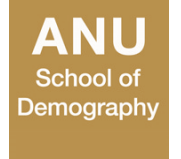


INCORPORATING DURATION DEPENDENCE INTO DISABILITY- FREE LIFE EXPECTANCY: HOW SERIOUS IS THE BIAS

Tianyu Shen & James O'Donnell



Australian
National
University

Population Association of New Zealand Conference
Auckland, 29-30 August 2023

BACKGROUND

- Discrete-time multistate life table (MSLT) is often used to calculate healthy life expectancy (HLE/LE)
- Markov assumption (memoryless)
- Longitudinal survey data are usually left-censored (unknown origin)
- Some paper explored duration dependency, but few paper calculated the LE with duration

Remain as a limitation in many papers?



AIMS

How to incorporate
duration dependency?

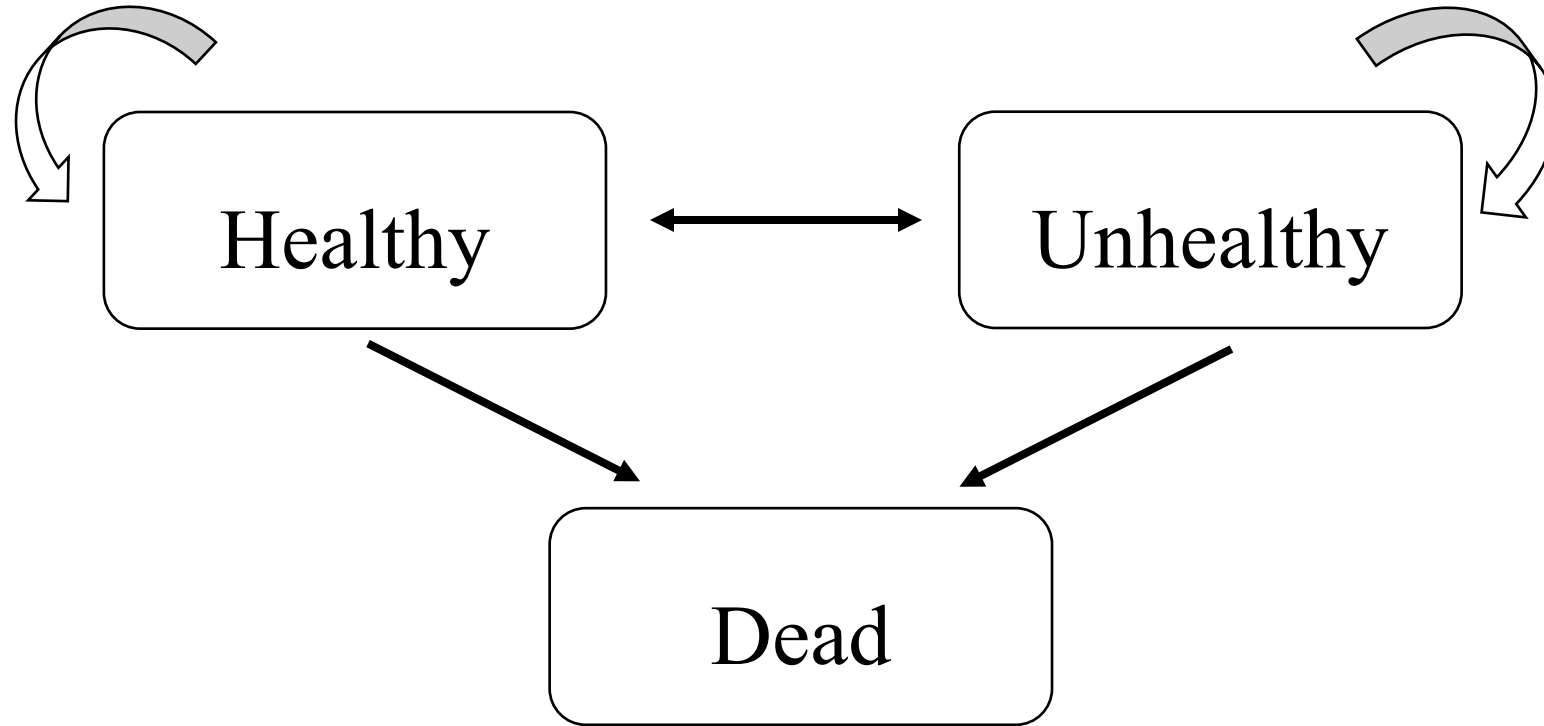
How much bias is in
the HLE/LE?

EXISTING MODLE

Semi-Markov
process model
(SMP)

