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MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH

decomposing multistate models

Tim Riffe

11 Nov, 2021
CED Seminari

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Consider parameterizing in terms of conditional probabilities when decomposing discrete time multistate models

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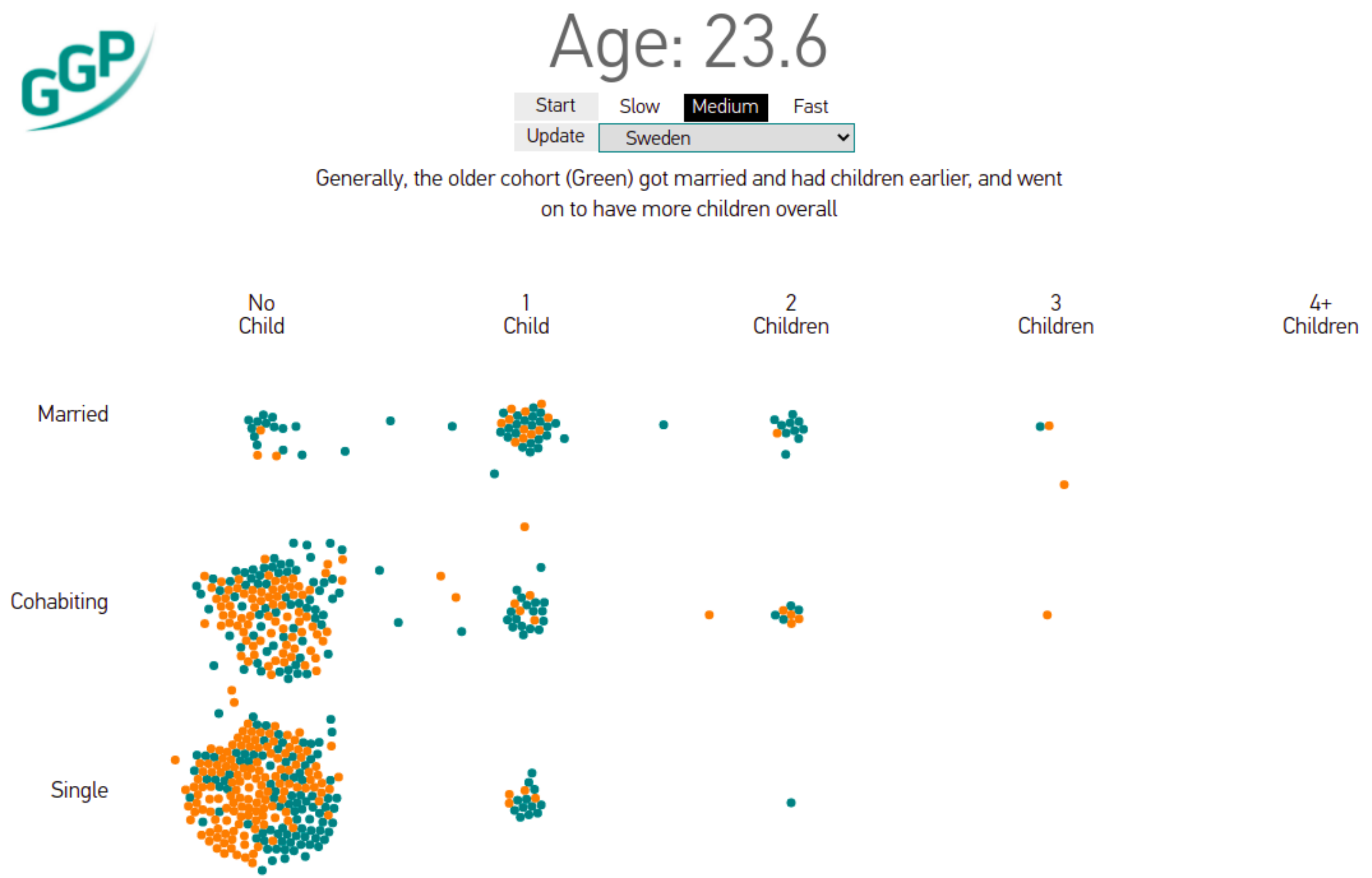
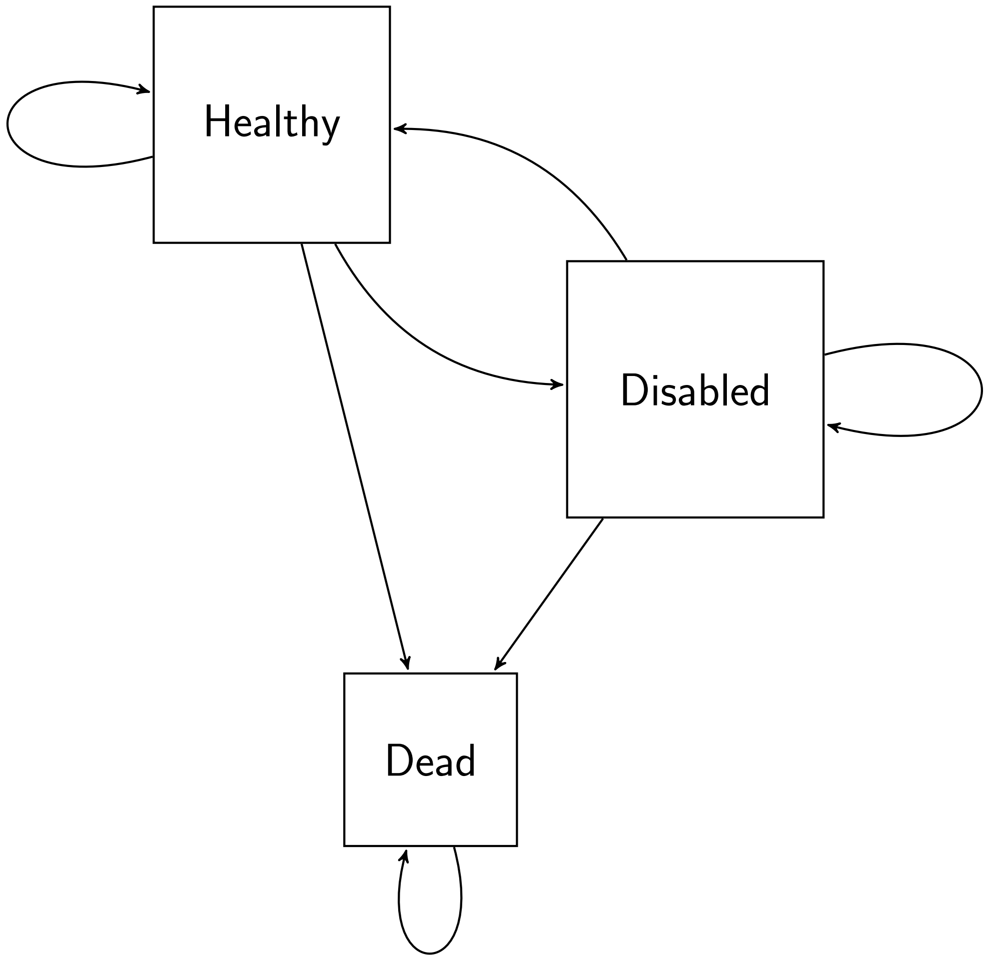
What is a multistate model?

