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Healthy Life Expectancy, Mortality, and Age Prevalence of Morbidity

Tim Riffe, Alyson van Raalte

Morbidity

Is variation in health over the lifespan better characterized by chronological age or time-to-death?

Expected life years with disability (DLY): Sullivan Method

$$\mathrm{DLY} = \frac{1}{\ell_0} \sum_{x=0}^{\omega} \pi_x \mathrm{L}_x$$

But what is π_x exactly?

- Disability prevalence at each age
- Stock variable: slow to react to abrupt health innovations since it depends on past cohort experiences with sickness (Barendregt et al. 1994)
- Can also depend on future mortality if disability is patterned by time-to-death
- Since π_x changes across mortality regimes, attributing between-population differences in DLY to mortality and morbidity is problematic.

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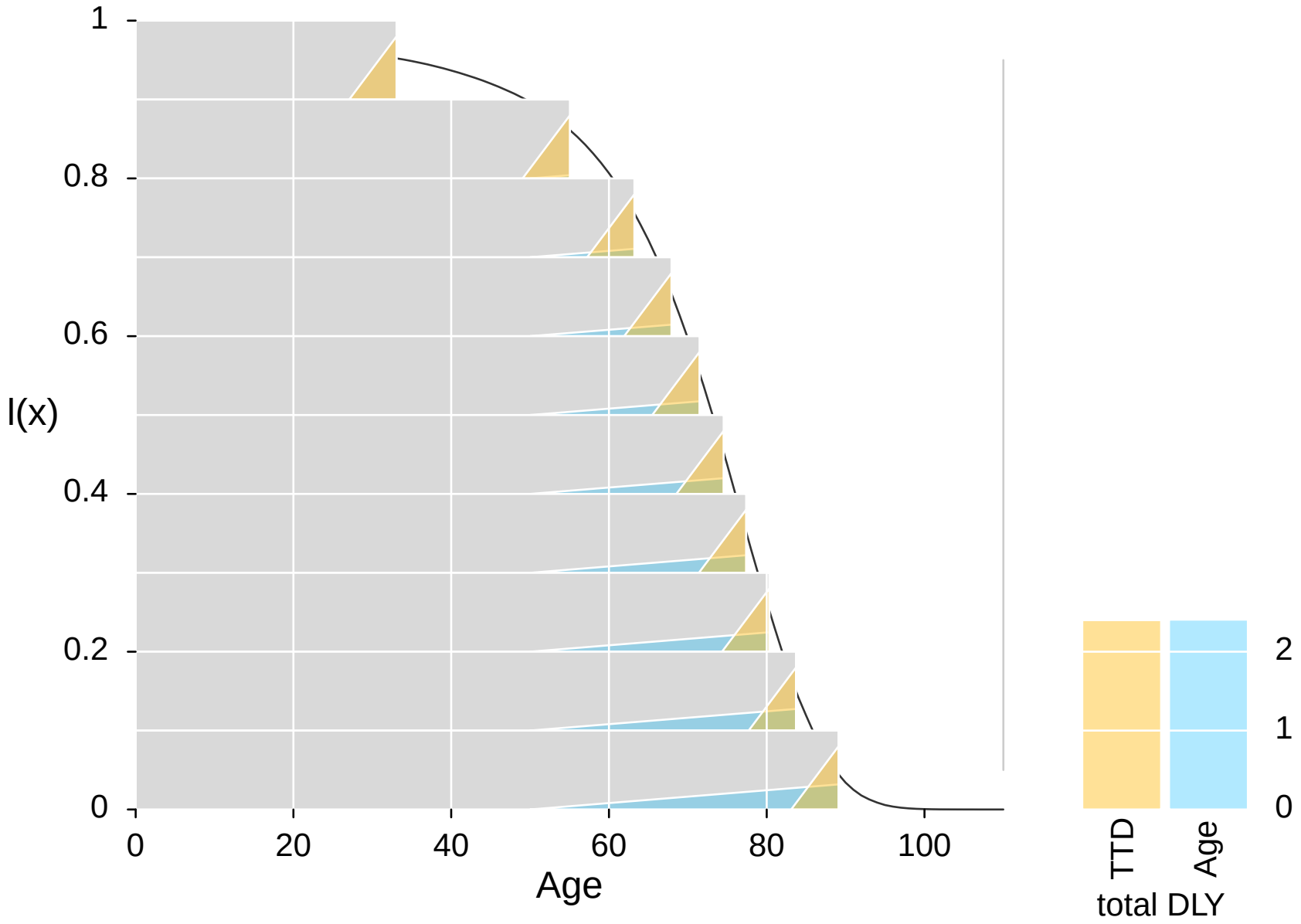
A simple illustration



