

# Average life expectancy and life years lost in people with mental disorders

Vladimir Canudas-Romo

School of Demography  
Research School of Social Sciences



## *Lancet Psychiatry*

[http://dx.doi.org/10.1016/S2215-0366\(17\)30429-7](http://dx.doi.org/10.1016/S2215-0366(17)30429-7)

---

# Cause-specific life-years lost in people with mental disorders: a nationwide, register-based cohort study

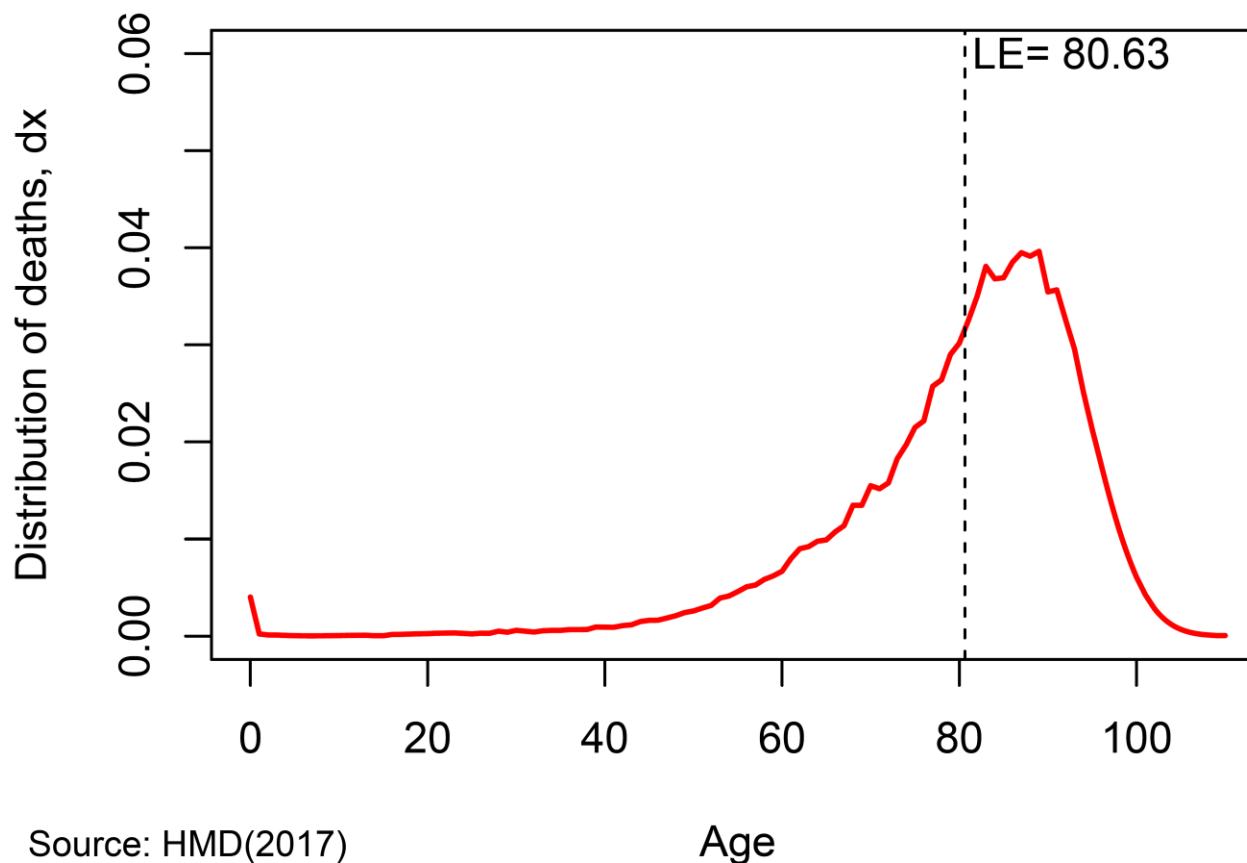
Annette Erlangsen, Per Kragh Andersen, Anita Toender, Thomas Munk Laursen, Merete Nordentoft, Vladimir Canudas-Romo

- Introduction & Aim
- Method: “Average life expectancy” ...  
What? Why? When?
- Illustration using Danish population  
with mental disorders
- Can we use it in other settings?



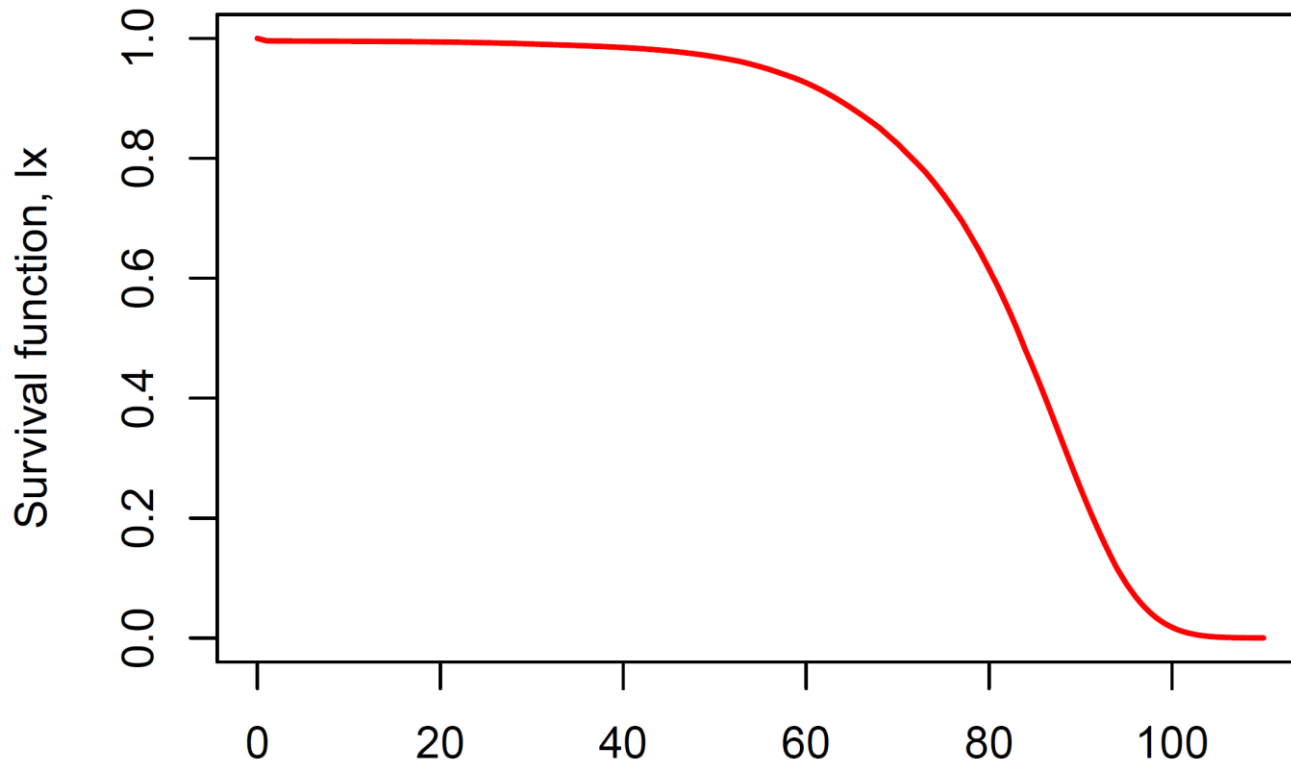
# Life expectancy

- “average age at death”



# Life expectancy

- “average survival time”



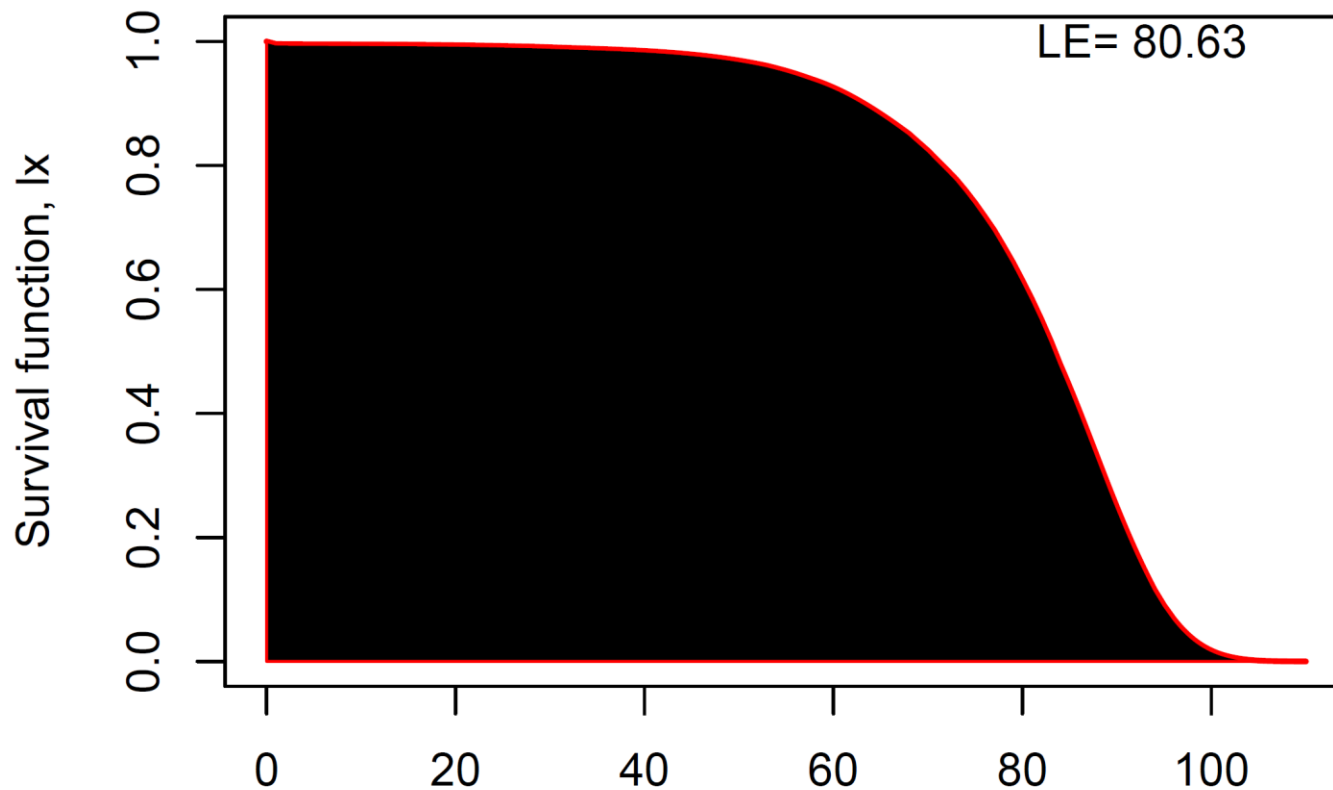
Source: HMD(2017)

