

# Trends and Forecasts of Mortality in Sweden: A Comparative Analysis Using the Age-Period-Cohort and Lee-Carter Models

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## Abstract

This thesis investigates long-term mortality trends in Sweden using two main demographic forecasting models: the Poisson Lee-Carter and Age-Period-Cohort (APC) models. Using mortality data and population exposure from 1751 to 2023, the models are suitable and evaluated in various age groups, focusing on the forecast of mortality rates from 2024 to 2050.

For model validation, we trained Lee-Carter between 1751 and 2000 and tested performance between 2001 and 2023 using multiple historical windows. For the final forecast 2024-2050, the model was re-estimated in the entire 1751-2023 dataset, assuming that mortality improvements follow a persistent trend over time. On the other hand, the APC model includes separate period and cohort effects, allowing more flexible generational patterns, and is trained on a shorter window to better capture structural changes.

Out-of-sample evaluations show that the Lee-Carter model performs better for mid-adult age groups when trained on a long historic window, and it achieves lower forecast errors in short-term projections for specific ages. In turn, the APC model provides better predictions for younger and older age groups when recent decades are highlighted, and it outperforms Lee-Carter over much longer forecast horizons. The forecast error is generally higher for the APC model due to the variability introduced by cohort effects. These results highlight a trade-off between the robustness and interpretability of the Lee-Carter model and the flexibility and responsiveness of the APC model to structural changes. In general, the findings support the use of both models as complementary tools in the analysis and prediction of mortality.

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