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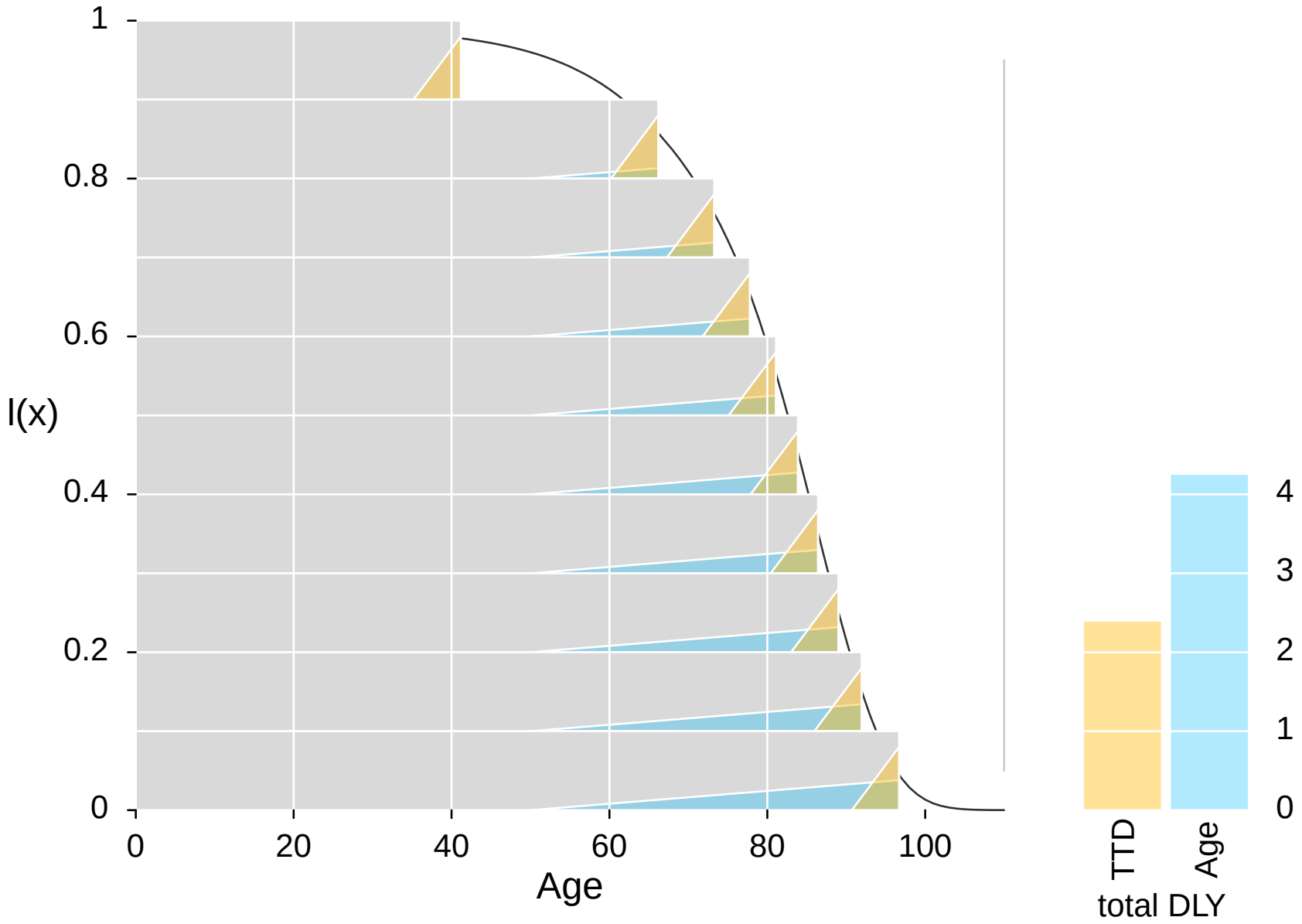
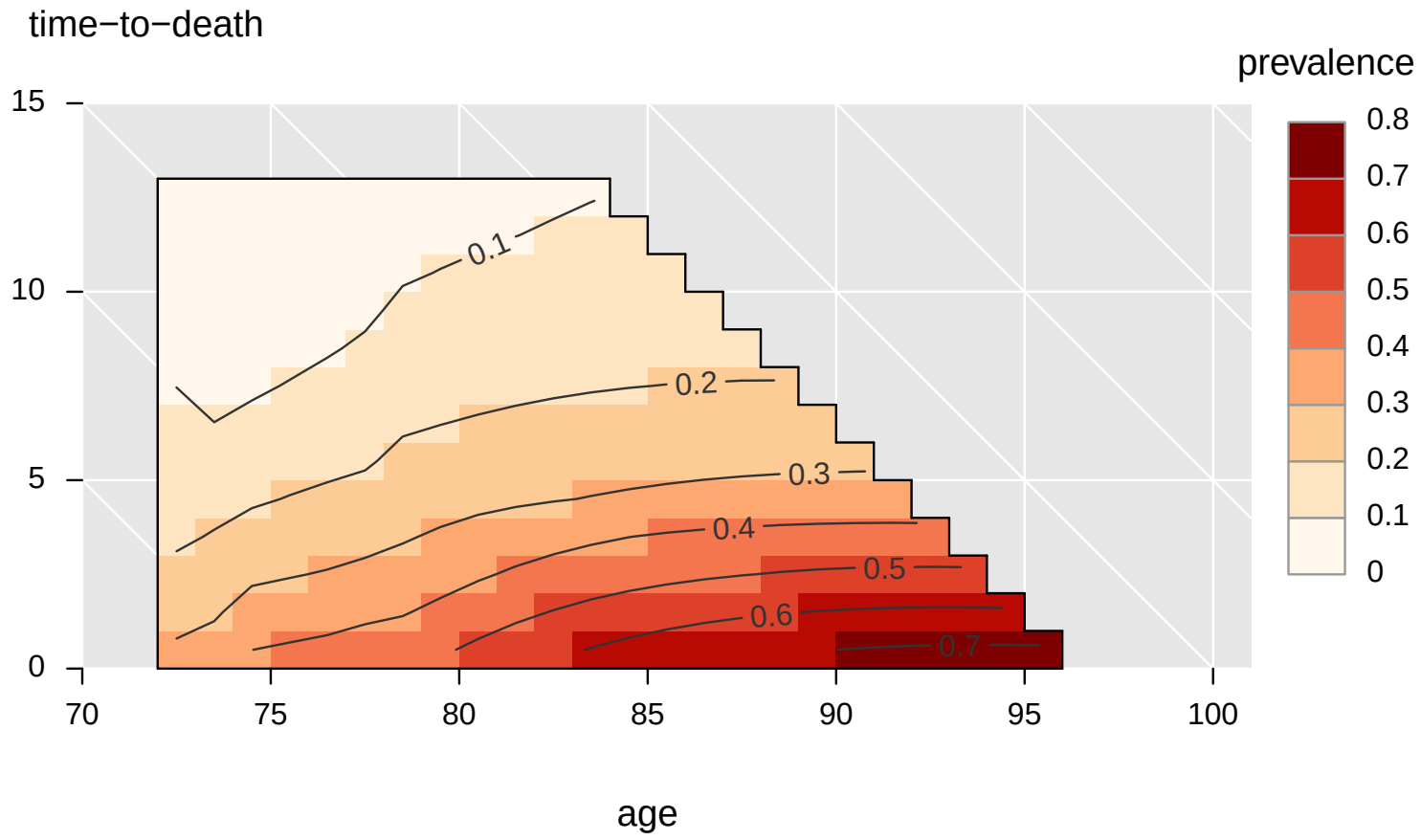