Age



# Life expectancy

- “average survival time”



Source: HMD(2017)

Age

Google scholar hits on:

“life expectancy”: 643.000

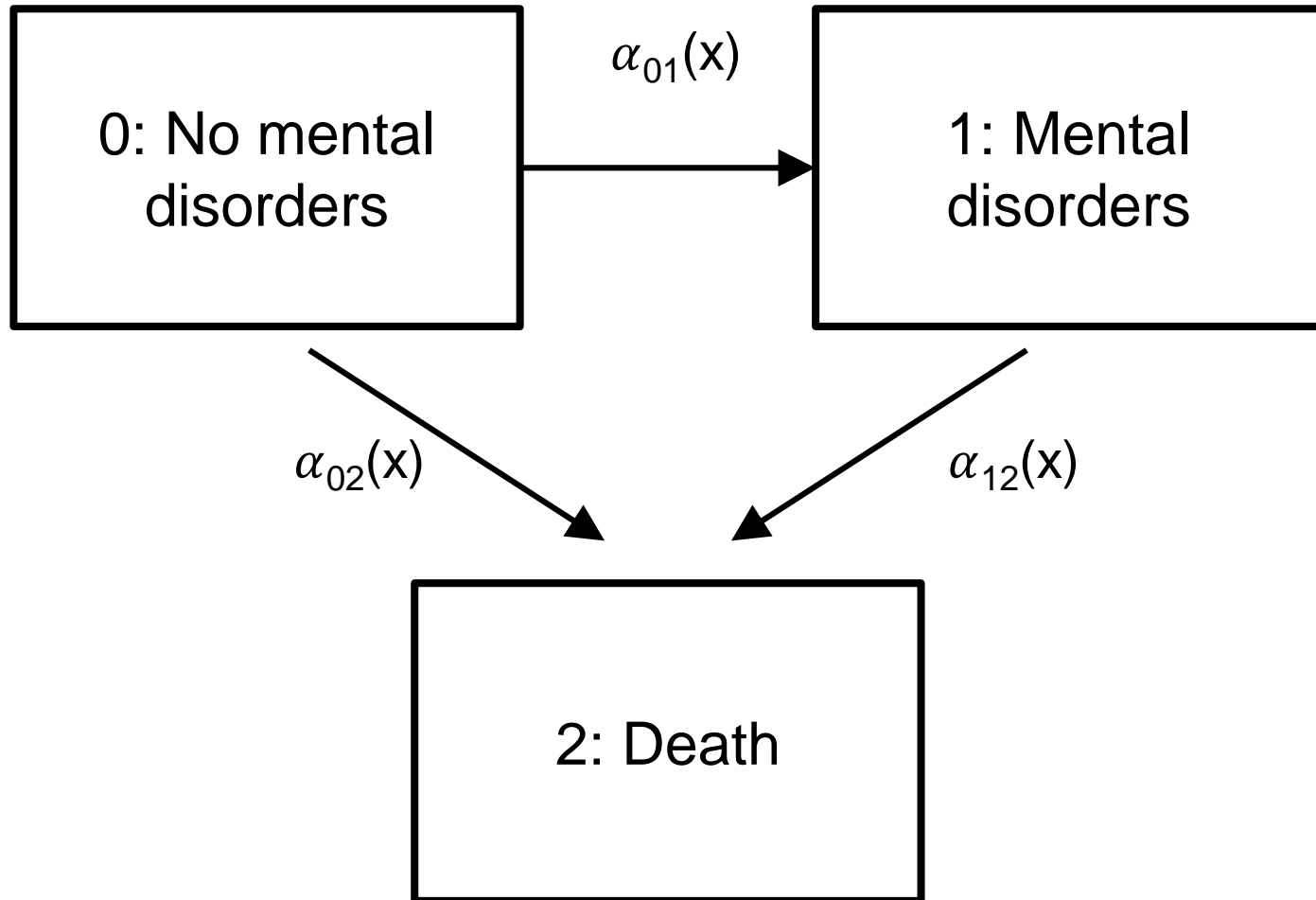
Google scholar hits on:

“life expectancy”: 643.000

“average life expectancy”: 53.400



# 3 state Markov health-disease model





# Aim

To define “average life expectancy”

and “average life years lost”



# Data and method

# Record linkage

Register data on all persons aged 15+ living in Denmark during 1995-2014 (N=6,107,234).

## **Extracts from:**

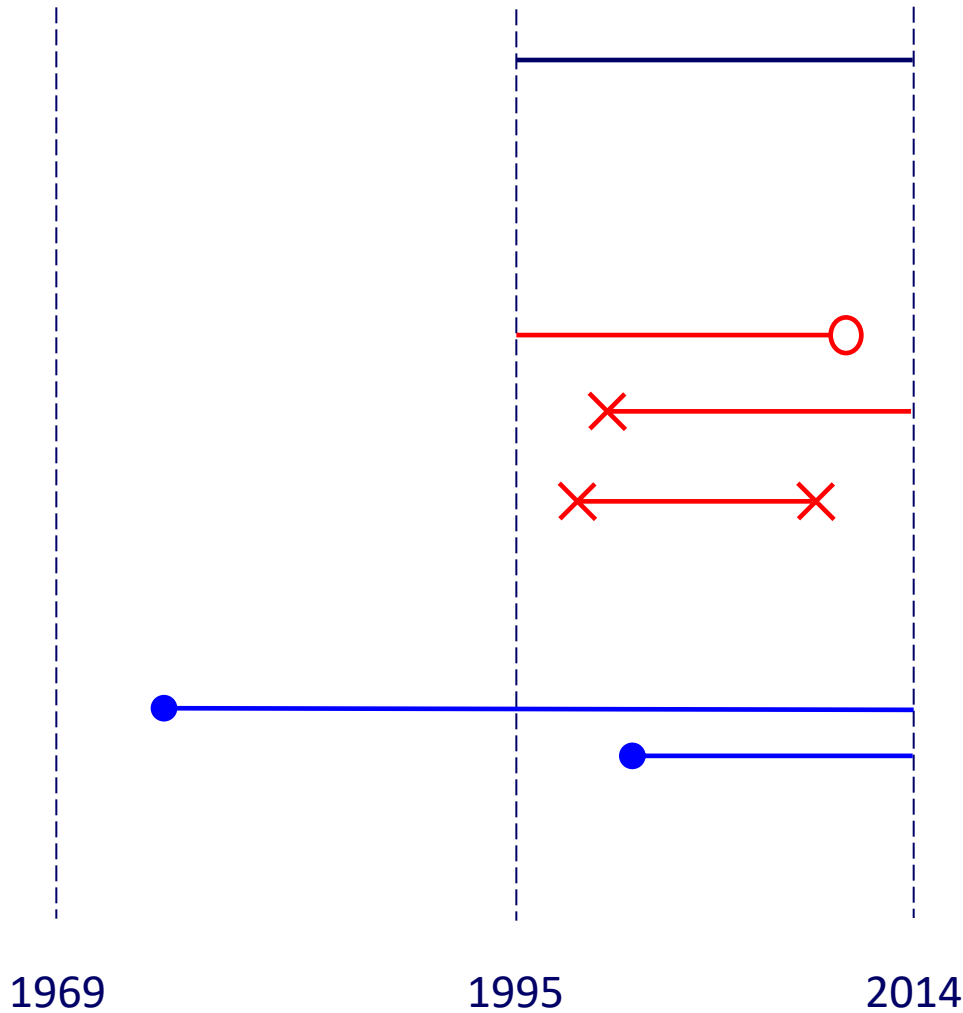
Centralised Civil Register

Register of Causes of Death

Psychiatric Centralized Registry (since 1969)