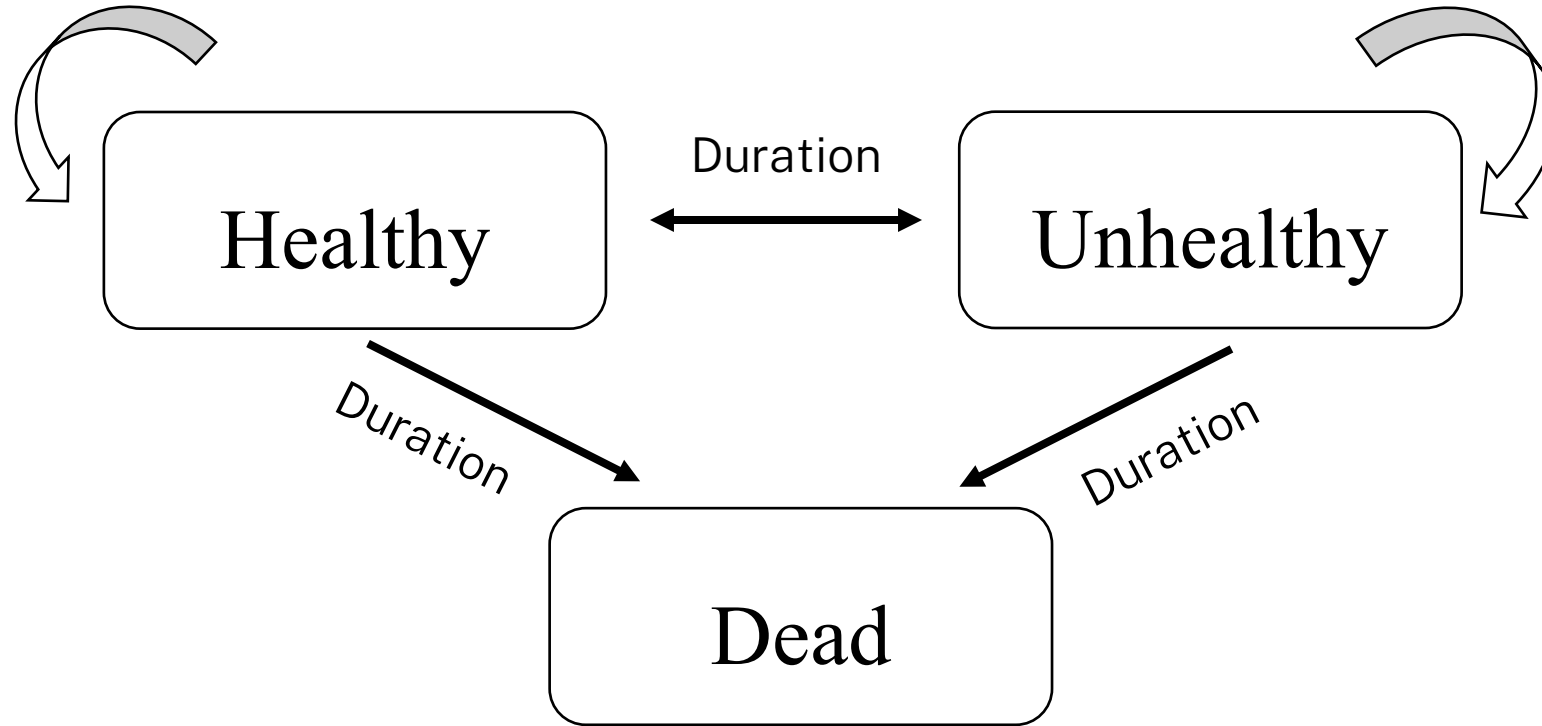
Multistate life
table with duration
dependence
(DDMSLT)

Model design: MSLT



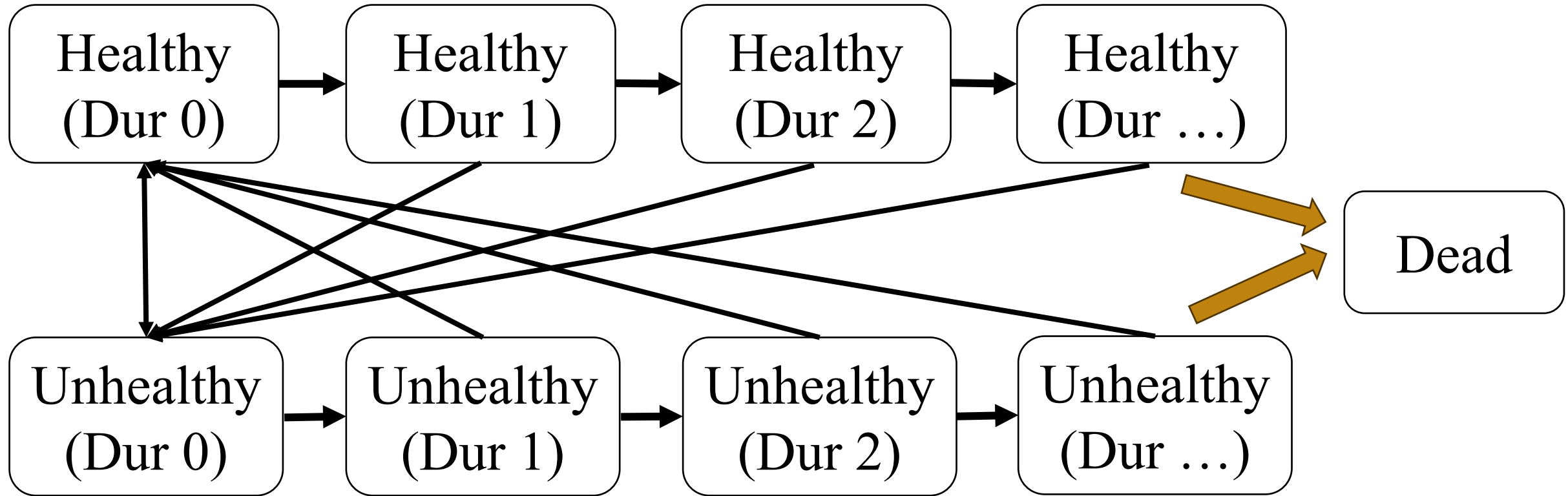
Markov property assumes that immediate future state depend only on the current state, not on the events occurred before it.

