

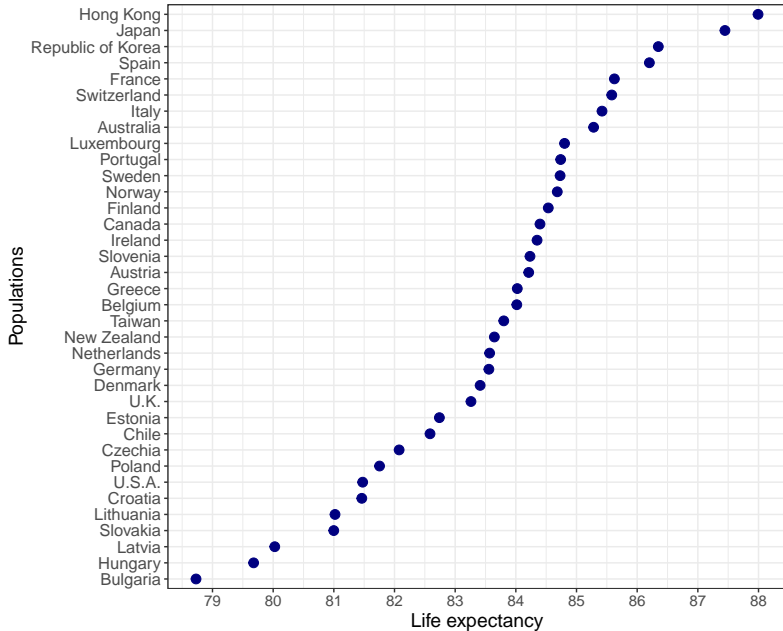
Life Expectancy Decomposition: A perspective of numerators and denominators

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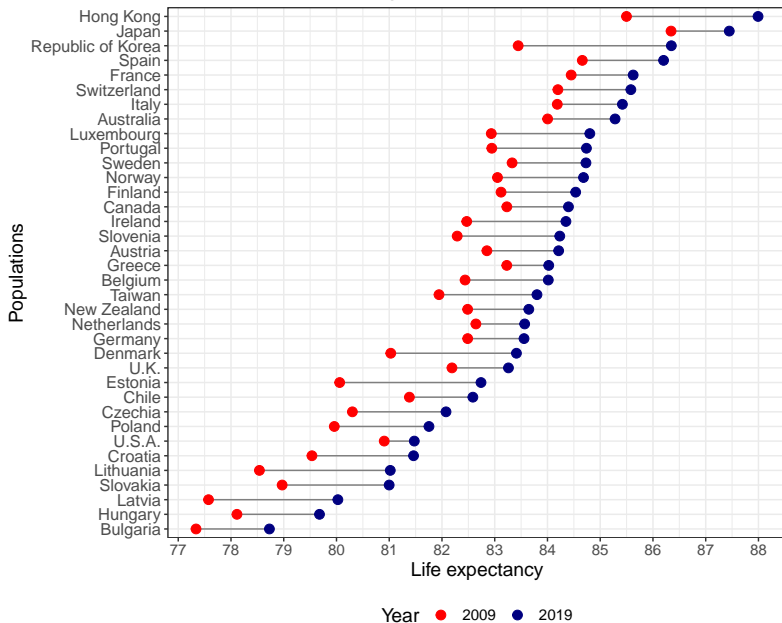


Life expectancy, Female, 2019



Source: HMD (2023)

Life expectancy changes, Female, 2019



Source: HMD (2023)

Background

- ▶ Life expectancy changes originate from changes in age-specific death rates
- ▶ Age-specific deaths rate contains two parts, the number of deaths (numerator) and exposed population (denominator)