# Cohort design



**Period:** 1995 – 2014

**Truncation at:**

– Date of death

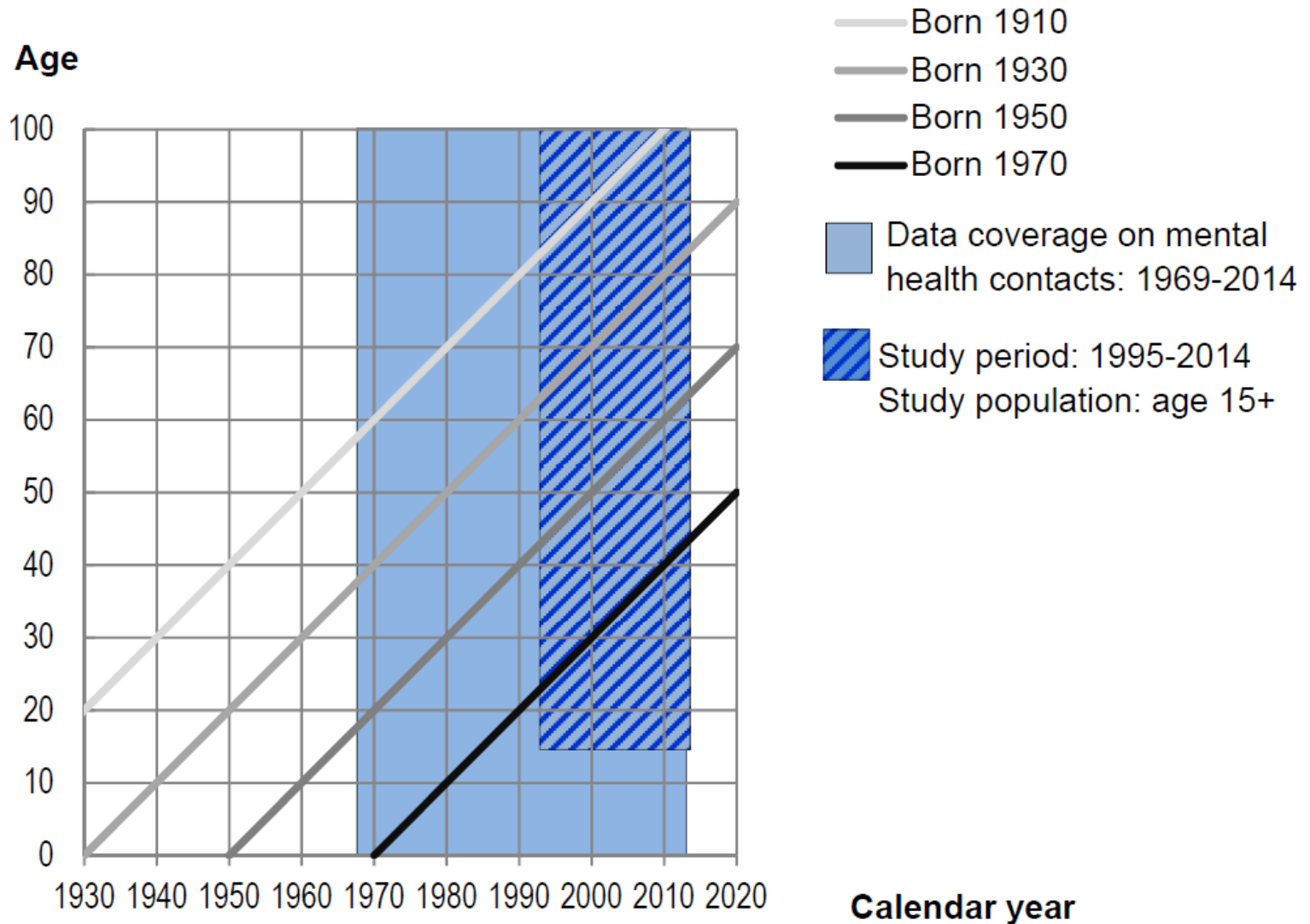
– Turning 15 years

– In and out migration

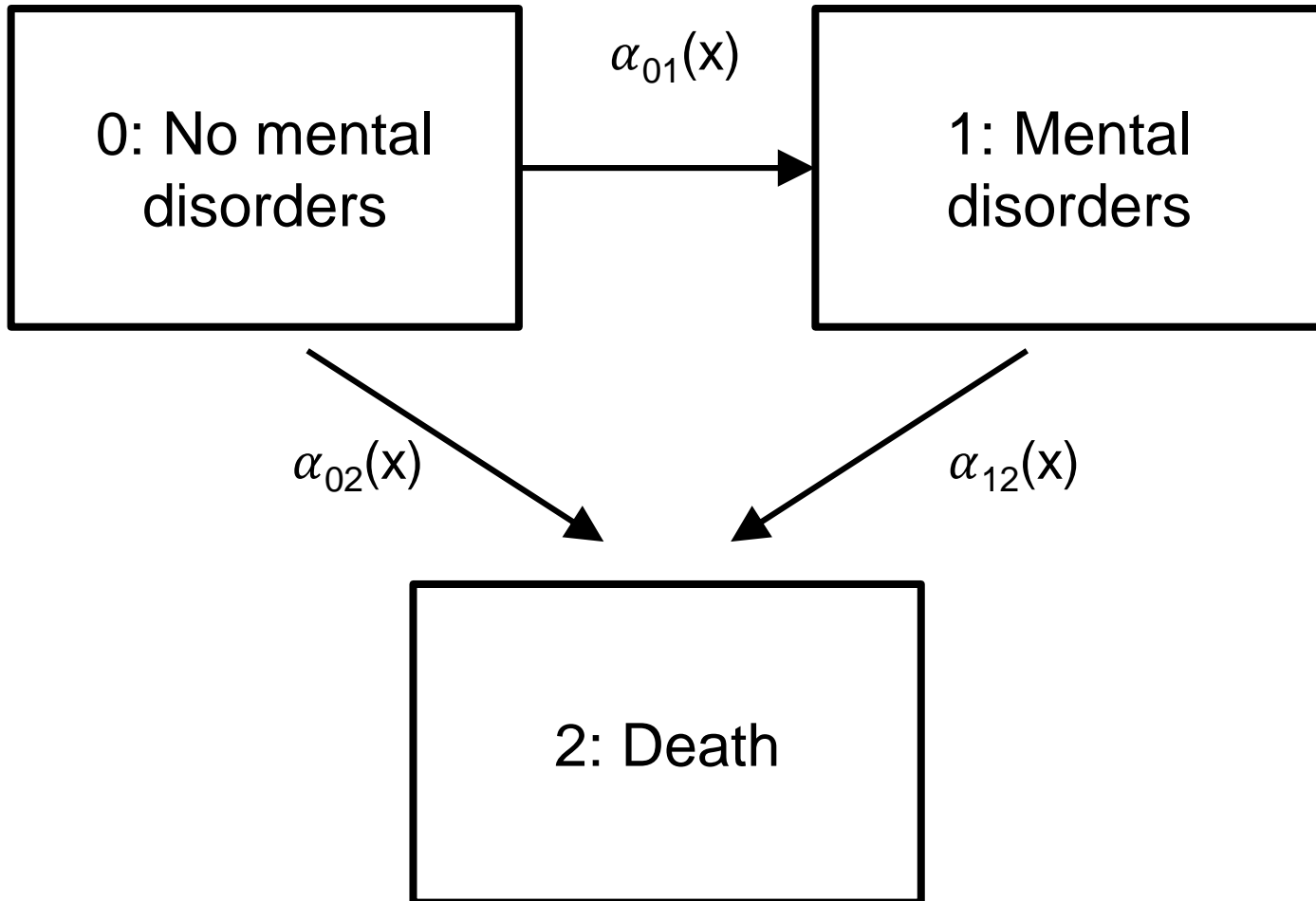
– **Exposure:** Mental disorders



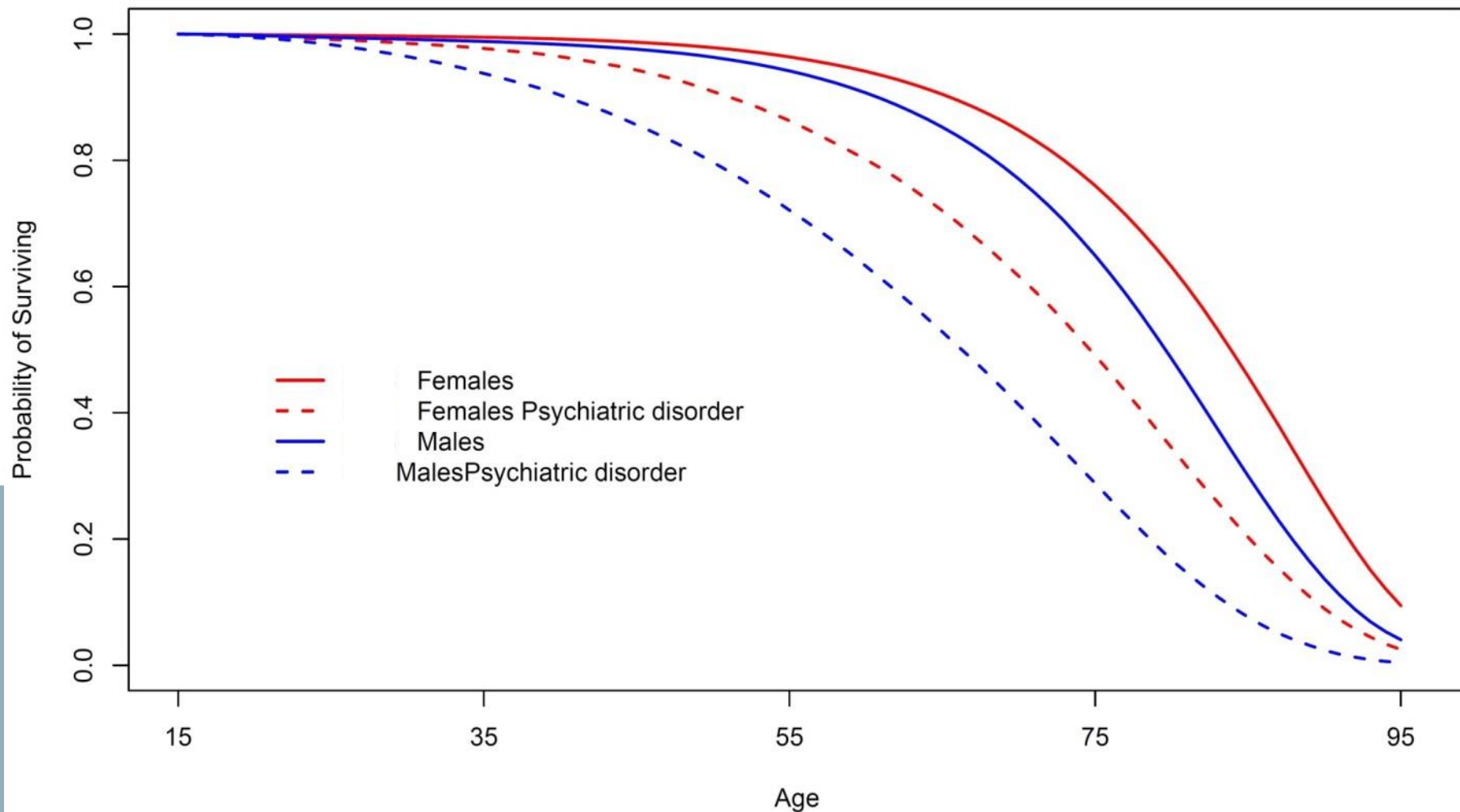
## Lexis diagram



# 3 state Markov health-disease model



# Probability of surviving between 15 and 94, Denmark, 1995-2014





**with** mental disorders

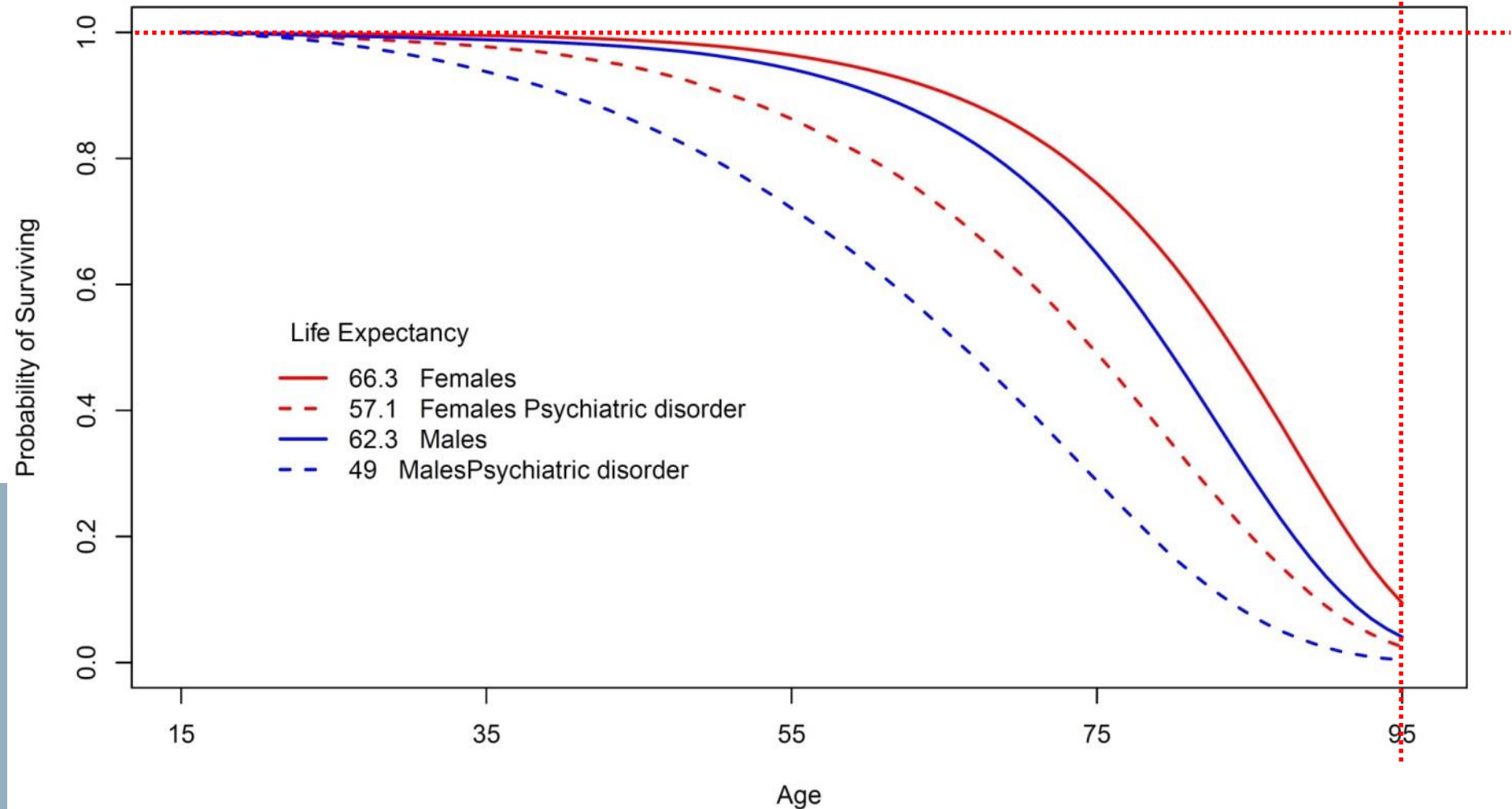
$$e(a_1, \tau) \quad \tau > a_1$$

**without** mental disorders

$$e^*(a_1, \tau) \quad \tau > a_1$$

