The Actuarial Profession
making financial sense of the future

Emerging Trends in Mortality and Longevity Symposium 2011
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Comparison of cause of death trends

13 September 2011

Introduction

Mortality improvements

- Countries studied:
  - France, Spain (« Latin countries »)
  - UK, USA (« Anglo-saxon countries)
- Study focused in particular on ages above ages 55-60

Mortality projections by cause of death

Summary

Observed improvements

- Reducing mortality rates
- Rectangularisation of the survival curve
- Male « extra-mortality »
- Causes of death and risk factors

Mortality projections

- Using observed cause of death trends

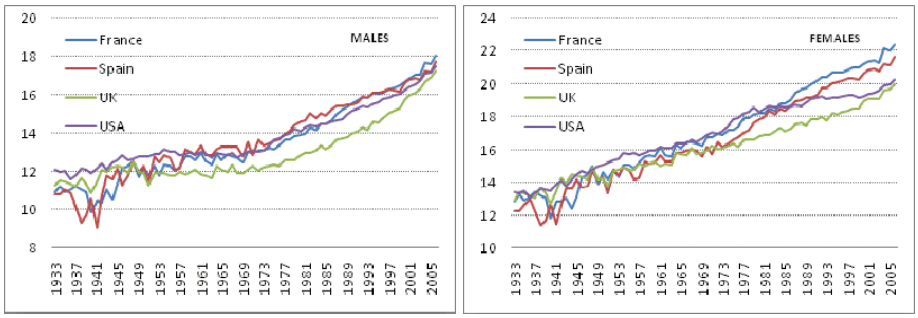
1/ Observed improvements

Significant changes in mortality over the 20th century

1/ Observed improvements

Decreasing mortality rates

- Increase in life expectancy by country

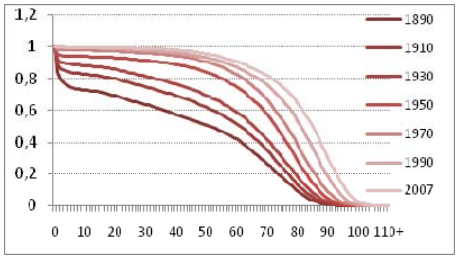


Evolution of life expectancy at 65 years (1933-2006)
Source : Own calculations using data from Mortality.org database (civil population)

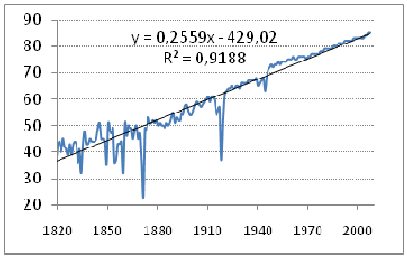
1/ Observed improvements

Rectangularisation of the survival curve

- Over the 20th century deaths are occuring later and becoming more concentrated over a shorter interval of high ages



Evolution of survival curves in France (1890-2007)
Source : Own calculations using data from Mortality.org database (civil population)



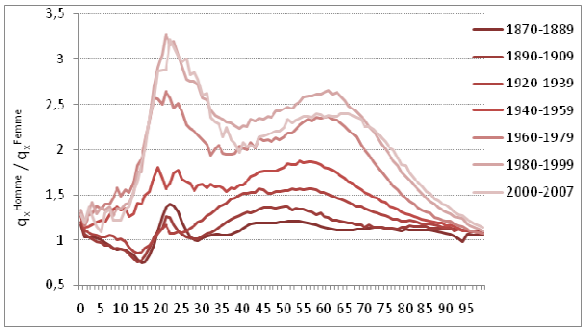
Evolution of the median age at death in France (1820-2007)
Source : Own calculations using data from Mortality.org database (civil population)

If the trend continues, in 2030: 50% of deaths will occur after age 91!