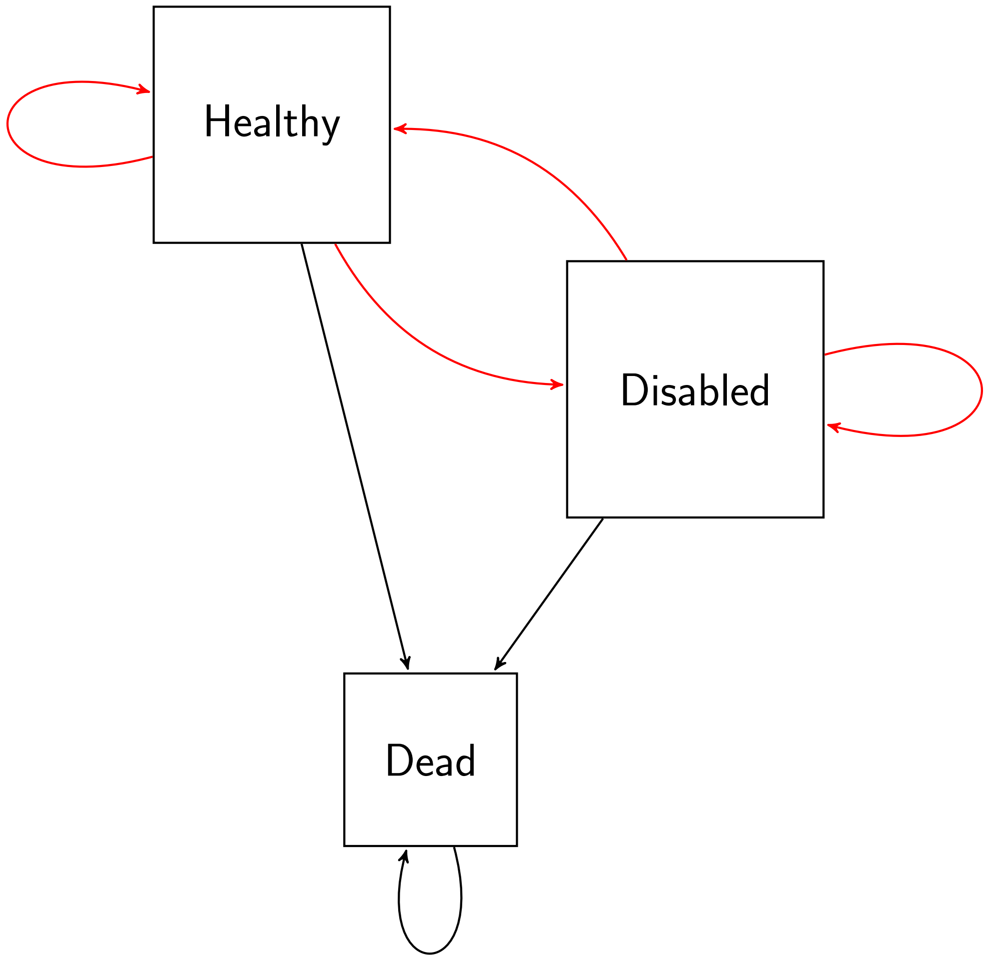
https://temery86.github.io/FullHistory/



A typical multistate model



A typical multistate model



$$🎁 = f(\theta)$$

🎁 is any synthetic index calculated from θ

Decomposition asbtract

