

*PAA 2018*

POTENTIAL GAINS IN LIFE EXPECTANCY BY  
REDUCING INEQUALITY OF LIFESPANS IN DENMARK

JM Aburto, M Wensink, A van Raalte, R Lindahl-Jacobsen



April 2018

- **Cancer** is a main public health issue in Denmark.

- ▶ **Cancer** is a main public health issue in Denmark.
- ▶ Females born in 1919-1939 → **high levels of smoking and alcohol consumption.**

- ▶ **Cancer** is a main public health issue in Denmark.
- ▶ Females born in 1919-1939 → **high levels of smoking and alcohol consumption.**
- ▶ **Highest** lung cancer mortality rates in Europe.

- ▶ **Cancer** is a main public health issue in Denmark.
- ▶ Females born in 1919-1939 → **high levels of smoking and alcohol consumption.**
- ▶ **Highest** lung cancer mortality rates in Europe.
- ▶ Males have **higher smoking-related mortality** than Swedish (snus vs tobacco).

- ▶ **Cancer** is a main public health issue in Denmark.
- ▶ Females born in 1919-1939 → **high levels of smoking and alcohol consumption.**
- ▶ **Highest** lung cancer mortality rates in Europe.
- ▶ Males have **higher smoking-related mortality** than Swedish (snus vs tobacco).
- ▶ Denmark showed the **highest mortality from all neoplasms in Europe.**

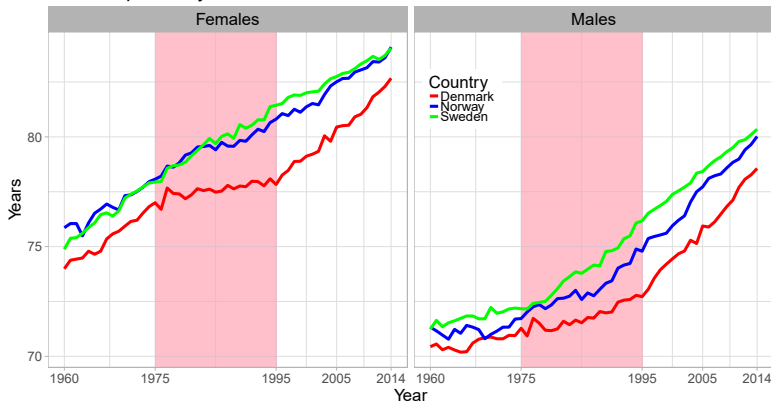
As a result

- ▶ Danish life expectancy **stagnated** in 1975-1995  
( $\sim 77$ y)

As a result

- Danish life expectancy **stagnated** in 1975-1995 ( $\sim 77y$ )

A Life expectancy at birth





# Motivation

- ▶ **Lifespan inequality** increasingly recognized as public health goal.

# Motivation

- ▶ **Lifespan inequality** increasingly recognized as public health goal.
- ▶ **Effect of smoking-related and overall cancer** on lifespan inequality is unknown.

# Motivation

- ▶ **Lifespan inequality** increasingly recognized as public health goal.
- ▶ **Effect of smoking-related and overall cancer** on lifespan inequality is unknown.
- ▶ **Shared** history, culture and similarities healthcare systems with Sweden and Norway.

# Motivation

- ▶ **Lifespan inequality** increasingly recognized as public health goal.
- ▶ **Effect of smoking-related and overall cancer** on lifespan inequality is unknown.
- ▶ **Shared** history, culture and similarities healthcare systems with Sweden and Norway.

**What does Denmark need to close the gap in  $e_0$  through lifespan inequality?**

## Why lifespan inequality?

- ▶ **Complements** life expectancy (mean) with variation of lifespans.

## Why lifespan inequality?

- ▶ **Complements** life expectancy (mean) with variation of lifespans.
- ▶ **Heterogeneity** in age at death at the **macro level**.