Model design: SMP



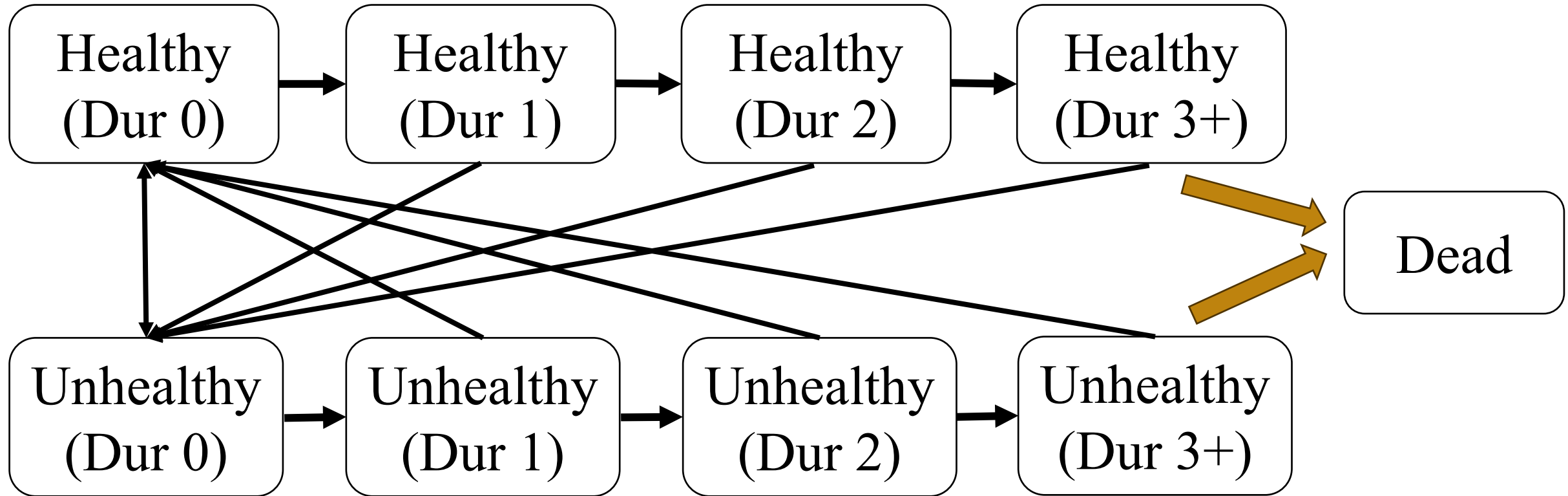
Semi-Markov model (SMP) assumes that immediate future state depend on the current state and the duration in this current state.

Model design: DDMSLT



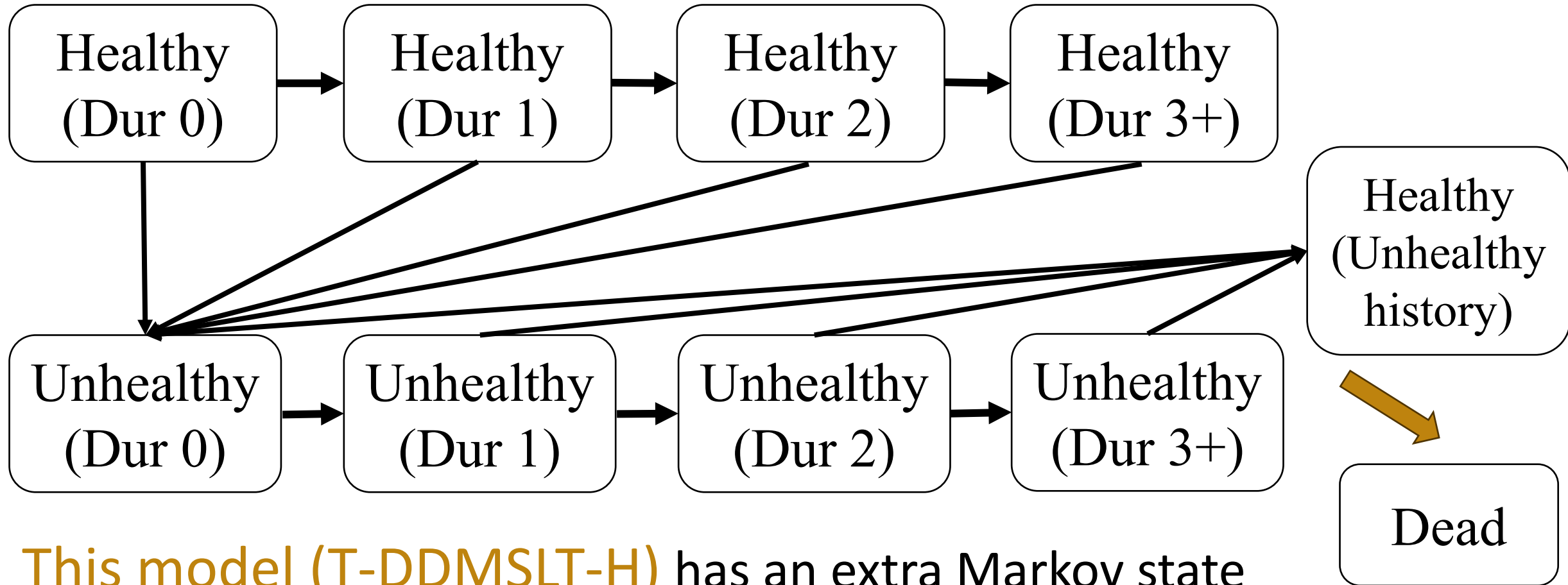
Multistate life table with duration dependence (DDMSLT)
incorporates duration into the state space as individual states.

Model design: Truncated DDMSLT



Truncated DDMSLT (T-DDMSLT) is similar to DDMSLT but includes a long-term (Markov) state at the end.

Model design: Truncated DDMSLT (with history)



This model (T-DDMSLT-H) has an extra Markov state that captures the history of being unhealthy.