$a_1$  is the mental disorder diagnostic age

# Probability of surviving between 15 and 94, Denmark, 1995-2014



# Life years lost

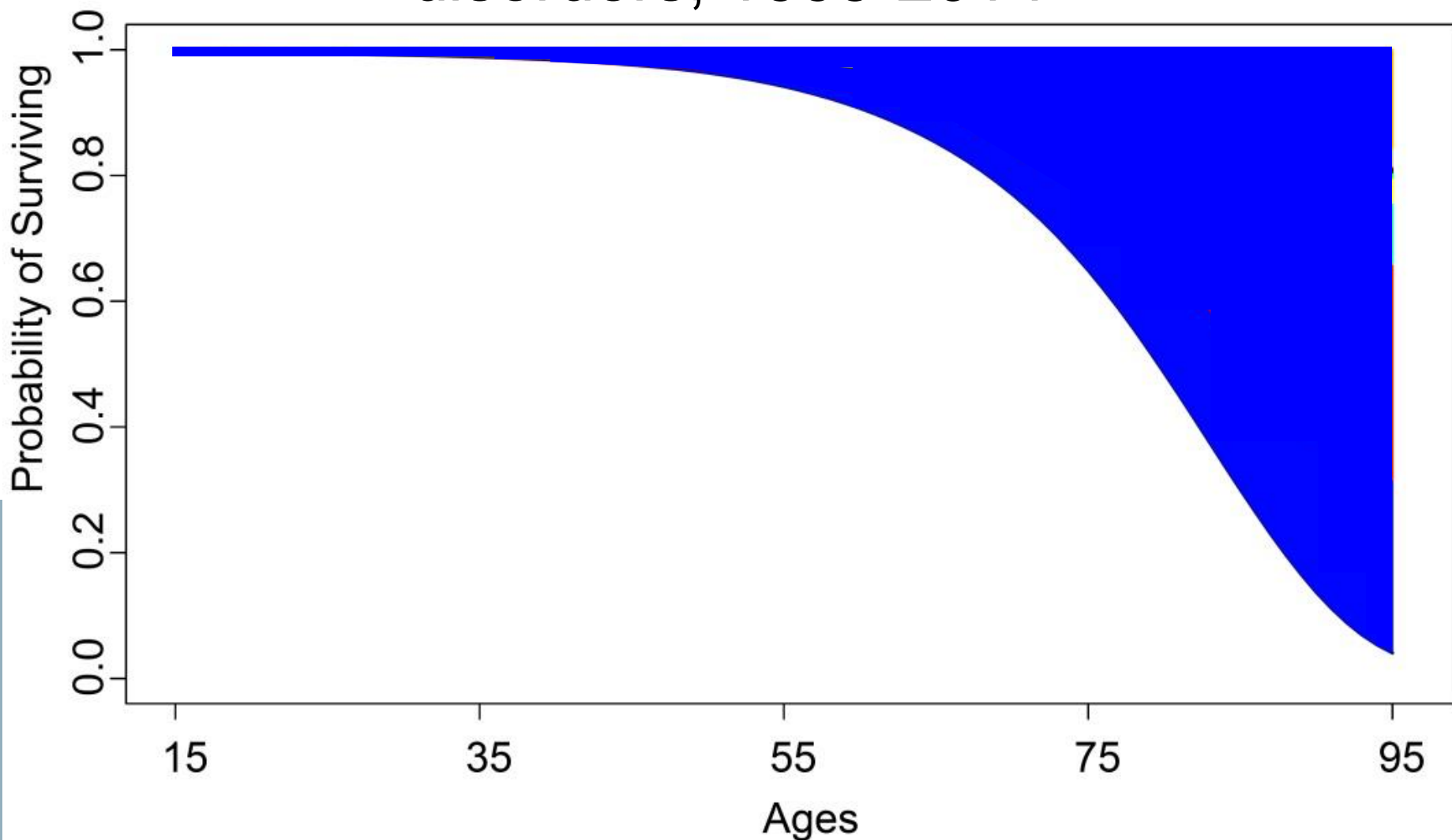
**with** mental disorders

$$\vartheta(a_1, \tau) \quad \tau > a_1$$

**without** mental disorders

$$\vartheta^*(a_1, \tau) \quad \tau > a_1$$

# Life years lost, Danish men without mental disorders, 1995-2014



**with** mental disorders

$$\vartheta(a_1, \tau) = \int_{a_1}^{\tau} F(x) dx$$

**with** mental disorders

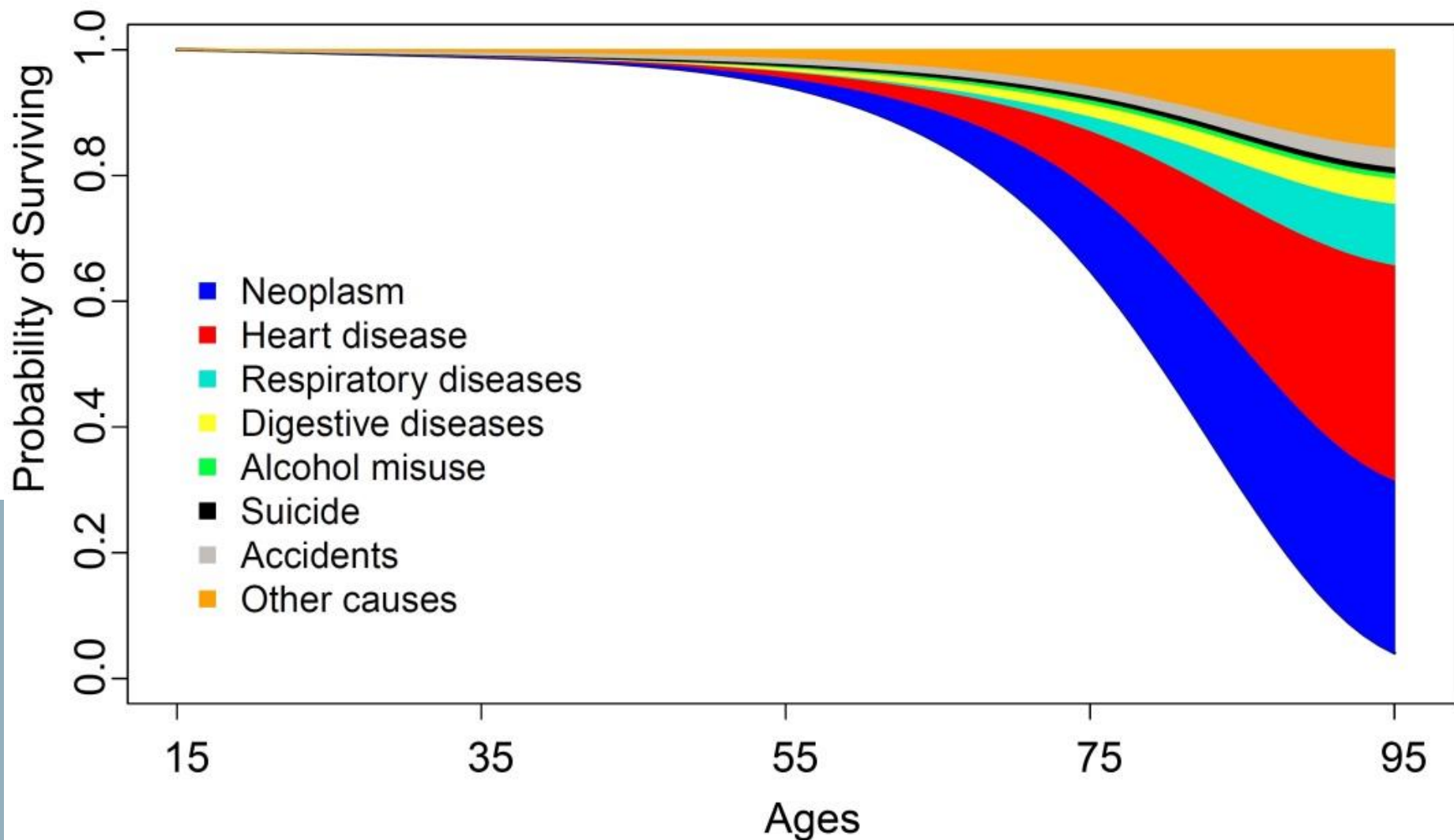
$$\vartheta(a_1, \tau) = \int_{a_1}^{\tau} F(x) dx$$

