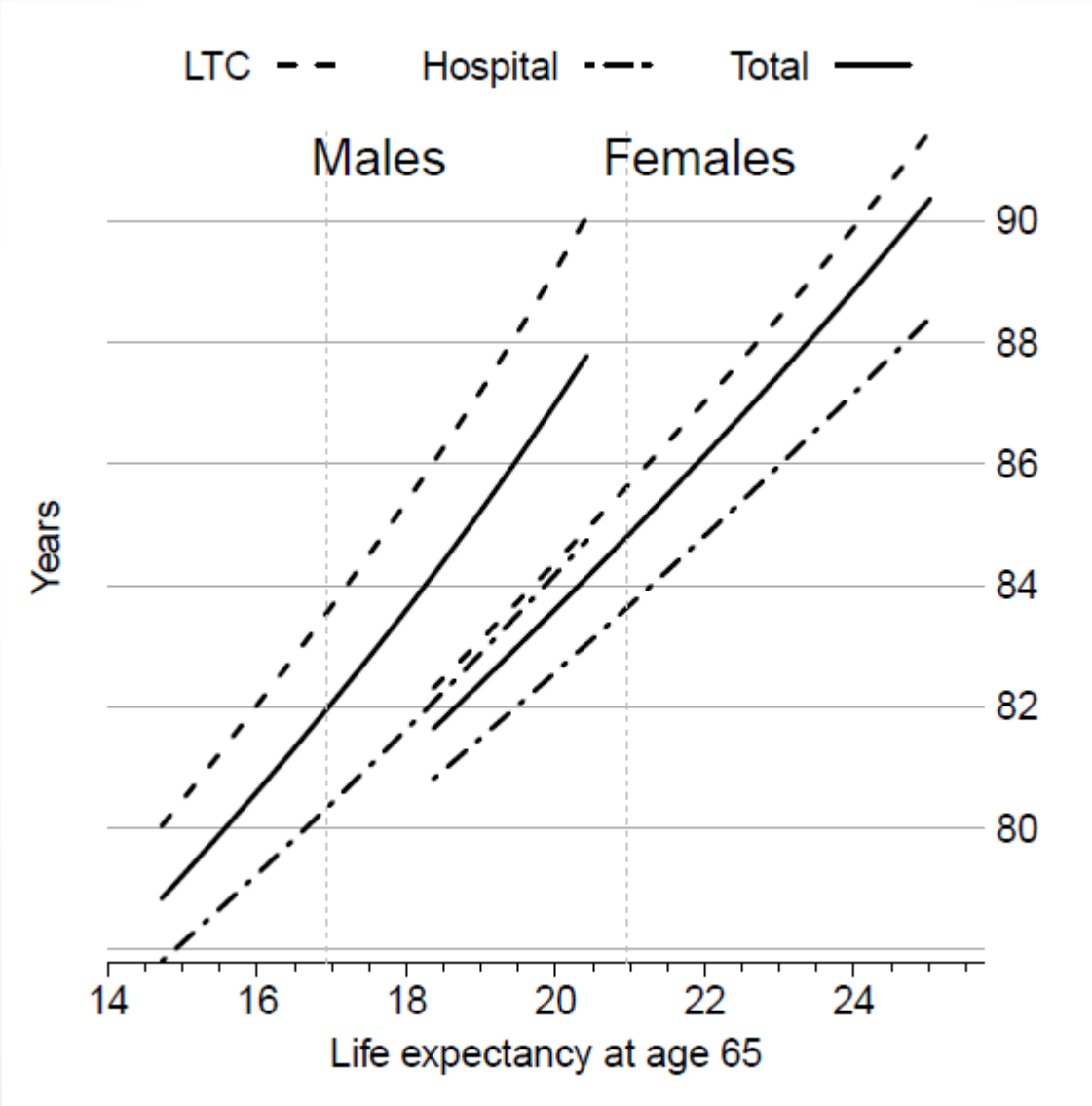
# *Expected annual days in hospital by sex and age for a person alive at age 65 for selected rates of cohort mortality improvement*



# *Expected lifetime total number of days in care by population life expectancy at age 65*



# *Mean age in care by population life expectancy at age 65*



# *Proportion of life from age 65 in care by sex for selected mortality levels*

| | | | Percent of life: | | | |
|---|---|---|---|---|---|---|
| Sex | Mortality improvement (% p.a.) | $e_{65}$ | LTC | Hospital | Total care | Care free |
| Males | 0 | 16.92 | 3.8 | 3.7 | 7.4 | 92.6 |
| | 1 | 17.89 | 4.0 | 3.6 | 7.6 | 92.4 |
| | 2 | 19.03 | 4.2 | 3.5 | 7.7 | 92.3 |
| | 3 | 20.42 | 4.6 | 3.4 | 8.0 | 92.0 |
| Females | 0 | 20.96 | 6.8 | 4.8 | 11.6 | 88.4 |
| | 1 | 22.09 | 7.1 | 4.7 | 11.8 | 88.2 |
| | 2 | 23.42 | 7.5 | 4.7 | 12.2 | 87.8 |
| | 3 | 25.02 | 8.0 | 4.6 | 12.6 | 87.4 |

# *Summary of key results*

- Proximity to death has more influence on time spent in hospital than in LTC, but age is more important for time spent in LTC.
- Concentration on the last year of life understates the additional use of services can be observed up to 30 years before death for acute care.

# *Summary continued …*

- Implicitly or explicitly, much of the “red herring” literature argues that population ageing is largely or completely irrelevant for acute health care costs.
- We observe expansion of both absolute and relative morbidity for both acute and long-term care but expansion of relative morbidity only for long-term care with improving mortality.

# *Summary continued …*

- Analyses often fail to emphasise that costs are postponed rather than eliminated.
- Use of care services in Finland increases especially sharply when people reach about 90 years or so.
- The average age of those in care will increase substantially, presenting new challenges and, of course, some rebalancing of the relative magnitudes of acute and social care needs.