Data

- US Health and Retirement Survey (HRS), 2000-2020
 - Wave 5 to Wave 15 (11 waves)
- Disability: ADL disability with five daily activities (Bathing, Dressing, Eating, Getting in/out of bed and Walking across a room)

Cohort (1936-1945): on average 60 years old in 2000

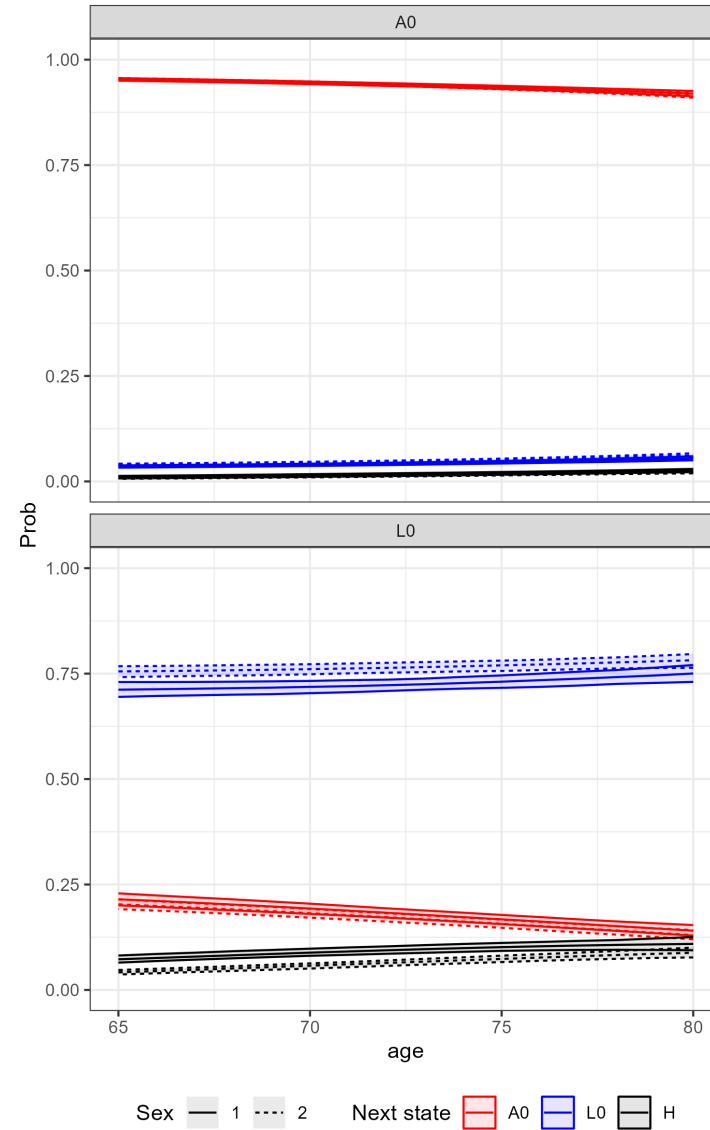
- 20 years of follow-up

Period (2000): only using wave 5 to wave 9 as a shorter follow up example

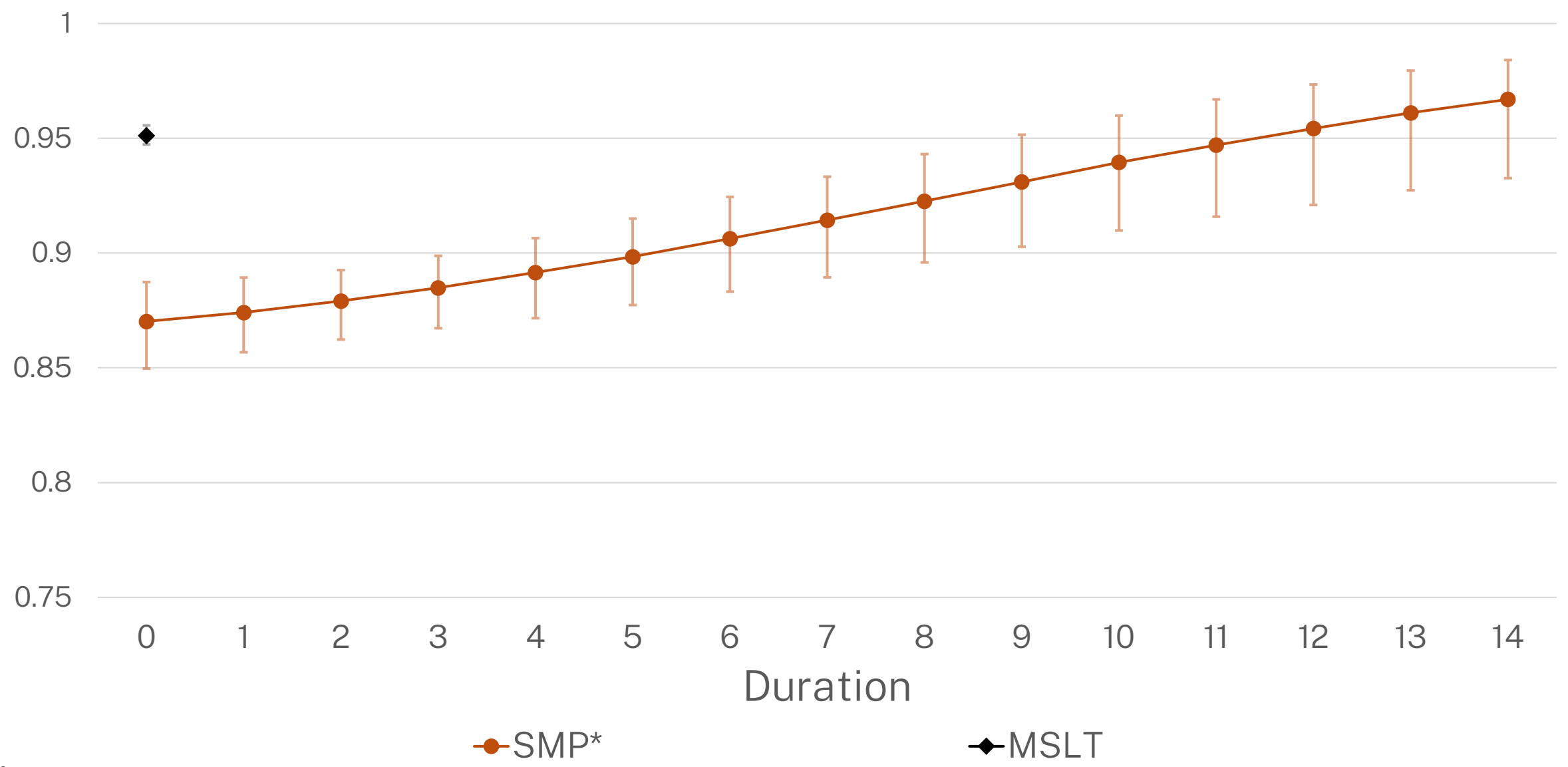
- Sensitivity test for shorter follow-up