by causes of death

$$\vartheta_j(a_1, \tau) = \int_{a_1}^{\tau} F_j(x) dx$$

$F_j$  cause  $j$  cumulative incidence function

# Life years lost by causes of death, Danish men without mental disorders, 1995-2014



**with** mental disorders

$$(\tau - a_1) = e(a_1, \tau) + \vartheta(a_1, \tau)$$

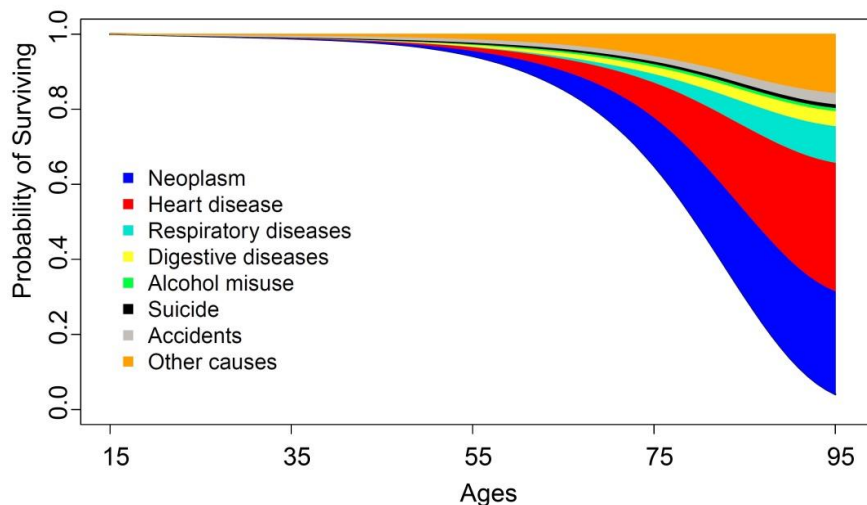
**without** mental disorders

$$(\tau - a_1) = e^*(a_1, \tau) + \vartheta^*(a_1, \tau)$$

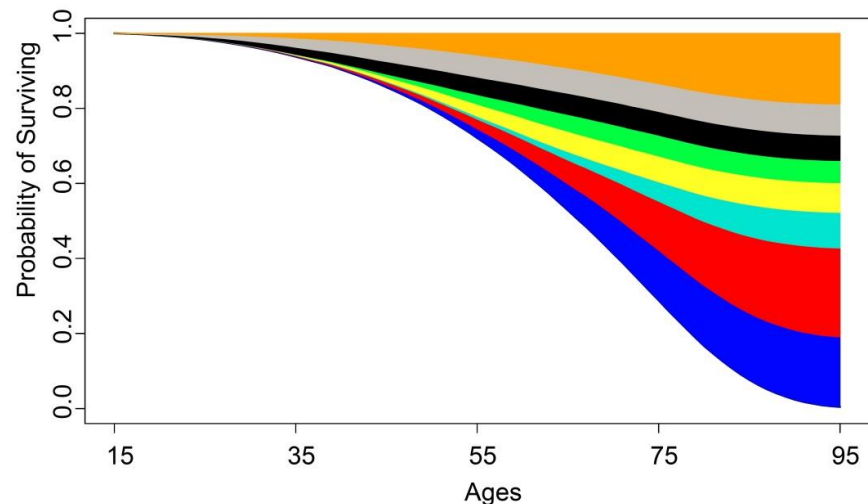


# Life years lost by causes of death ages 15-94, Denmark, 1995-2014

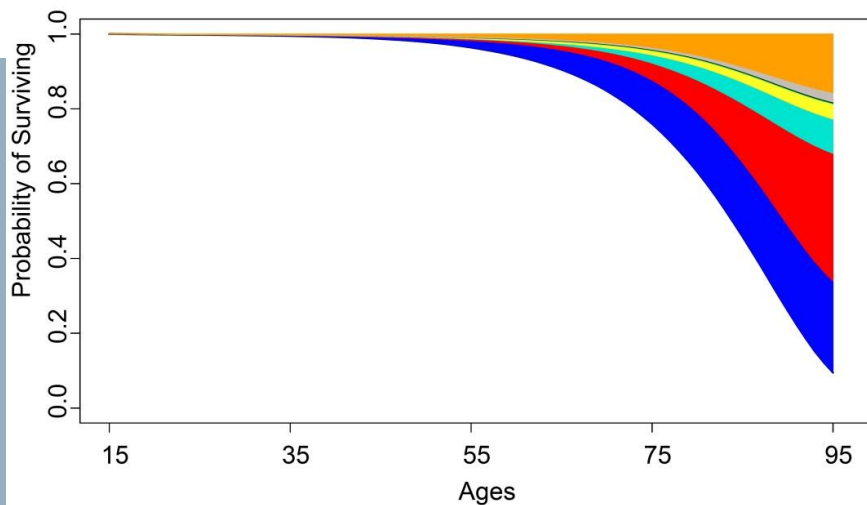
**Men with no mental disorders**



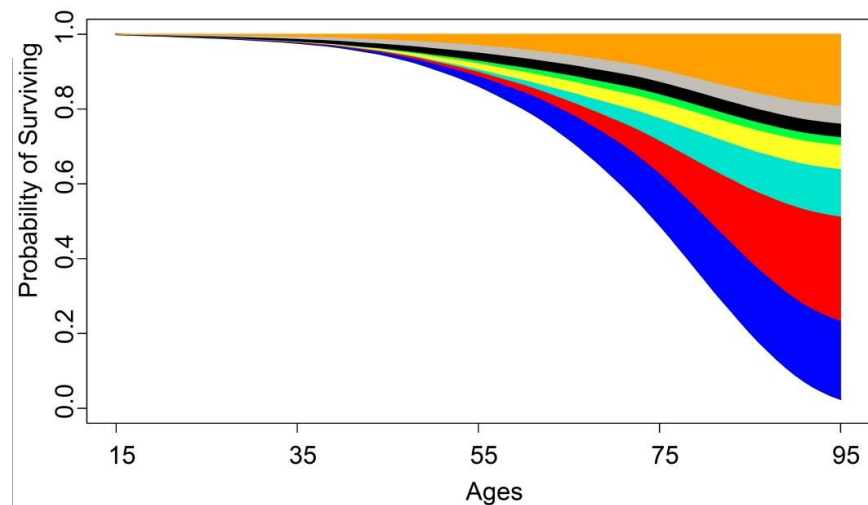
**Men with mental disorders**



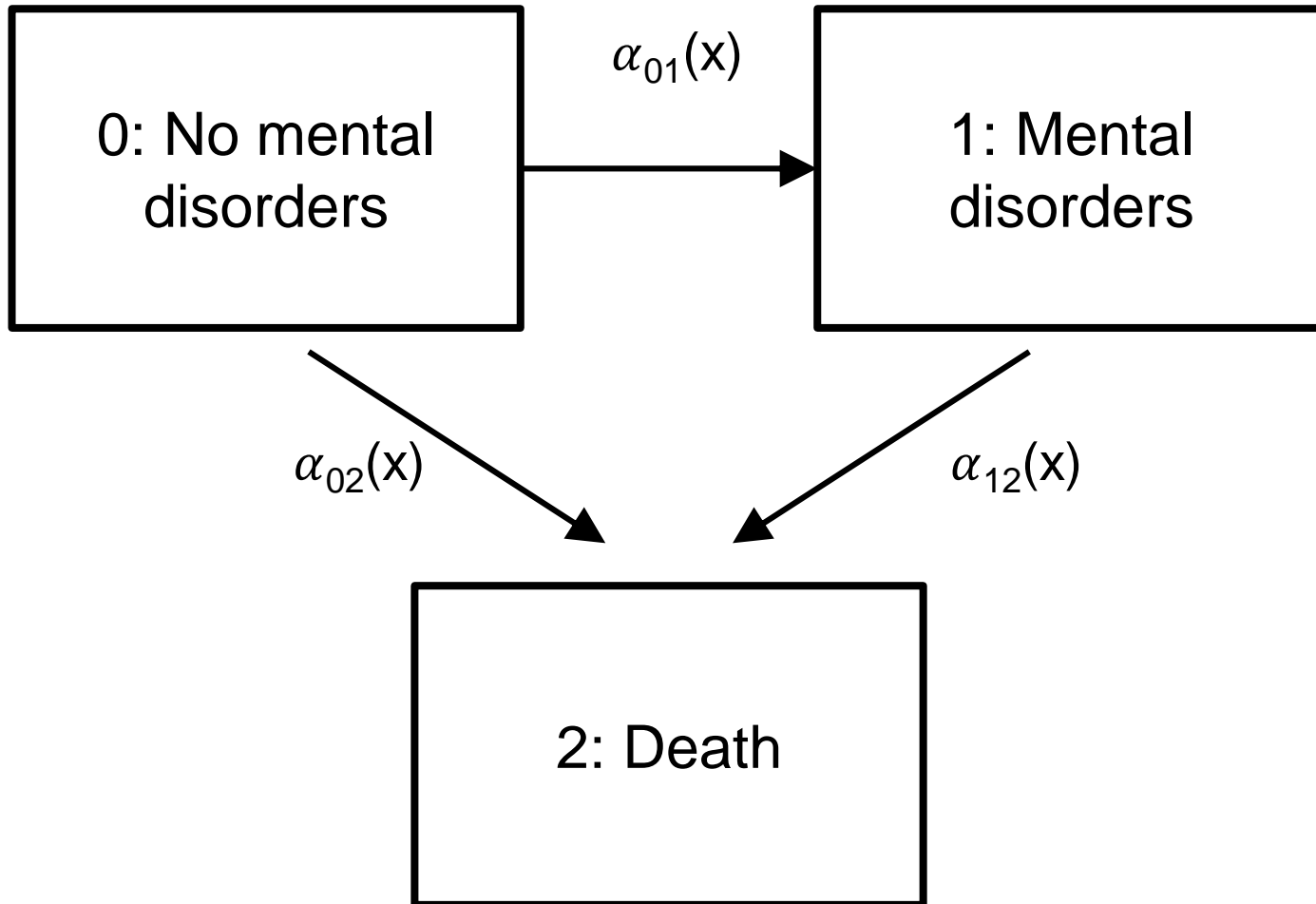
**Women with no mental disorders**



**Women with mental disorders**



# 3 state Markov health-disease model



**with** mental disorders

$$\frac{1}{n} \sum_{i=1}^n (\tau - a_{1i}) = \frac{1}{n} \sum_{i=1}^n [e(a_{1i}, \tau) + \vartheta(a_{1i}, \tau)]$$

**without** mental disorders

$$\frac{1}{n} \sum_{i=1}^n (\tau - a_{1i}) = \frac{1}{n} \sum_{i=1}^n [e^*(a_{1i}, \tau) + \vartheta^*(a_{1i}, \tau)]$$

# Average life expectancy and life years lost, 15-94, Denmark, 1995-2014

	<b>with</b> mental disorders		<b>without</b> mental disorders	