## Why lifespan inequality?

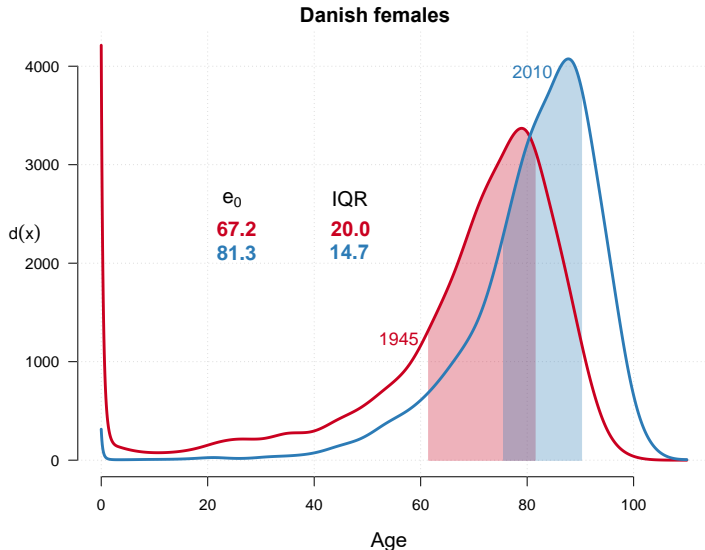
- ▶ **Complements** life expectancy (mean) with variation of lifespans.
- ▶ **Heterogeneity** in age at death at the **macro level**.
- ▶ **Uncertainty** in the timing of death at the **micro level**

## Why lifespan inequality?

- ▶ **Complements** life expectancy (mean) with variation of lifespans.
- ▶ **Heterogeneity** in age at death at the **macro level**.
- ▶ **Uncertainty** in the timing of death at the **micro level**
- ▶ We make **decisions** based on both.



# Why lifespan inequality?



# Data

- ▶ **Period lifetables** from HMD for Denmark, Sweden and Norway from 1960-2014.
- ▶ **Cause of death** data from WHO database.

## Classification of deaths

1. Cancer sensitive to smoking
2. Cancer non-sensitive to smoking
3. Cardiovascular conditions
4. Non-infectious respiratory diseases
5. Infectious respiratory diseases
6. External causes
7. Rest.

## Indicator: Coefficient of variation

## Indicator: Coefficient of variation

- ▶ Standard deviation over the mean

$$\frac{\sigma}{e_0}$$

- ▶ Captures the **dimensionless** of the shape of aging.

## Indicator: Coefficient of variation

- ▶ Standard deviation over the mean

$$\frac{\sigma}{e_0}$$

- ▶ Captures the **dimensionless** of the shape of aging.
- ▶ **Easy** to interpret.

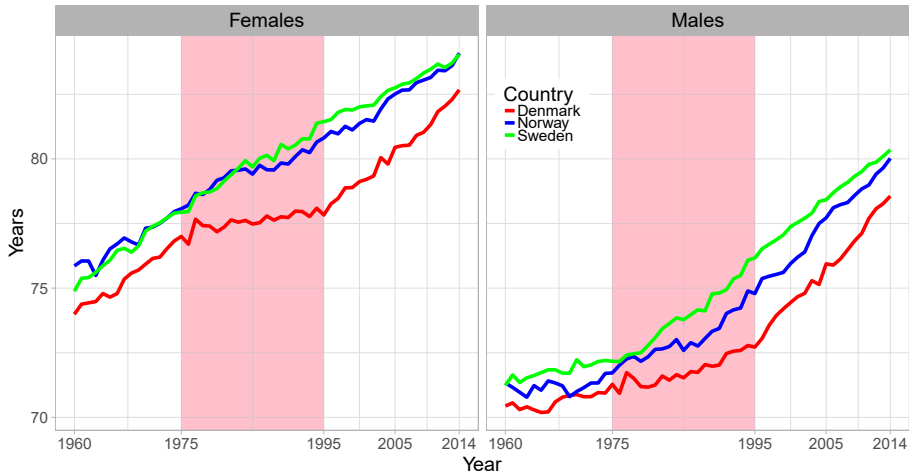
## Indicator: Coefficient of variation

- ▶ Standard deviation over the mean

$$\frac{\sigma}{e_0}$$

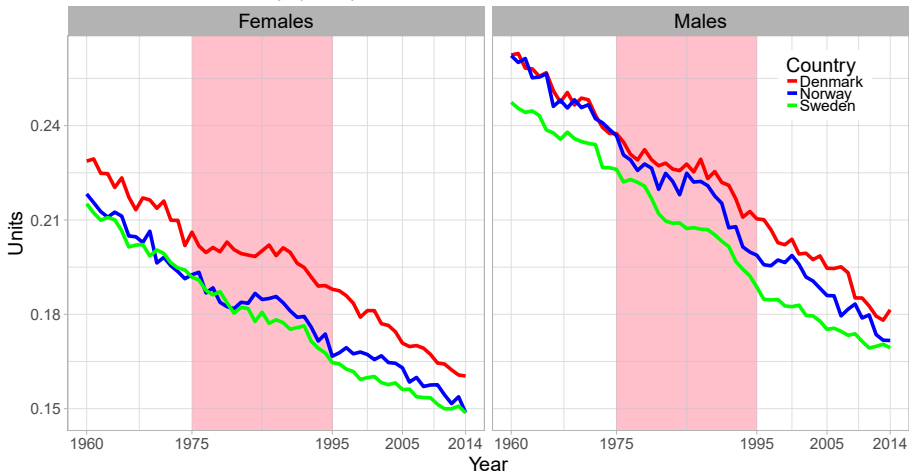
- ▶ Captures the **dimensionless** of the shape of aging.
- ▶ **Easy** to interpret.
- ▶ Allows to separate ages and causes that **decrease** from those that **increase** inequality.

