

# Heterogeneity of Mortality Patterns: A Discussion in the Perspective of Longevity Benefits

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## **Abstract**

Different profiles emerge in mortality patterns of populations. Aspects that have been focussed in the literature include gender, geographical area, health status, socio-economic factors among the others. Investigating the heterogeneity of populations in respect of mortality represents a classical topic in demography but also in actuarial science, due to the importance of modelling appropriately mortality when dealing with life insurance benefits.

The basic insurance principle, which governs traditional insurance pricing and risk management, relies on the fact that in sufficiently large and homogeneous pools there is a high probability to achieve an outcome in line with what expected. The heterogeneity of the pool takes away from such a result, thus requiring premium loadings and sometimes expensive risk management solutions. Understanding the heterogeneity of the pool with regard to mortality can help in taking appropriate choices in both respects, to the benefit not only of providers, but also of individuals purchasing insurance.

In this presentation the topic is discussed with particular regard to the case of longevity benefits, namely annuities. This choice is suggested by the role that private resources and individual decisions will play (in the not so distant future) in building the post-retirement income.

Aiming at fair pricing, satisfactory annuity design and efficient risk management, an overview of models expressing differential mortality will be provided, which are deterministic and suitable to account, at least to some extent, for differences in mortality attributable

to observable (risk) factors. Then, frailty models will be addressed, which are suitable to measure heterogeneity attributable to risk factors which are either unobservable or disregarded.

**Keywords:** Annuities; Longevity risk; Differential mortality; Risk classification; Frailty models.

**JEL Classifications:** G22.