Average	Men	Women	Men	Women
$\frac{1}{n} \sum_{i=1}^n (\tau - a_{1i})$	55,6	54,2	55,6	54,2
Life expectancy	29,3	34,6	39,5	41,9
Life years lost	26,3	19,6	16,1	12,3



# Excess life years lost

$$\sum_{j=1}^m \left[ \frac{1}{n} \sum_{i=1}^n (\vartheta_j(a_{1i}, \tau) - \vartheta_j^*(a_{1i}, \tau)) \right]$$



# Results



# Life expectancy at age 15



	<b>Denmark</b>	<b>Sweden</b>	<b>Finland</b>
Serious mental ill	39.0	41.9	43.3
General population	60.9	60.8	63.6
Difference	<b>21.9</b>	<b>18.9</b>	<b>20.3</b>



	<b>Denmark</b>	<b>Sweden</b>	<b>Finland</b>
Serious mental ill	<b>48.3</b>	54.1	53.1
General population	<b>65.4</b>	67.6	68.0
Difference	<b>17.1</b>	<b>13.6</b>	<b>14.9</b>



# Background

- ➔ People with mental disorders have 3 to 4-fold higher mortality rates than people without mental disorders
- ➔ Higher mortality rate ratios by: suicides, accidents, and homicides
- ➔ Also elevated rate ratios for cardiovascular disease, malignant neoplasms, respiratory diseases, as well as endocrine and metabolic conditions

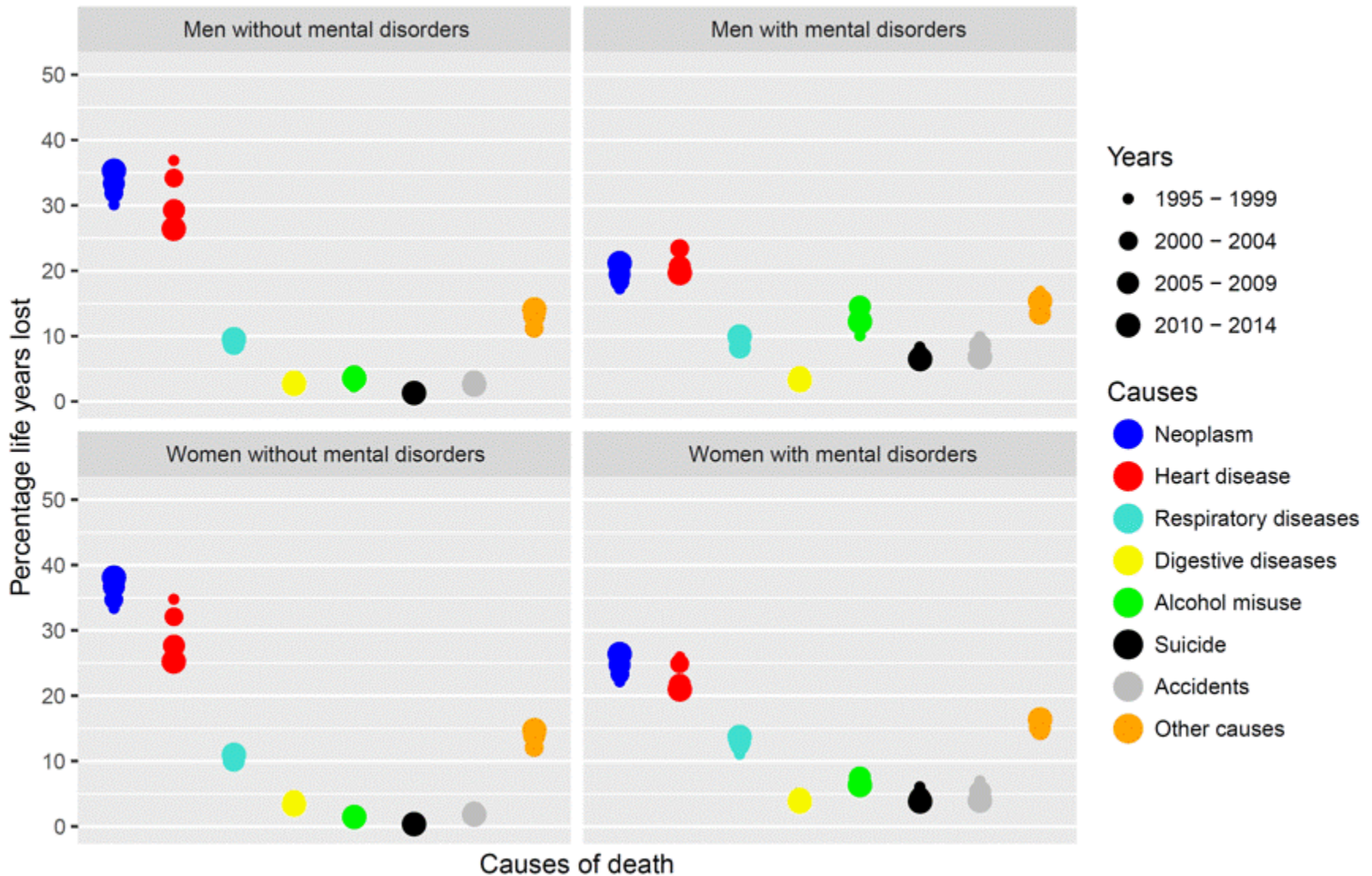
Laursen et al., 2007; Joukamaa et al., 2001;  
Lawrence et al., 2013



