



# Beyond Convergence and Divergence: Measuring Mortality Trends and Variations Across Countries

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## Introduction

- Demographic theories often imply regional convergence in mortality indicators
- More recent studies have questioned this assumption, arguing that periods of convergence alternate with bouts of divergence
- The statistical measures often used to calculate convergence in mortality do not capture all the trends and country variations, which in many cases are difficult to be expressed in terms of convergence and divergence
- This paper discusses the hypothesis of convergence and divergence in mortality across countries, using the United Nations estimations

## Method

This paper uses three statistical measures to assess the hypothesis of convergence in life expectancy at birth ( $e_0$ ):

- **$\sigma$ -convergence** (difference in standard deviation)

$$SD_t - SD_0$$

- **$\beta$ -convergence**

$$(Y_{i,t} - Y_{i,0}) = \alpha + \beta(Y_{i,0}) + \varepsilon_i$$

where  $Y_{i,t}$  is the indicator to be measured for country  $i$  and time  $t$  and  $\beta$  is the convergence coefficient.

- **$\gamma$ -convergence** (Kendall's index of rank concordance)

## Results

- The results based on the combination of the three measures confirm some of the previous works, but also allow for new ways to interpret the processes of mortality change
- Figures 1 and 2 illustrate six different patterns of changes in cross-country variation over time

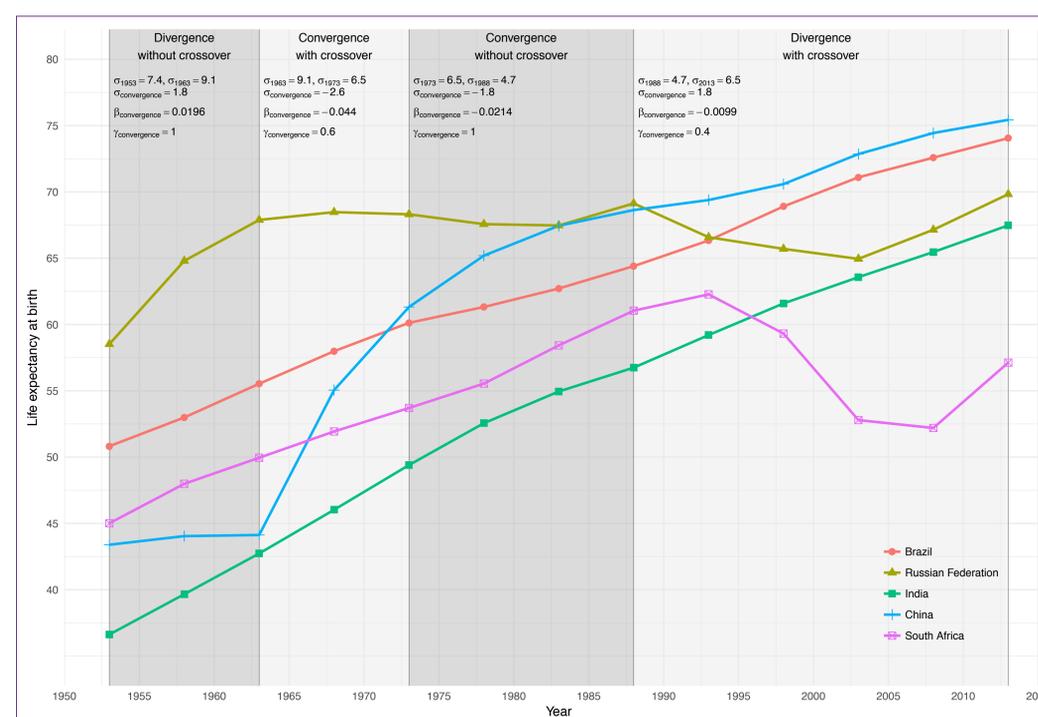


Figure 1 - Life expectancy at birth for both sexes by country (BRICS) in 1950-2015 and measures of convergence