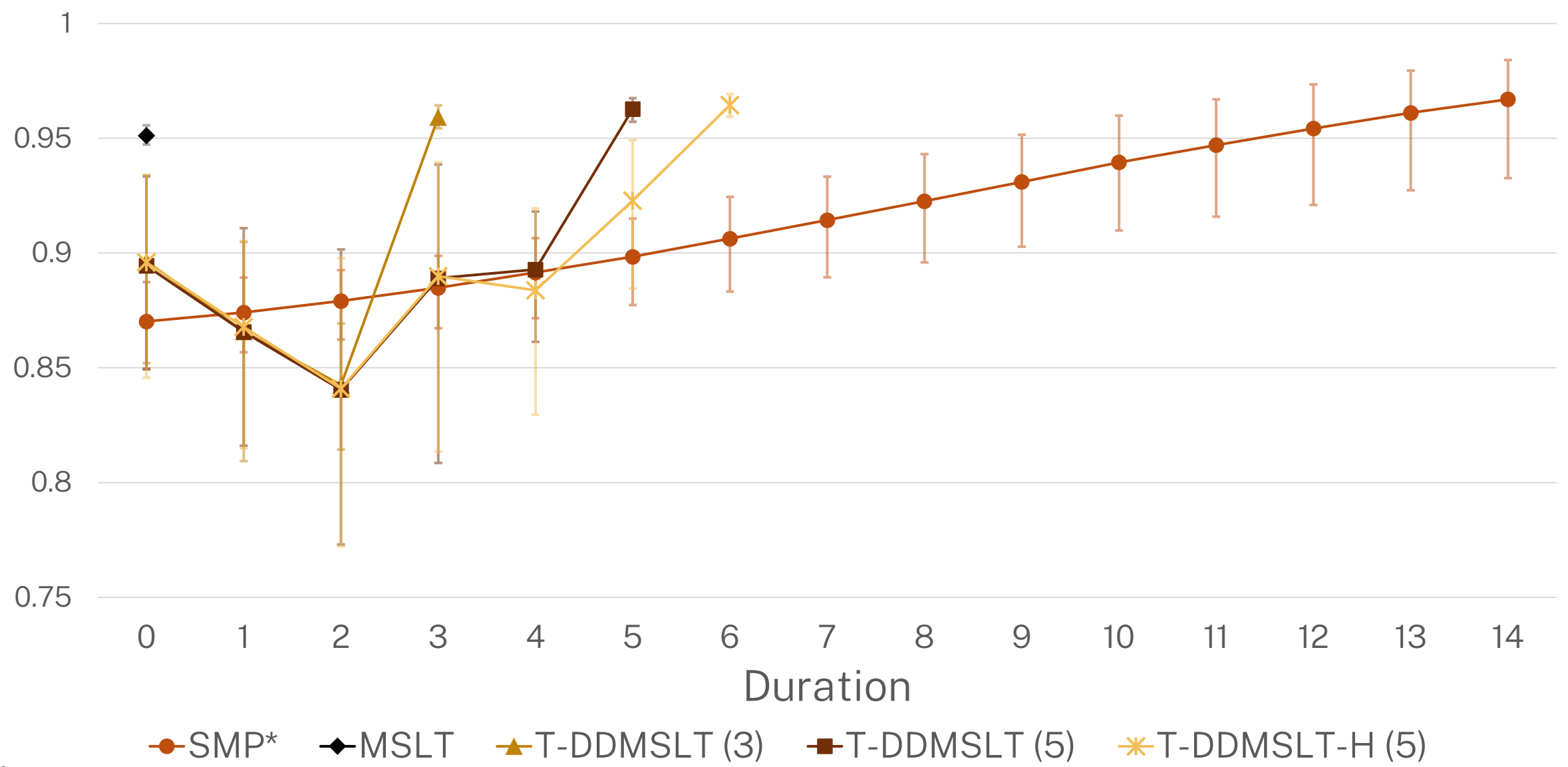
Results: transition probabilities (MSLT)