# Mortality Rate Ratio

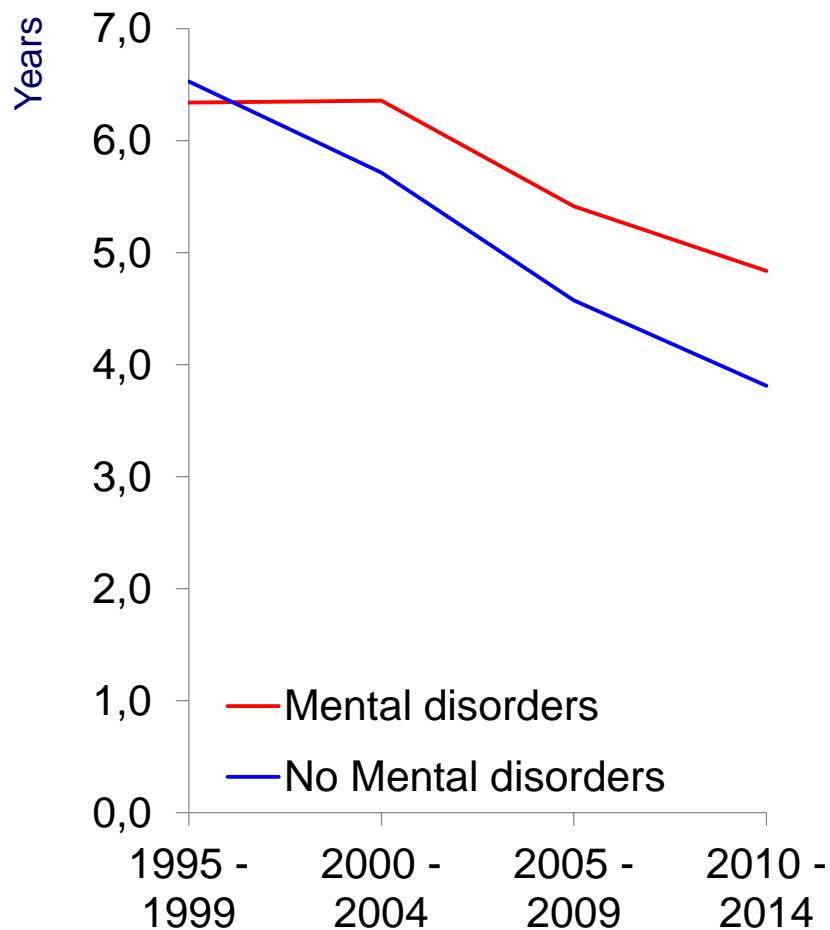
	<i>Men</i> 	<i>Women</i> 
Infectious diseases	3.1 [2.9 - 3.3]	2.2 [2 - 2.3]
Neoplasms	1.5 [1.4 - 1.5]	1.3 [1.3 - 1.4]
Diabetes	2.5 [2.4 - 2.7]	2.0 [1.9 - 2.1]
Heart diseases	1.9 [1.8 - 1.9]	1.7 [1.7 - 1.7]
Respiratory diseases	2.6 [2.5 - 2.7]	2.5 [2.4 - 2.5]
Digestive diseases	2.7 [2.6 - 2.8]	2.0 [2 - 2.1]
<b>Alcohol misuse</b>	8.3 [8.1 - 8.5]	8.9 [8.6 - 9.2]
<b>Suicide</b>	10.7 [10.4 - 11]	18.7 [17.9 - 19.5]
<b>Accidents</b>	5.0 [4.9 - 5.2]	3.3 [3.2 - 3.5]
Other causes of death	2.7 [2.7 - 2.8]	2.2 [2.2 - 2.3]

