Evolution of Life Tables and Life Insurance Mathematics

- Early Mortality Observations (Ancient–1600s) – Rough demographic notes in ancient civilizations and parish records, but no formal mathematics for life expectancy.
- Graunt's Mortality Analysis (1662) – John Graunt publishes Natural and Political Observations, analyzing London Bills of Mortality to estimate life expectancy.
- Halley's Mortality Table (1693) – Edmond Halley builds the first scientific life table using Breslau parish data, linking age-specific death probabilities to annuity pricing.
- Bernoulli's Mathematical Framework (1725–1732) – Jakob Bernoulli and later Daniel Bernoulli apply probability theory to life annuities, establishing expected value methods for insurance.
- De Moivre's Law of Mortality (1725) – Abraham de Moivre proposes a linear mortality model simplifying annuity and premium calculations.
- Price & Dodson (1750s–1760s) – Richard Price refines life tables and advises Equitable Life; James Dodson pioneered using mortality data for premium setting.
- 19th-Century Refinement – National censuses and statistical societies expand mortality data; actuaries develop graduation techniques and commutation functions.
- 20th-Century Advances – Stochastic processes, Markov models, and computers enable dynamic life tables, select and ultimate tables, and multi-decrement models.
- Modern Actuarial Science (Late 20th–Early 21st c.) – Use of generalized linear models, survival analysis, and credibility theory improves mortality forecasting and risk pricing.
- Contemporary Innovations – Big data, machine learning, and longevity research drive dynamic cohort tables and updated actuarial practice.