Age-specific Mortality

$$m(x, t) = \frac{D(x, t)}{P(x, t)} \quad (1)$$

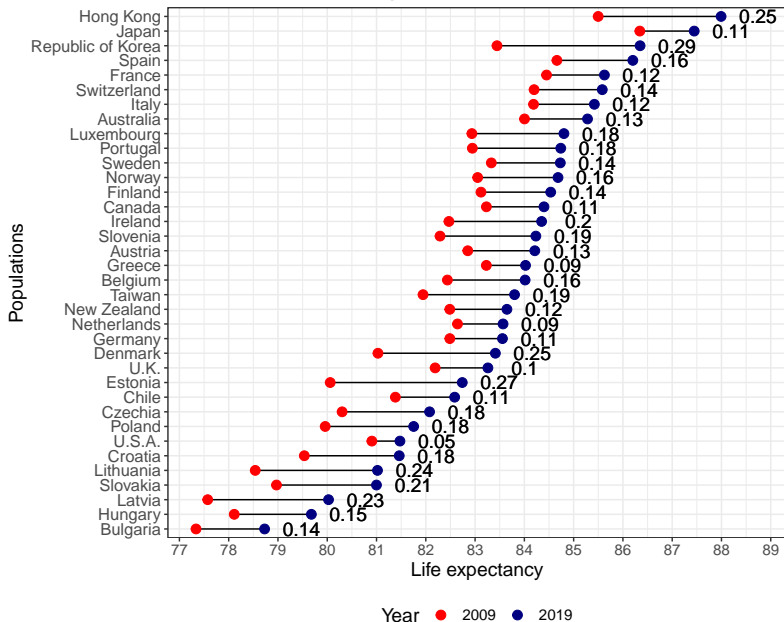
Decomposing Mortality

$$-\frac{\dot{m}(x, t)}{m(x, t)} = \left[\frac{\dot{P}(x, t)}{P(x, t)} - \frac{\dot{D}(x, t)}{D(x, t)} \right] \quad (2)$$

Decomposing Mortality

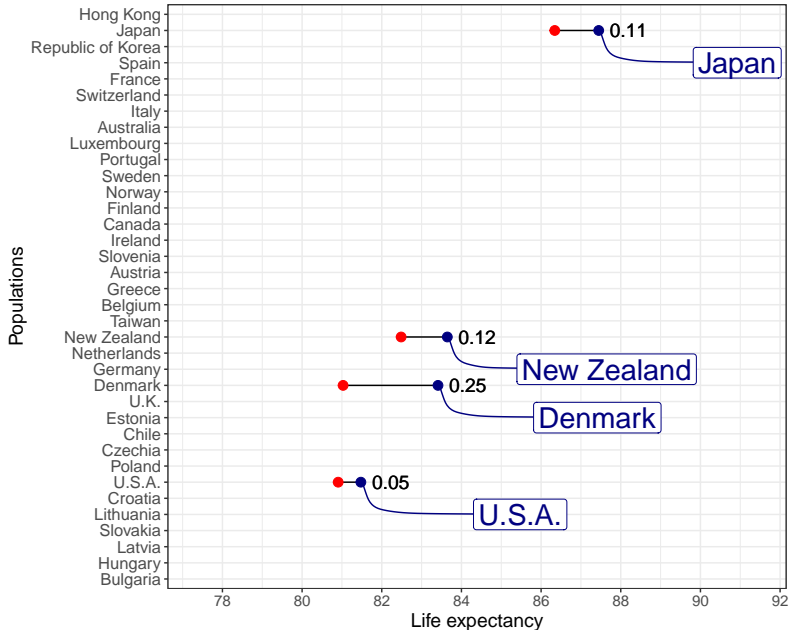
$$-\frac{\dot{m}(x, t)}{m(x, t)} = [r(x, t) - r_D(x, t)] \quad (3)$$

Life expectancy changes, Female, 2019



Source: HMD (2023)

Life expectancy changes, Female, 2019



Source: HMD (2023)

Research Question

1. How does population growth and the growth rate of deaths influence changes in life expectancy?
2. Are all populations following the same pattern regarding the dynamic?