## A Life expectancy at birth

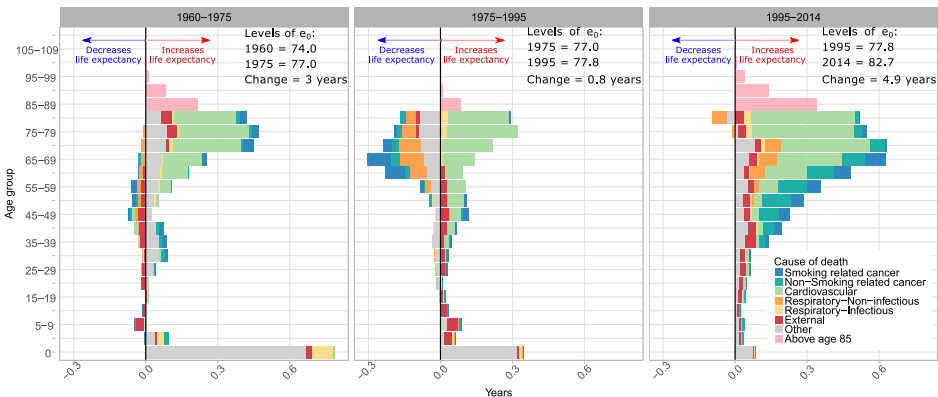




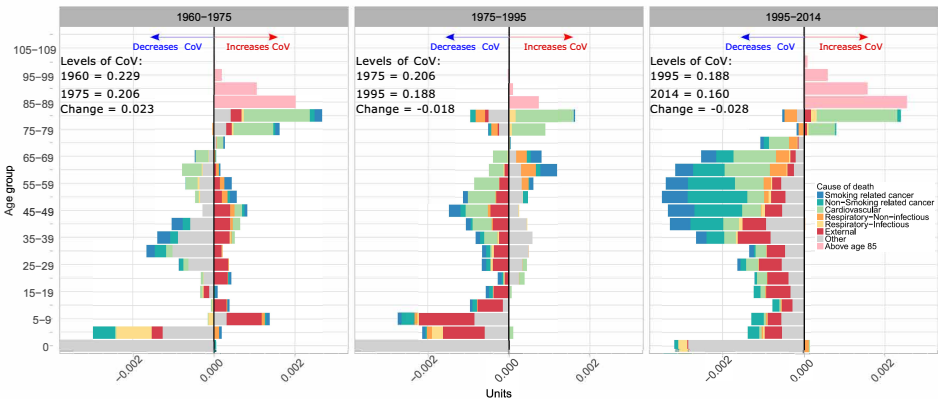
## B Lifespan inequality (CoV)



# A Decomposition of life expectancy

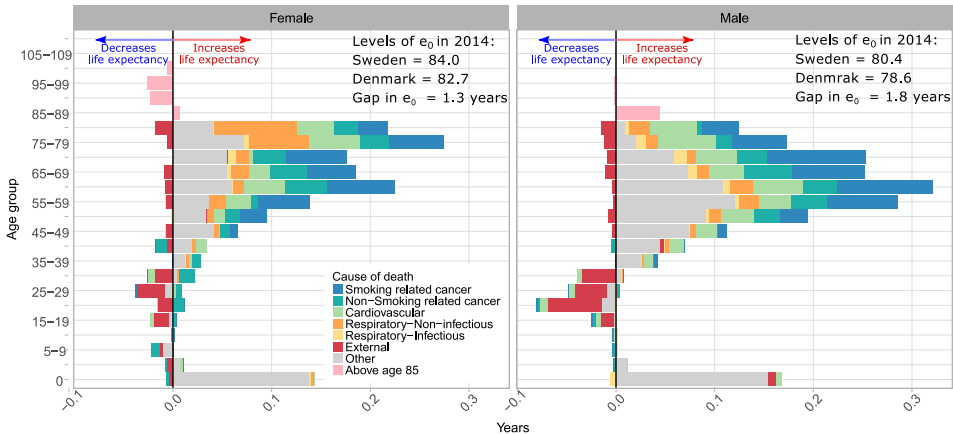


## B Decomposition of lifespan inequality (CoV)



## A Decomposition of life expectancy

Sweden – Denmark, 2014.