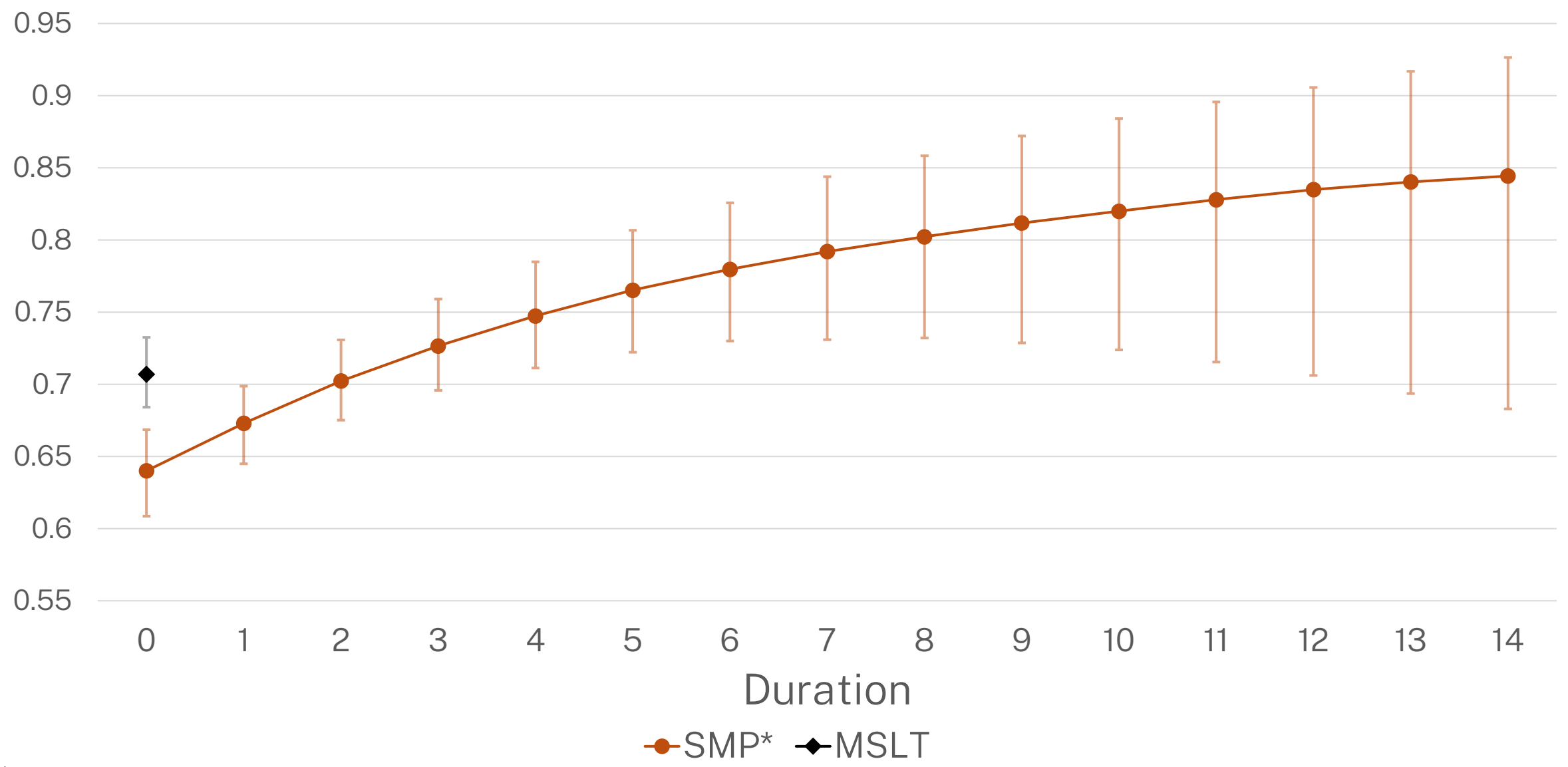
Results: Remain Disability-free, age 65 male (cohort)



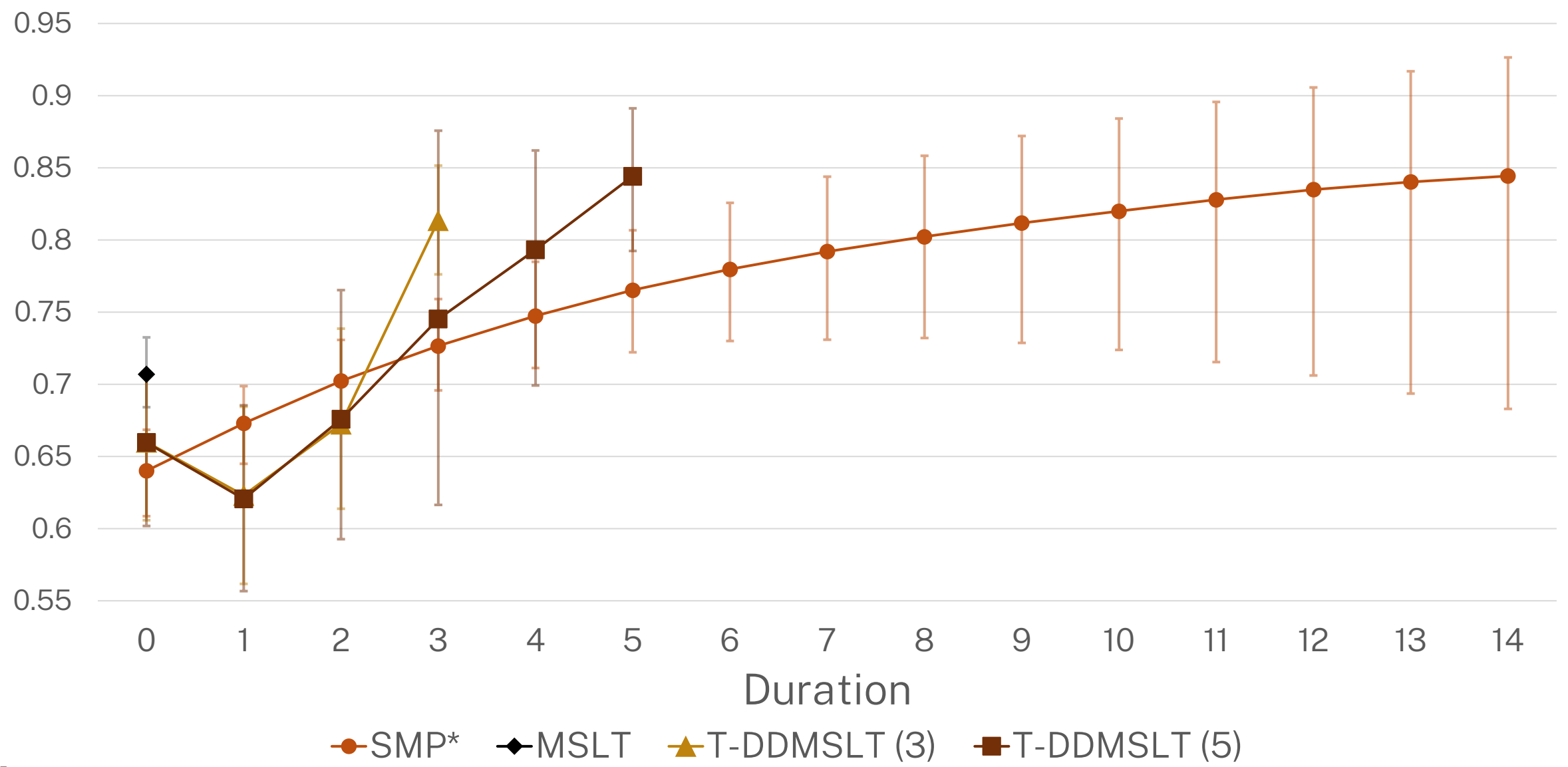
Results: Remain Disability-free, age 65 male (cohort)