$$\Delta \text{🎁} = \text{🎁}^2 - \text{🎁}^1$$

$$= f\left(\theta^2\right) - f\left(\theta^1\right)$$

$$\Delta \text{🎁} = \sum c_i$$

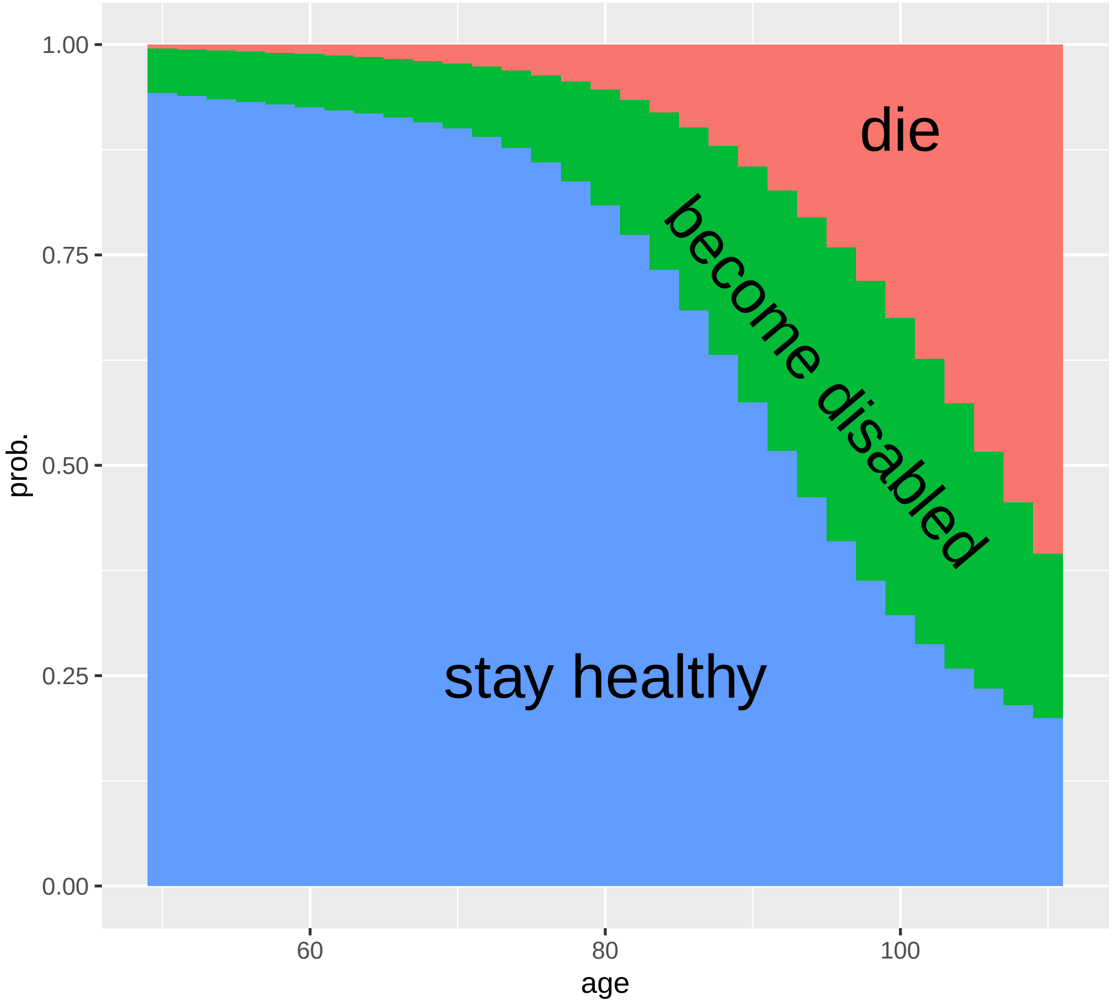
$$c = \mathcal{D}\left(f, \theta^2, \theta^1\right)$$