## B Decomposition of lifespan inequality (CoV)

Denmark – Sweden, 2014.

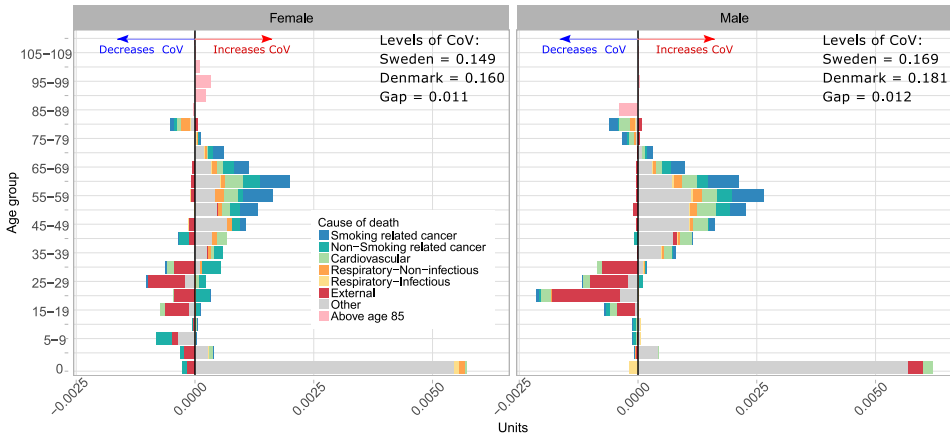


Table 1. Potential gains in life expectancy in Denmark if inequality is reduced (%%) to Swedish levels in 2014 by cause of death.

Sex	Cause of death category and mortality above age 85	Reduce gap with Sweden in CoV (%)	Reduction in life expectancy gap (%)	Potential Gains in life expectancy (years)
Females	1 Smoking-related cancer	18%	25%	0.35
	2 Non-Smoking related cancer	13%	16%	0.22
	3 Cardiovascular	10%	15%	0.21
	4 Respiratory-Infectious	2%	2%	0.03
	5 Respiratory-Non-infectious	7%	17%	0.23
	6 External	-26% *	-11% **	-0.15
	7 Other	71%	40%	0.55
	Above age 85	5%	-3% **	-0.05
Males	1 Smoking-related cancer	15%	26%	0.47
	2 Non-Smoking related cancer	7%	10%	0.19
	3 Cardiovascular	10%	19%	0.33
	4 Respiratory-Infectious	1%	3%	0.05
	5 Respiratory-Non-infectious	5%	7%	0.12
	6 External	-26% *	-11% **	-0.19
	7 Other	92%	43%	0.77
	Above age 85	0.0	0.0	0.04

\* Increases the gap with Sweden. Represents potential gains for Sweden if they achieve the levels of Denmark.

\*\* Increases the gap with Sweden in life expectancy.

Note: the sum of percentages differ to 100% due to rounding.

# Key messages

## Key messages

- ▶ **Lifespan inequality** reflects →
  1. **heterogeneity** in ages at death.
  2. **uncertainty** in the timing of death.



## Key messages

- ▶ **Lifespan inequality** reflects →
  1. **heterogeneity** in ages at death.
  2. **uncertainty** in the timing of death.
- ▶ **Cancer mortality** → biggest contributor to Danish-Swedish **life expectancy difference**.

## Key messages

- ▶ **Lifespan inequality** reflects →
  1. **heterogeneity** in ages at death.
  2. **uncertainty** in the timing of death.
- ▶ **Cancer mortality** → biggest contributor to Danish-Swedish **life expectancy difference**.
- ▶ **Infant mortality** → contributor to the 2014 Danish-Swedish **lifespan inequality difference**.

## Key messages

- ▶ **Lifespan inequality** reflects →
  1. **heterogeneity** in ages at death.
  2. **uncertainty** in the timing of death.
- ▶ **Cancer mortality** → biggest contributor to Danish-Swedish **life expectancy difference**.
- ▶ **Infant mortality** → contributor to the 2014 Danish-Swedish **lifespan inequality difference**.
- ▶ **Denmark** can ↓ inequality in lifespans and ↑ life expectancy through a consistent policy target: **reducing cancer and infant mortality**.

# Potential gains in Denmark: Cancer and Infant Mortality

More information:

Email: [jmaburto@health.sdu.dk](mailto:jmaburto@health.sdu.dk)



@jm\_aburto



@jmaburto

Shinyapp: [https://jmaburto.shinyapps.io/DK\\_App/](https://jmaburto.shinyapps.io/DK_App/)

Lifespan inequality in Denmark, Sweden and Norway