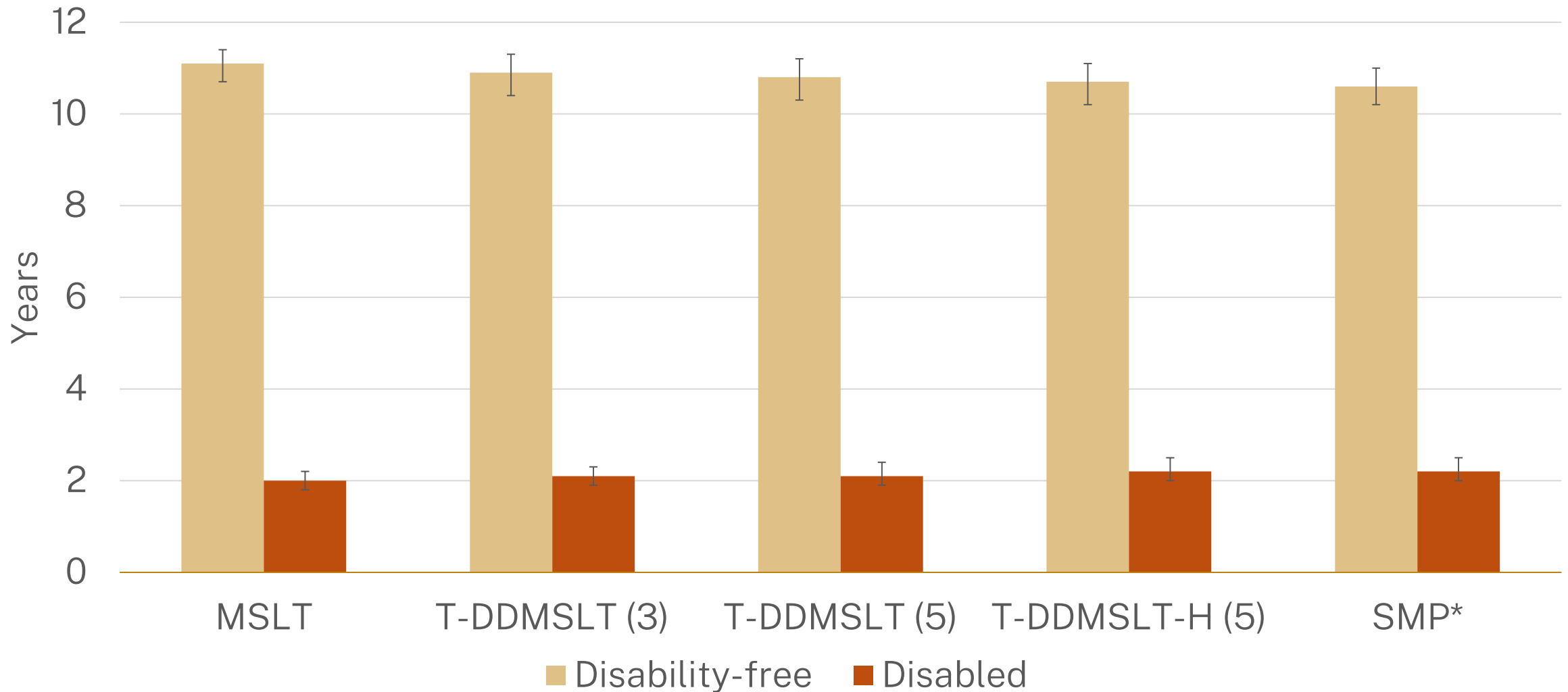
Results: Remain Disabled, age 65 male (cohort)