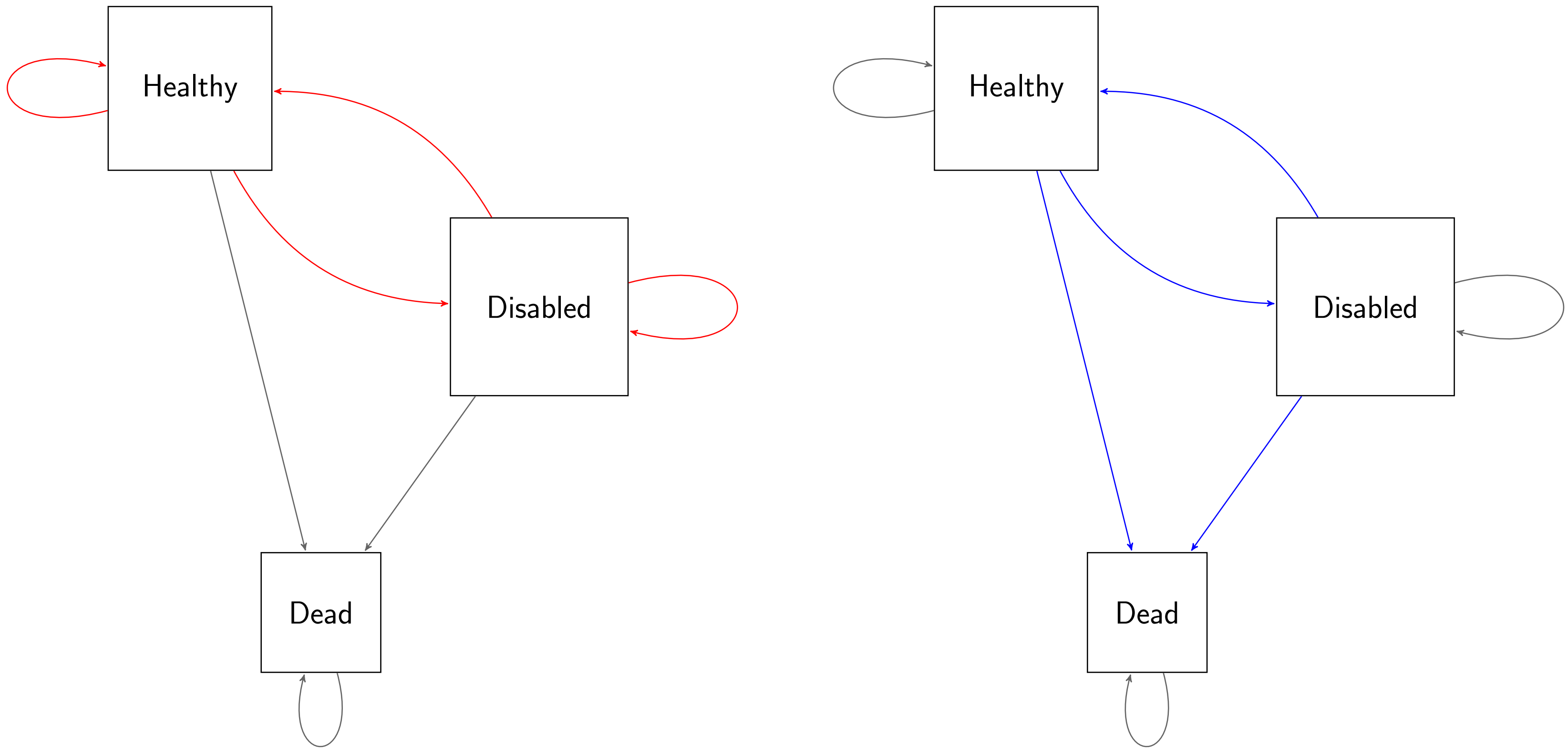
Decomposition, $\mathcal{D}()$

- difference-scaled partial derivatves a.k.a *LTRE* (Caswell 1989)
- Stepwise parameter swapping (Andreev et al 2002)
- Pseudo continuous (Horiuchi et al 2008)

Let's talk about θ

Pick two colors to make θ




Healthy
Disabled
Dead
Healthy
Disabled
Dead

Example

DFLE increased from 30.75 in 2006 to 32.33 in 2014.
That's Δ🎁 $=$1.58 years

(HRS, age 50 women with secondary education)