# Change over time

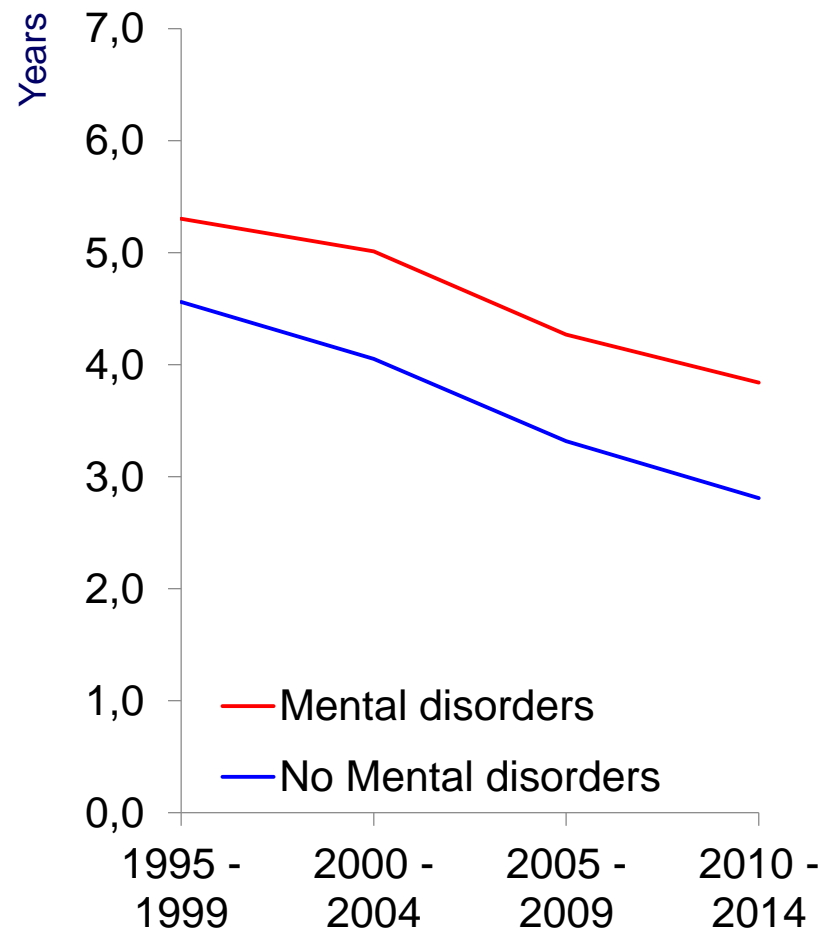


# Heart disease – life years lost

## Men

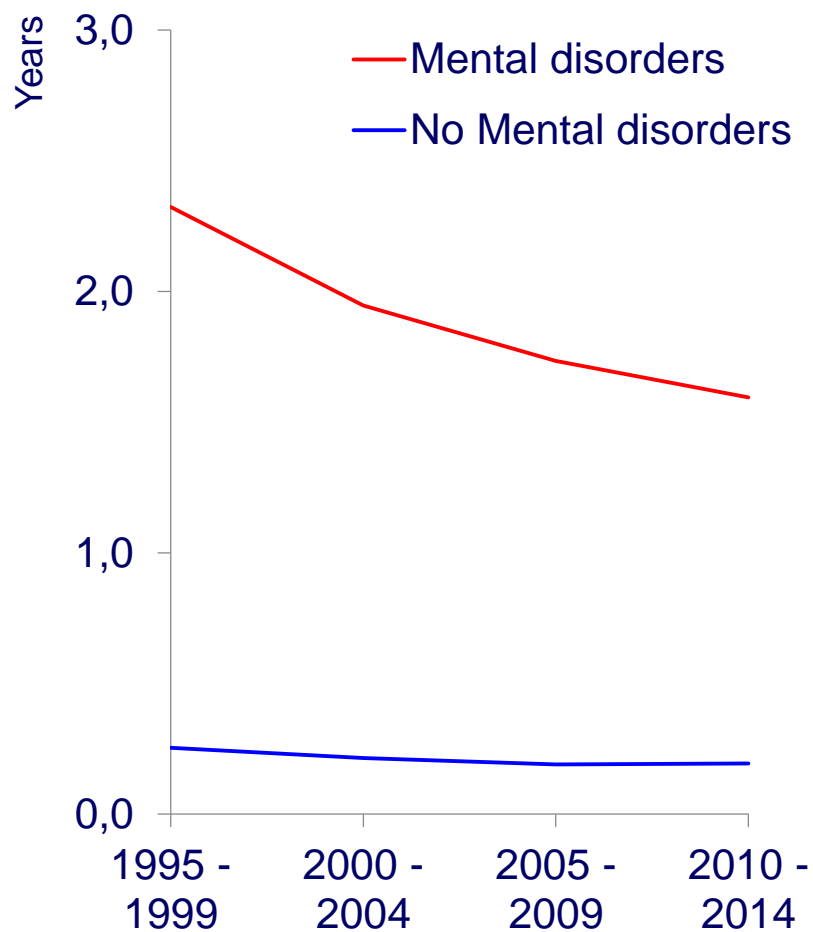


## Women

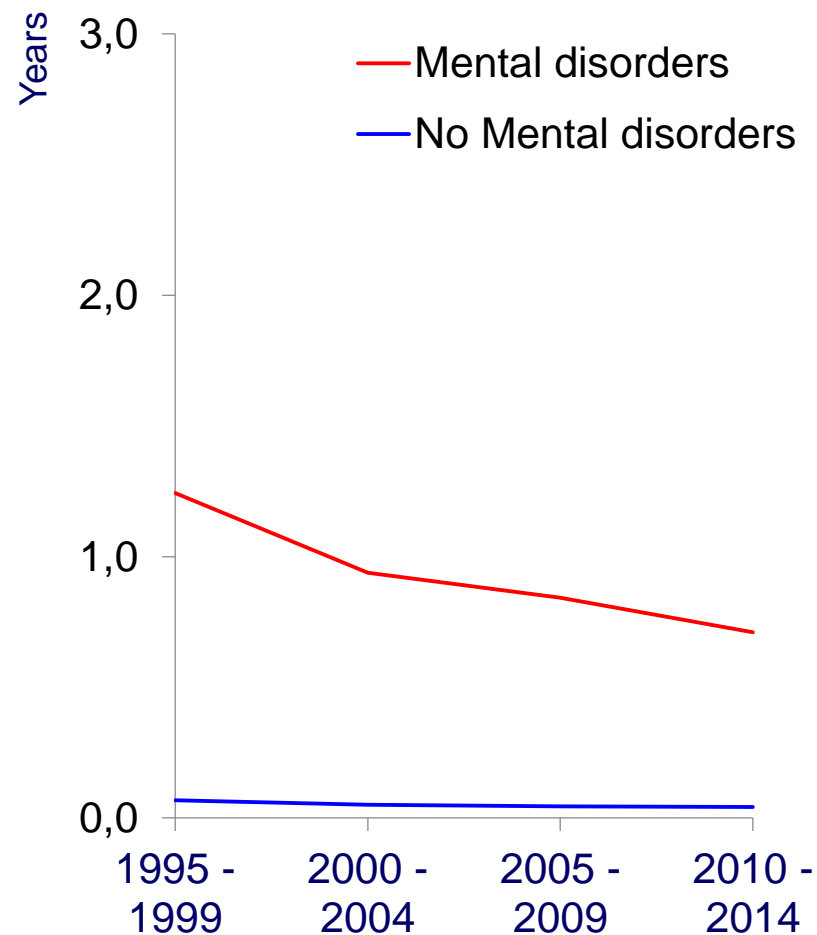


# Suicide – life years lost

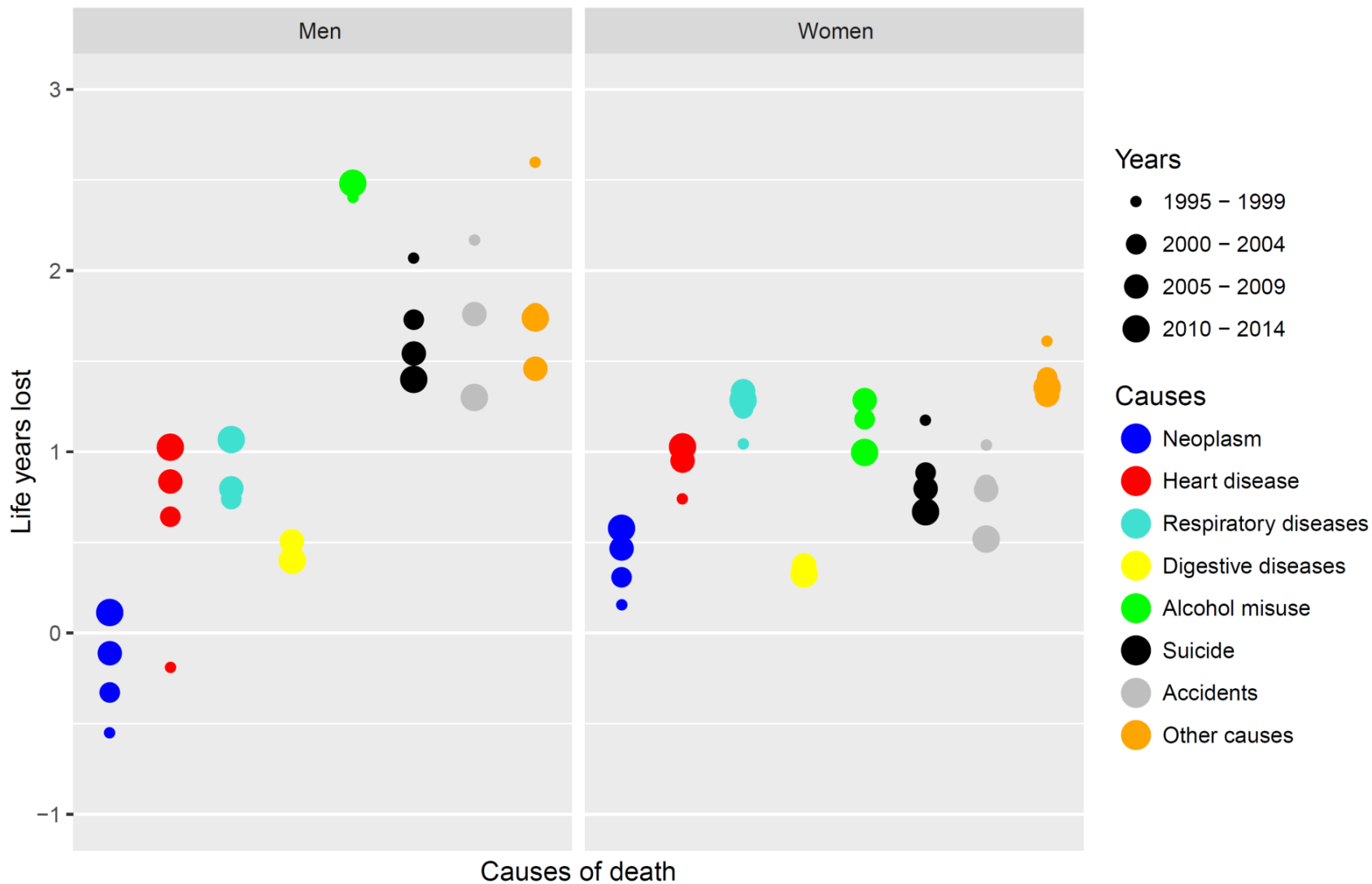
## Men



## Women



# Excess Life Years Lost

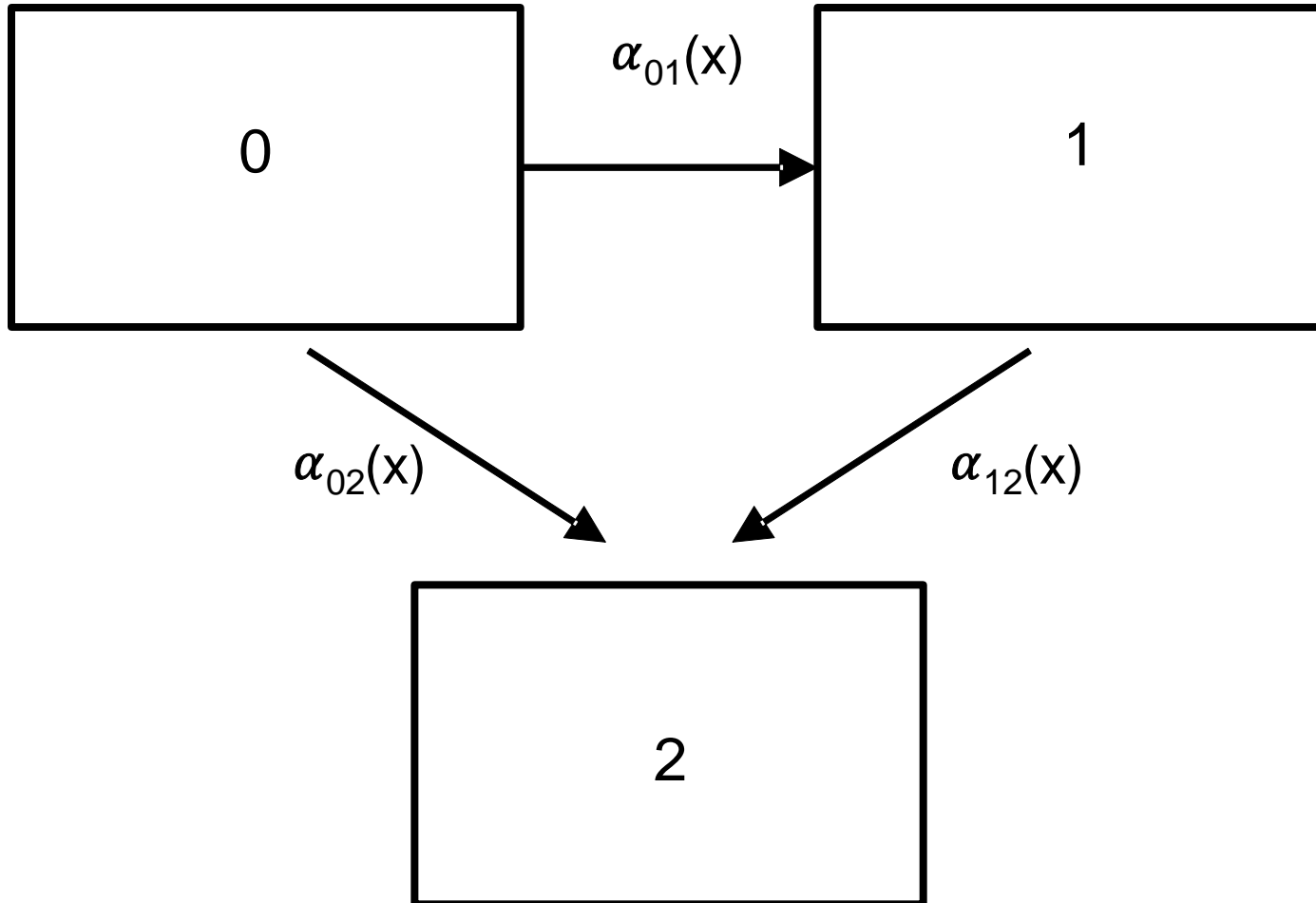


- ➔ A difference of 10.2 and 7.3 life years lost was noted between men and women with and without mental disorders, respectively.
- ➔ Most excess LYL for alcohol misuse for men and respiratory diseases for women
- ➔ Over time, a decrease in excess LYL for suicide and accidents among people with mental disorders.

# Conclusion

- ➔ Average life expectancy is a suitable measure for multistate demographic models where people enter states at different ages

# 3 state Markov health-disease model





# 4 state Markov marriage model