Data

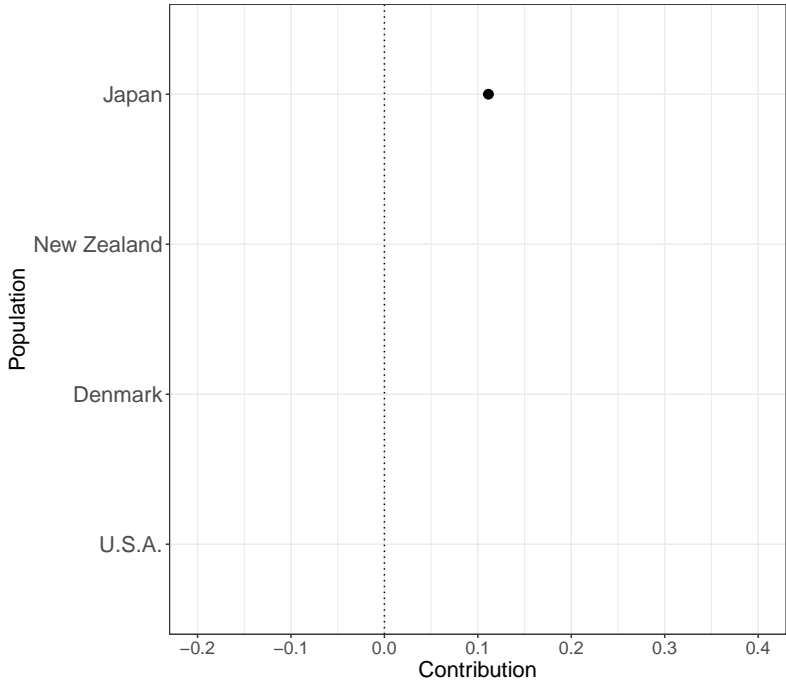
Data are sourced from Human Mortality Database Database (2023) including all populations with mortality and population data between 2009 and 2019.