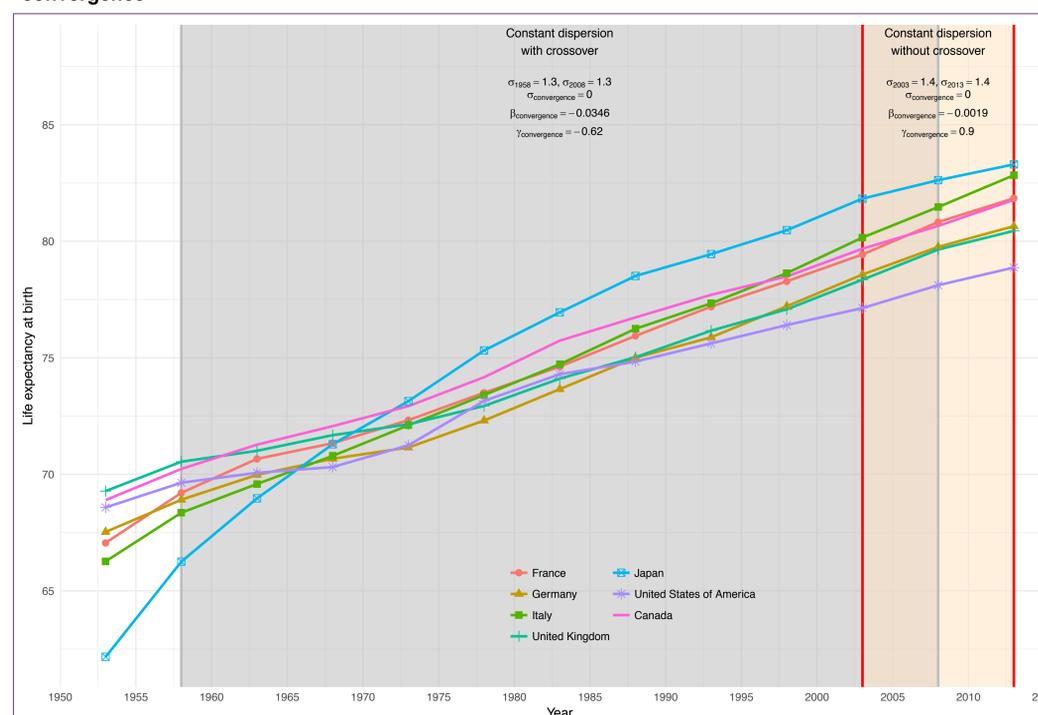


Figure 2 - Life expectancy at birth for both sexes by country (G7) in 1950-2015 and measures of convergence

Indicator	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
$\sigma$ -convergence	0.02	-0.13	-1.98	-0.71	-0.33	-0.43	-0.26	-0.14	-0.06	0.13	-0.49	-0.57
$\beta$ -convergence	0.000	-0.003	-0.038	-0.018	-0.011	-0.012	-0.008	-0.008	-0.008	-0.002	-0.015	-0.018
$\gamma$ -convergence	0.94	0.95	0.95	0.94	0.93	0.93	0.92	0.90	0.91	0.93	0.94	0.94

Table 1 - Measures of convergence for all countries, circa 1955-2010

## Discussion and Conclusions

- In addition to simple movements from diversity to uniformity and from uniformity to diversity, the existence of crossover, measured by the  $\gamma$ -convergence indicator, indicates different types of changes
- Mortality changes do not occur smoothly over time and processes involving leapfrogging, for example, confirms that convergence or catching-up are therefore not an "end state", but a path to a new arrangement.
- HMD data have shown that the record life expectancy, for instance, has changed considerably over the last decades and currently belongs to Japan, which 50 years ago was not even among the 40 countries with the highest life expectancy.
- Countries like Norway and Denmark, which once had the post of highest life expectancy in the world, no longer appear among the top.
- South Korea and Singapore have also left behind several countries.
- This is also valid for the trends observed in developing countries, for instance the crossover between life expectancy in some Latin American and Asian countries compared to Eastern European countries.

## References

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