1/ Observed improvements

Male « extra-mortality »

- Male-Female difference has increased over time: illustration for France



Characteristics

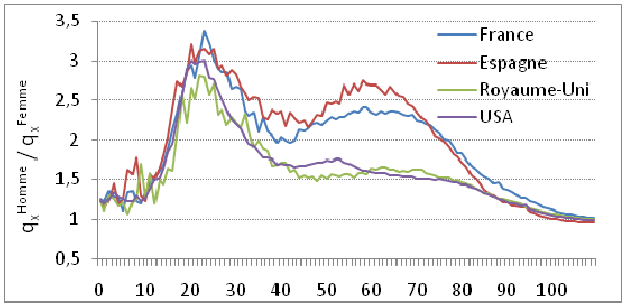
- Silhouette with 2 humps
- 15-25: accidents
- 45-65: tumeurs (40%) CV (23%)

Evolution of the ratio of male to female mortality rates by age, for several periods since 1870
Source : Own calculations using data from Mortality.org database (civil population)

1/ Observed improvements

Male « extra-mortality »

- Difference between genders is less pronounced for « anglo-saxon » than « latin » countries.



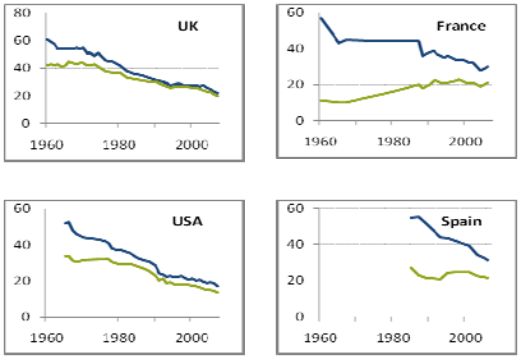
Ratio of male to female mortality rates by age (average 2002 - 2006)
Source : Own calculations using data from Mortality.org database (civil population)

- Partial explanation: life style of « anglo-saxon » females closer to that of their male counterparts than in « latin » countries ?

1/ Observed improvements

Male « extra-mortality »

- Male-Female lifestyles: illustration by tobacco behaviour – closer between the genders in UK/USA than in Spain/France



Evolution of smoking incidence by gender
Source : Eco-Santé OCDE 2009

Male
Female

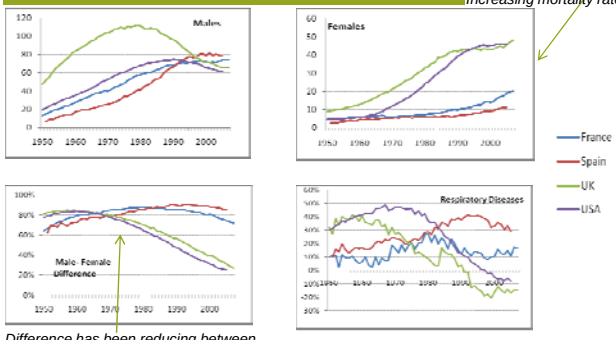
1/ Observed improvements

Male « extra-mortality »

- Male-Female lifestyles: illustration by cause of death

Deaths from malignant neoplasm of trachea, bronchus and lung

Increasing mortality rates for US/UK females



Difference has been reducing between anglo-saxon males and females.

Mortality rates per 100,000, all ages
Source : Own calculations using data from Mortality.org database

1/ Observed improvements

Cause of death and risk factors

- The principle causes of death between ages 55 and 75 averaged across the 4 countries, in 2005 (unisex)

Tumours	38%
Circulatory diseases	29%
Respiratory diseases	9%
Accident/Suicide/Murder	4%
Percentage of death accounted for	80%

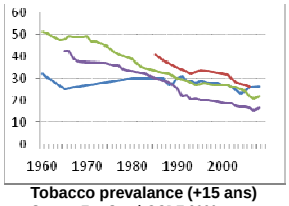
- The principale cause of death above age 75 averaged across the 4 countries, in 2005 (unisex)

Tumours	19%
Circulatory diseases	40%
Respiratory diseases	12%
Accident/Suicide/Murder	2%
Percentage of death accounted for	74%

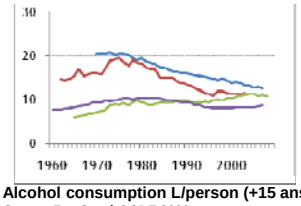
1/ Observed improvements

Cause of death and risk factors

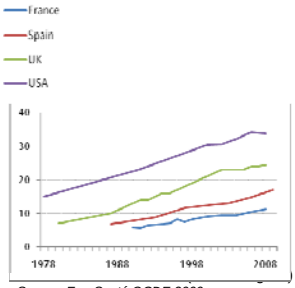
- Evolution of some risk factors (unisex)