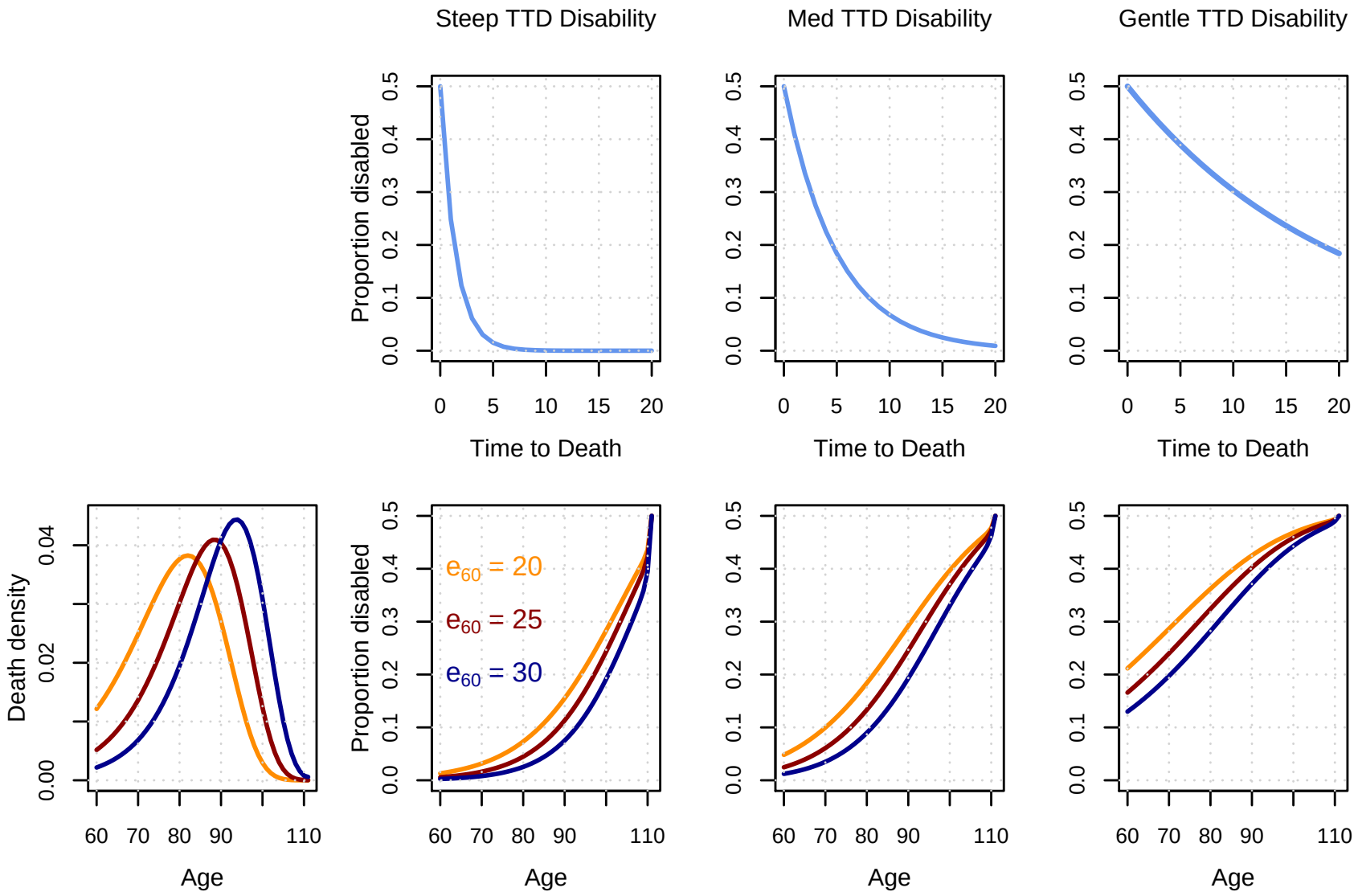