Example

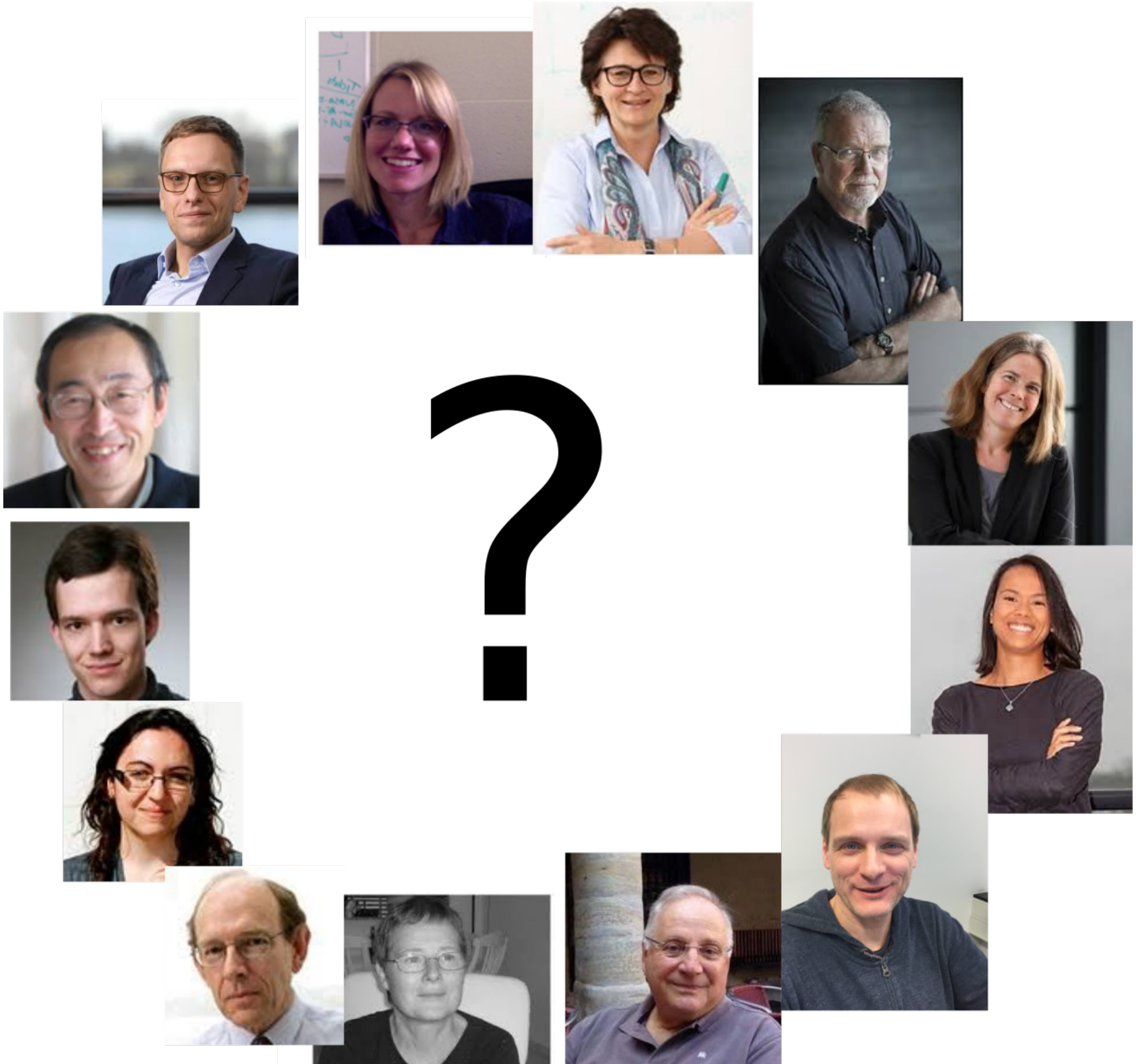
Same result, whether we omit:

- self-transitions
- mortality transitions
- health transitions

But very different stories if we decompose:

θ omits	DF$\rightarrow$ *DF*	DF$\rightarrow$ *Dis*	DF mort	Dis$\rightarrow$ *DF*	Dis$\rightarrow$ *Dis*	Dis mort
self		-0.01	1.32	-0.28		0.54
mort	1.28	0.04		-1.86	2.13	
health	0.21		1.10		-0.41	0.67

"Thank you" intermission



We would like a solution that gives consistent interpretable results

Solution

Make θ consist in conditional probabilities

For standard calcs compose θ from (two of)

$$\left[p^{stay}, p^{switch}, p^{die}\right]$$

Transform this into two multiplicative probabilities

$$\left[p^{stay} | survive, p^{survive}\right]$$

Complementarity (or *Symmetry*?)

DF mort	Dis. mort	DF$\rightarrow$ *Dis*	Dis$\rightarrow$ *Df*
1.29	0.58	0.02	-0.31

Transitions can be framed in terms of mortality or survival, in terms of staying in the state of transfering out of it. Results *identical*

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Really, IDENTICAL

Thanks