Tobacco prevalance (+15 ans)
Source: Eco-Santé OCDE 2009



Alcohol consumption L/person (+15 ans)
Source: Eco-Santé OCDE 2009



Source: Eco-Santé OCDE 2009

- General decrease in tobacco prevalence

- Reduction in alcohol consumption for France and Spain
- Stable / increasing consumption for UK and USA

- Increasing trend in obesity in all 4 countries

1/ Observed improvements

Conclusion – past mortality trends

- Future mortality improvements
  - We can hope for more future gains, especially for cancer
  - Impact of other medical progress?
- Increasing prevalence of obesity
  - Could result in change in CVD future mortality
- Divergence of male – female lifestyles
  - Female mortality improvements could stagnate

2/ Mortality projections

Is it possible to use information from other countries' observed data when making future mortality projections ?

2/ Mortality projections

Considerations in Cause of death projections

- Richards (2011)* lists numerous issues with cause-of-death projections including :
  1) How is the inherent bias towards projecting lower improvements corrected?
  2) How is socio-economic bias handled?
  3) How are correlations in the data handled?
  4) How are correlations in projections handled?
  5) How are changes in the classification systems and in their application handled?

*** Richards, S. J (2011)** ***Seven questions for projections by cause-of-death*****, Longevitas Ltd**

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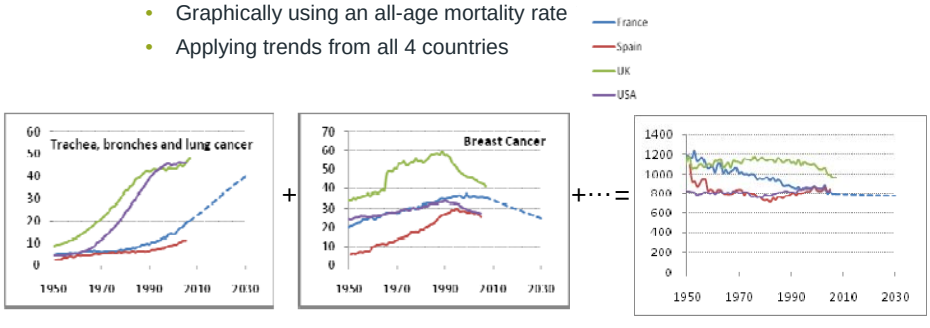
2/ Mortality projections

Subjective model – applying cause of death projection

- Simple example of model for French female mortality
  - Graphically using an all-age mortality rate
  - Applying trends from all 4 countries



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2/ Mortality projections

Subjective model – applying cause of death projection

- Simple example of model for French female mortality
  - Rate per 100 000 females

Resulting in an annual improvement rate of 0.132% between 2005 and 2030

The observed average improvement between 1987-2005: 0.556%
Pessimistic projection

Femmes France		2005	Target 2030
Cancer		192	194
Lung cancer		*19*	*40*
Breast cancer		*36*	*25*
Cancer of reproductive system		*18*	*15*
Stomach cancer		*6*	*4*
Bowel and colon cancer		*25*	*22*
Other cancers (46%)	(Assume unchanged)	*88*	*88*
Circulatory diseases		254	215
CVD		*192*	*170*
Stroke		*62*	*45*
Respiratory diseases		54	54
Accidents Suicides Homicide		45	30
Transport accidents		*4*	*3*
Unexplained (33%)	(Assume unchanged)	273	273
Total		819	767

Assumption of independence between causes of death →

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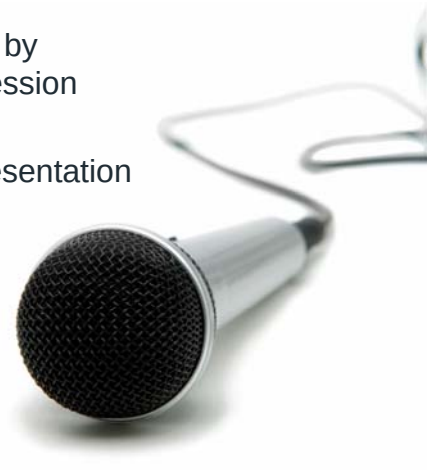
Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.



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