

Alignment, Clocking, and Macro Patterns of Episodes in the Life Course

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Backstory

Sequence analysis for *pathways-to-event* questions can be tricky (Yaoyue Hu presentation, 2017) .

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Idea: Realign sequences on transitions.

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Markov matrix expression for average episode count
(Dudiel & Myrskylä, 2017-).

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∴ Question: Are bespoke algebraic
derivations necessary?

Example questions:

- ▶ Do disability episodes get shorter or longer with age? And over time?

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- ▶ Do disability episodes get shorter or longer with age? And over time?
- ▶ What is the distribution of other state episode durations before cancer?
- ▶ How much of an expectancy is composed of short vs long episodes?
- ▶ How do parity-specific birth interval distributions vary by completed fertility or in response to birth outcomes?

Problem

Tools for answering such questions are scattered.

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Corollary

Questions are posed less often, and new pattern discovery less frequent.

Solution

We develop a framework (or grammar) of data operations to flexibly derive aggregate patterns.

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Approach

Clocks are within and between episode time operations.

Alignment is a time structuring operation.

Approach

Clocks

Within episodes of state s , count time **steps** or episode **order** up or down, or total episode **duration** conditional on time of episode entry, exit, or neither.

Approach

Alignment

left, right, center, etc. on the first, last, longest, shortest, n^{th} , n^{th} from last episode of state s .

Requisites

Trajectory data

A set of either **observed** or **simulated** time series of **discrete time steps** consisting in **categories**.

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All examples here based on individual multistate (categorical) trajectories in uniform annual time steps

Illustrations

10 lives simulated from Dudel & Myrskylä (2017)

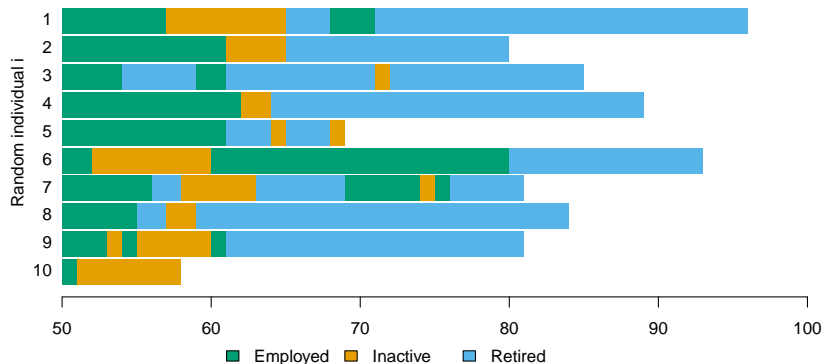


Illustration: Age structured prevalence.