Disablity broken down by age and time to death



Proportion of USA males from the 1915-1919 cohort with at least 1 of 5 IADLs

Proportion disabled by TTD and mortality level



Decomposing DLY

- Are differences in DLY from mortality or morbidity?
- Decomposition methods isolate the effects of changes in L_x and changes in π_x
- These are considered as *mortality* and *morbidity* effects (Nusselder and Looman 2004, Andreev et al. 2002)
- Interpretation problem: mortality can change π_x all by itself if disability is patterned by time-to-death

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Estimating the upper magnitude of bias of morbidity differences from mortality decline

- Estimated average TTD profile for different disability types, based on USA HRS data, quinquennial cohorts 1905-1930
- Calculated apparent period age prevalence of morbidity for HMD countries had they experienced the US TTD morbidity
- Assumed all populations were stationary
- Decomposed differences between all population pairs in 1980, 1990, 2000 into apparent mortality and morbidity components
- Same for within-population changes over 10-year periods, 1950-2010

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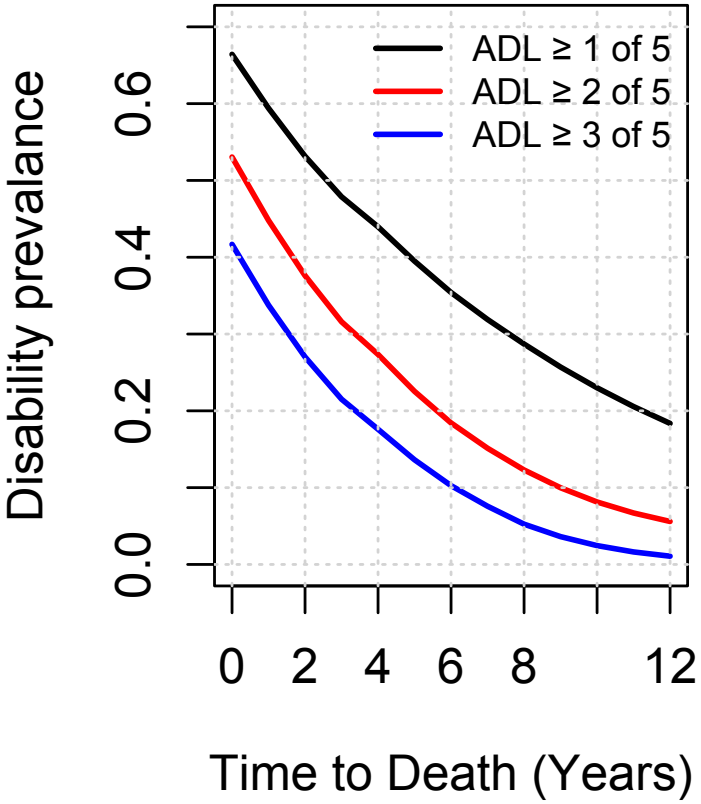
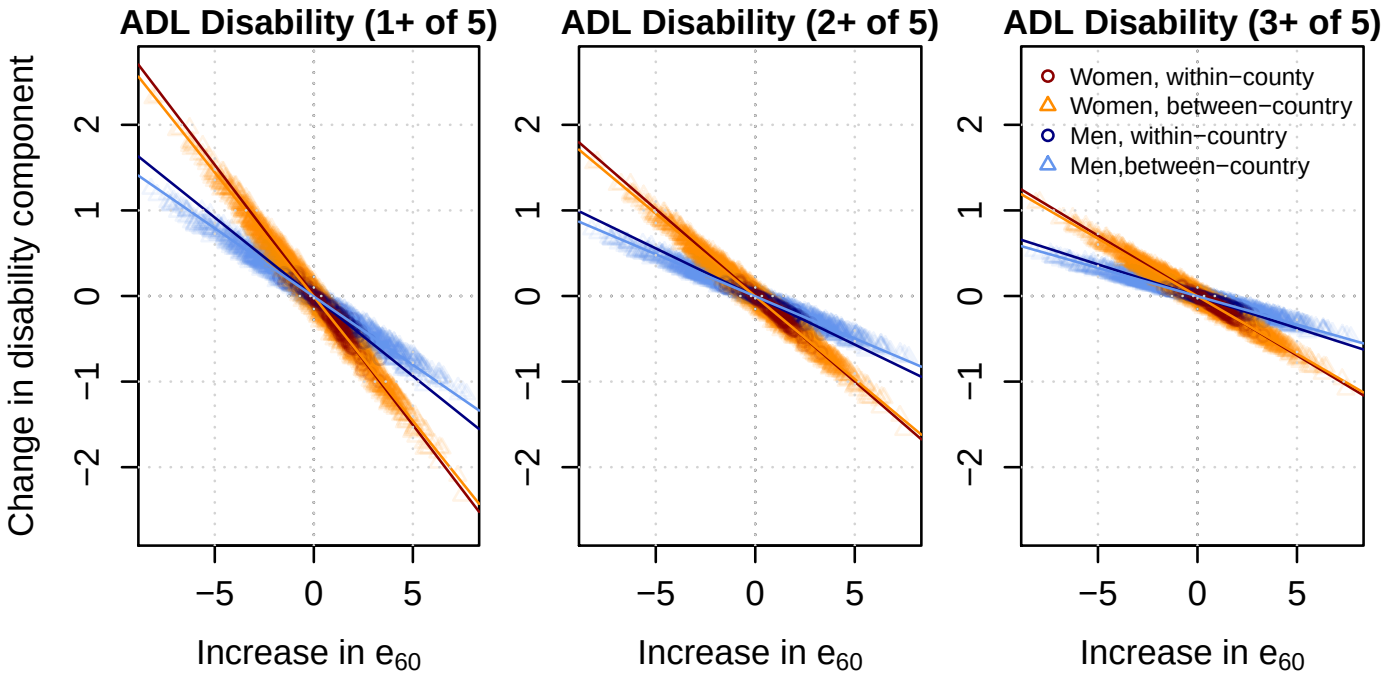
TTD disability prevalence for different disabilty types



Decomposition: Change in disability component



Interpreting decomposition results

- True value of the change in disability component is zero by design
- Deviation is result of differences in mortality
- Departure from upper bound depends on patterns of π_x, how well US pattern applies, departure from stationarity.
- Different slopes partly from differences in final π_x between disability types and the sexes

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Considerations

- Considering morbidity prevalence as a function of time to death does not imply that morbidity incidence is a time to death
- Modeling prevalence as TTD requires no specification of process
- In reality morbidity varies over both chronological age and time-to-death

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Summary

- HLE or DLY provide an important snapshot of expected life years lived in good or poor health
- Difficulty in interpreting period differences in these quantities between populations
- Chronological age pattern of disability can change solely as a function of mortality change even when the underlying morbidity function is held constant
- Could partly explain why mortality levels and disability prevalence are related (Van Oyen et al. 2013, Luy and Minagawa 2014)

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