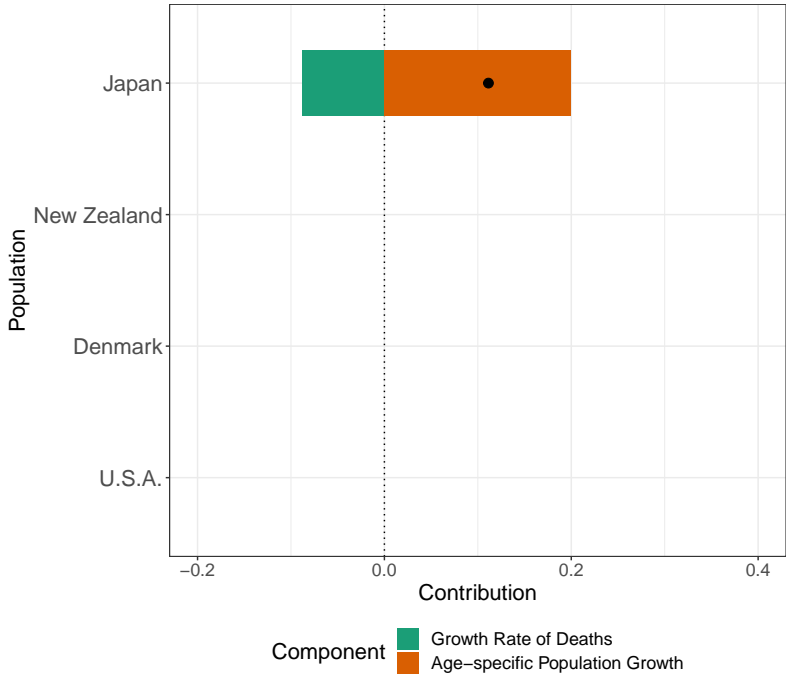
Methods

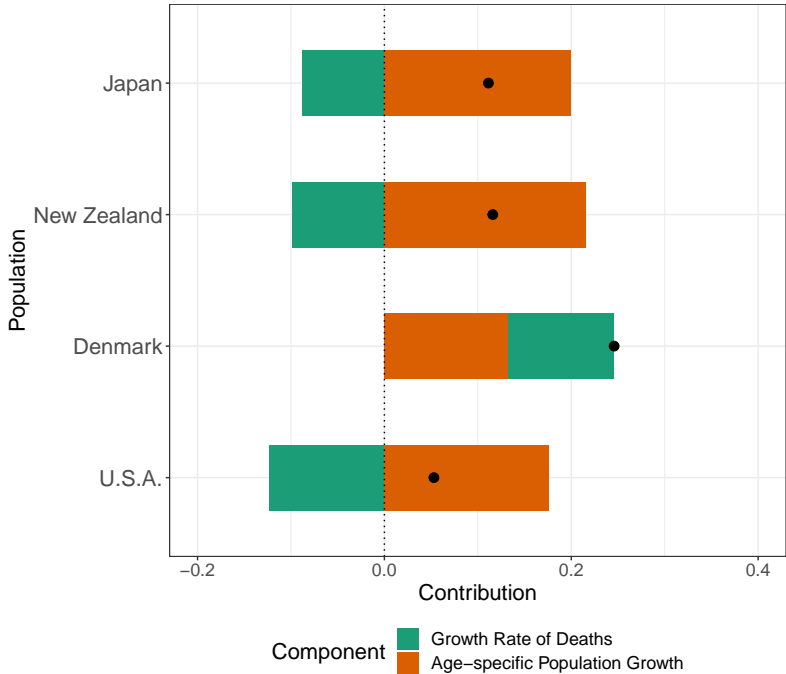
$$\dot{e}_0 = \int_0^\omega [r(x, t) - r_D(x, t)] f(x, t) e(x, t) dx. \quad (4)$$

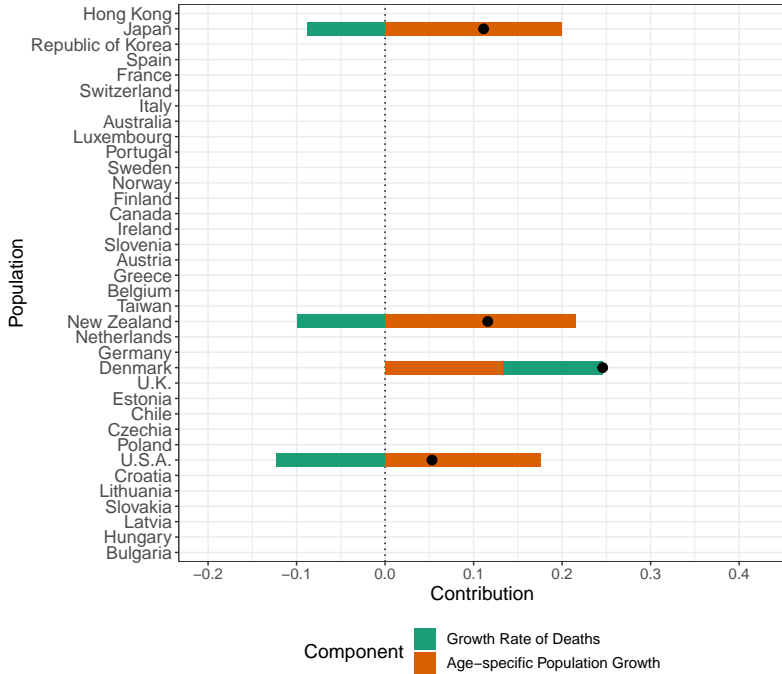
(Canudas-Romo, Shen, and Payne 2022)