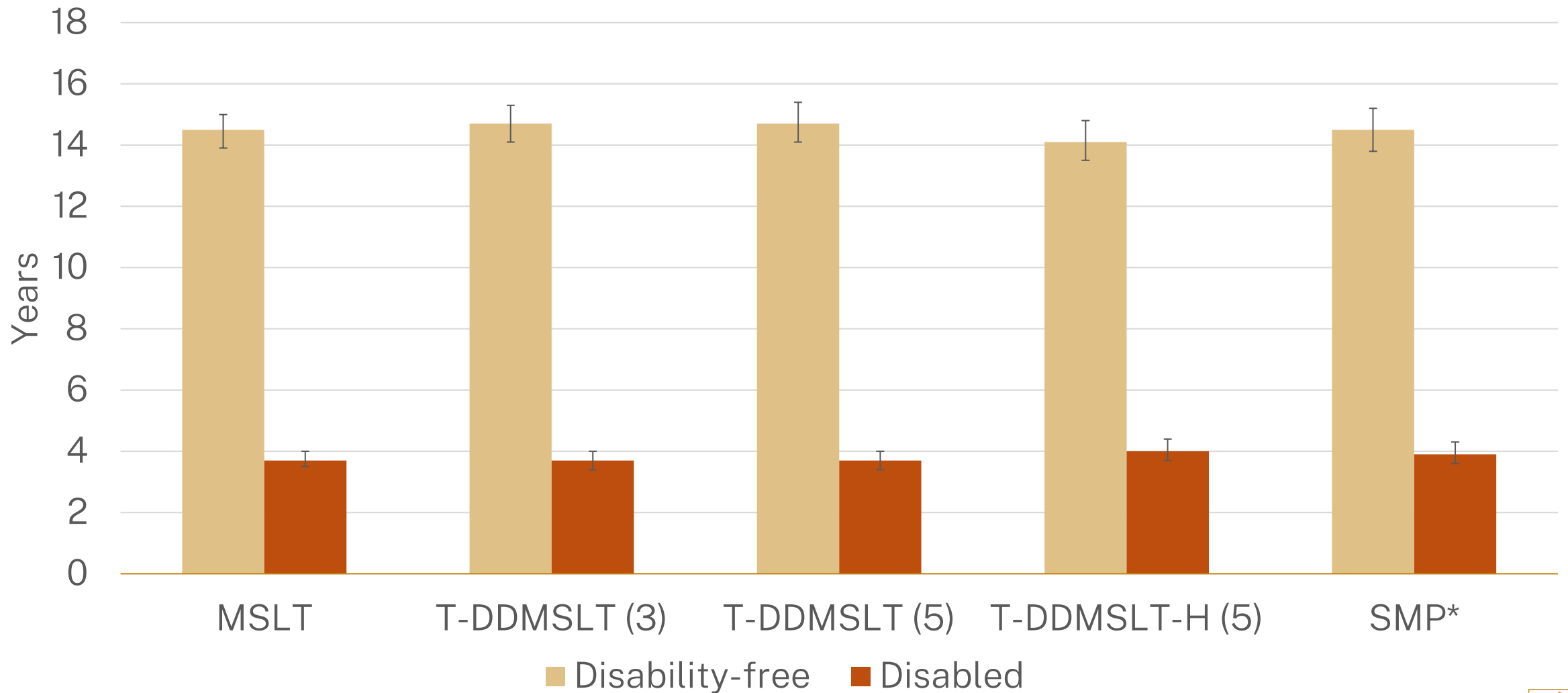
Results: Remain Disabled, age 65 male (cohort)



Results: life expectancies (Cohort, 65-80)



Results: life expectancies (Period, 65+)



How serious is the bias?



How serious is the bias?

Yes, we also find duration dependence.

But in the HLE/LE, the bias is **not so serious**.



DISCUSSION

- There is no one golden standard.
 - Every model comes with some assumptions and compromises.
- The MSLT (Markov assumption) seems to be a fair model for estimating HLE/LE.
 - The stickiness of long-term state is averaged out by the fluidity of short-term state.
 - MSLT can also include the most observed data
- The simulated trajectories might not be the same if accounting for the duration.
 - However, it is difficult to quantify how different



INCORPORATING DURATION DEPENDENCE INTO DISABILITY- FREE LIFE EXPECTANCY: HOW SERIOUS IS THE BIAS

Questions or Comments:
Tianyu.Shen@anu.edu.au

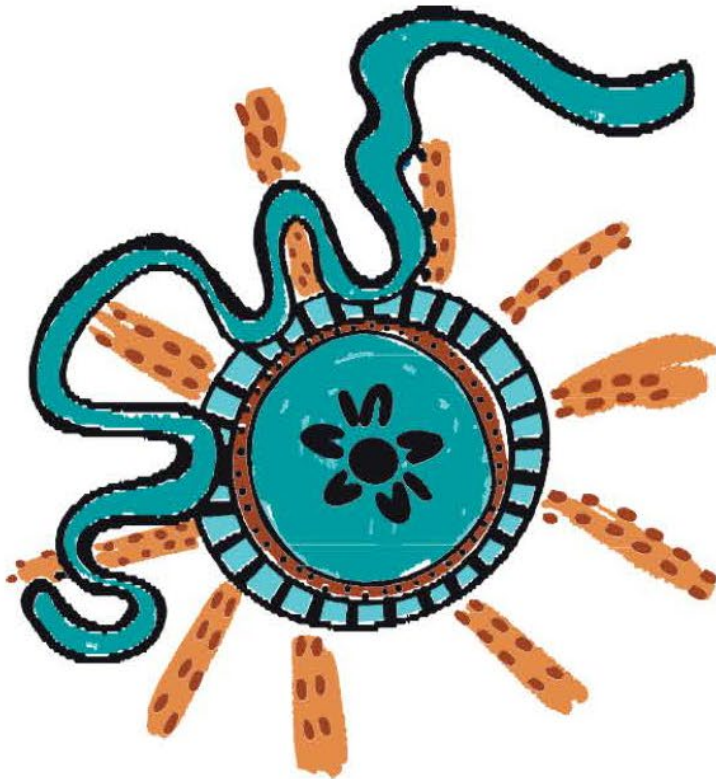


Australian
National
University

New Zealand Population Conference
Auckland, 29-30 August 2023

DON'T FORGET TO COME AND JOIN
US IN BRISBANE
13-18 JULY 2025!

Register here for
more info



30TH INTERNATIONAL
POPULATION
CONFERENCE



13-18 JULY 2025

BRISBANE CONVENTION
& EXHIBITION CENTRE
AUSTRALIA



Australian
National
University