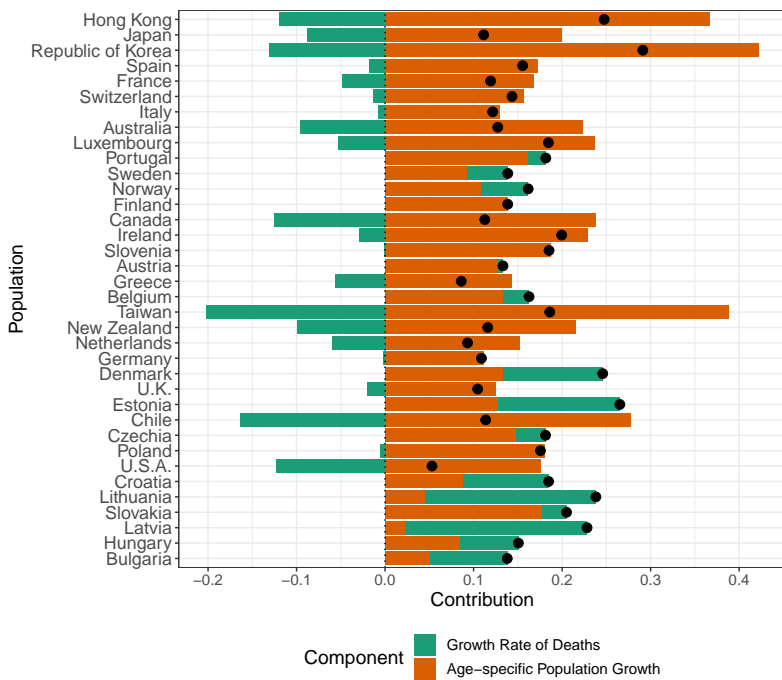
Results

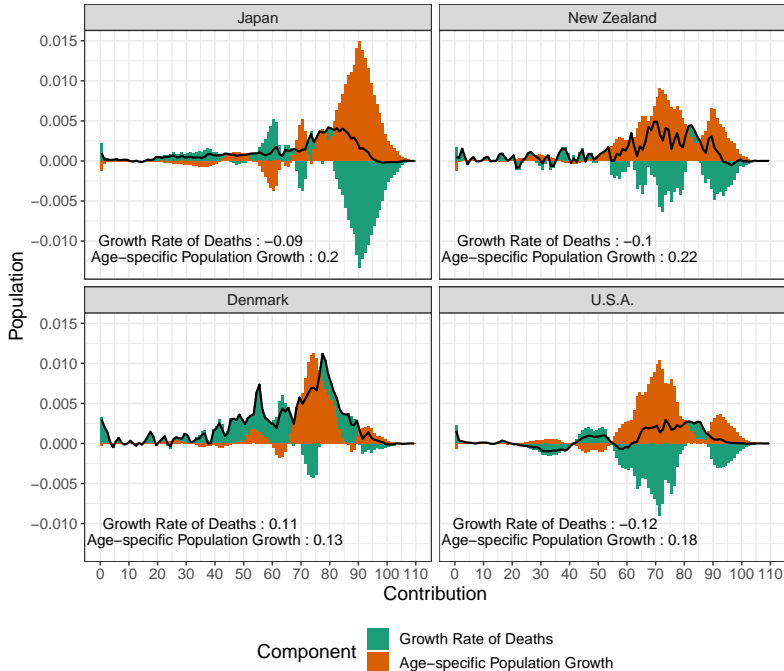












Discussion

1. Population growth (expanding denominator) is a key component in all life expectancy changes for HMD populations in 2009-2019.
2. Reducing number of deaths (shrinking numerator) at older ages will impact life expectancy changes significantly in the future.
3. Population ageing will accentuate this dynamic further.

Future Directions

1. Changes across time.
2. Results for developing countries.
(WPP2022)
3. Sensitivity to COVID-19?
(trivial growth component)
4. Suggestions?

Thank you!

Reference

Canudas-Romo, Vladimir, Tianyu Shen, and Collin F. Payne. 2022. "The Components of Change in Population Growth Rates." Journal Article. *Demography*.
<https://doi.org/10.1215/00703370-9765067>.
Database, Human Mortality. 2023. Dataset.
Available at: <http://www.mortality.org>.