Identity clock in employment state

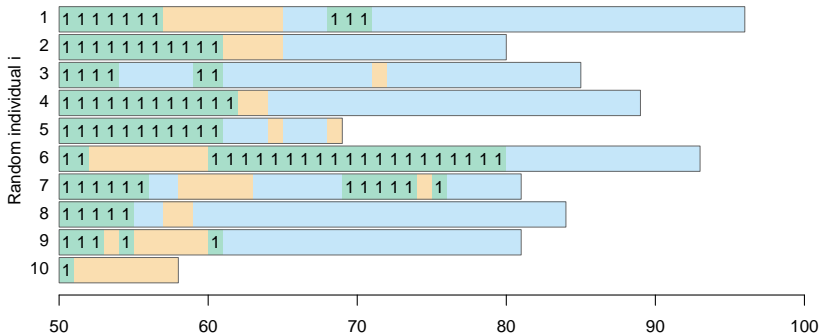


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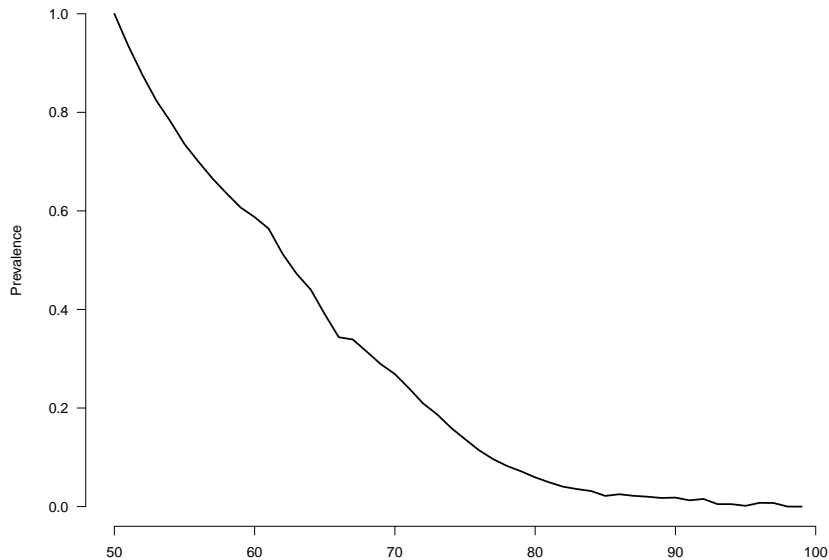


Illustration: Clocks: Duration (unconditional)

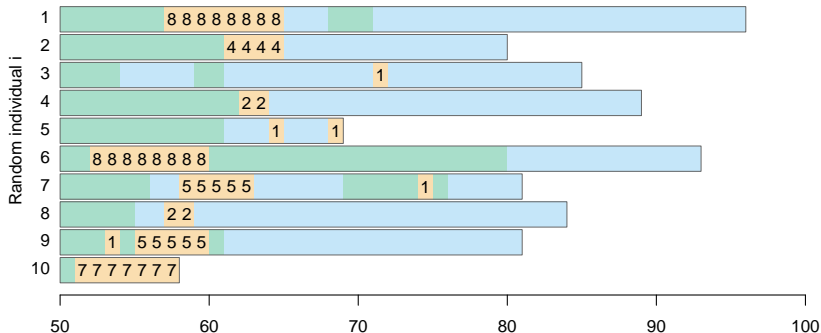


Illustration: Clocks: Duration conditioned on entry

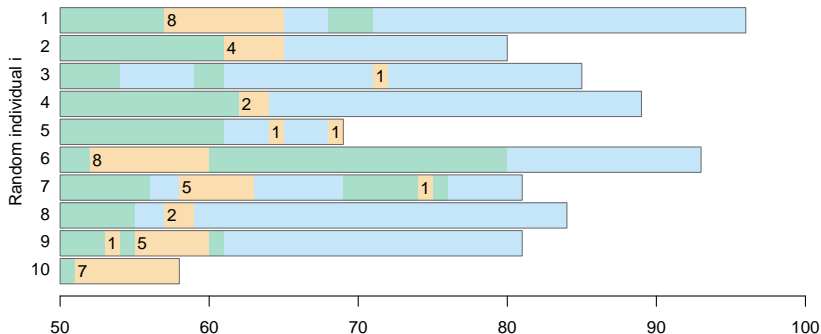


Illustration: Clocks: Duration conditioned on exit

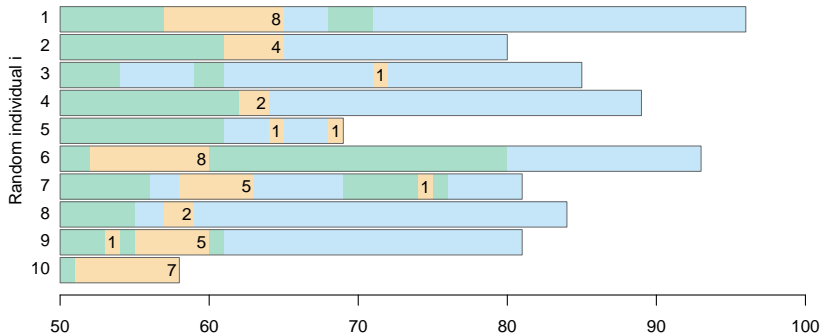


Illustration: Clocks: Order **Ascending**

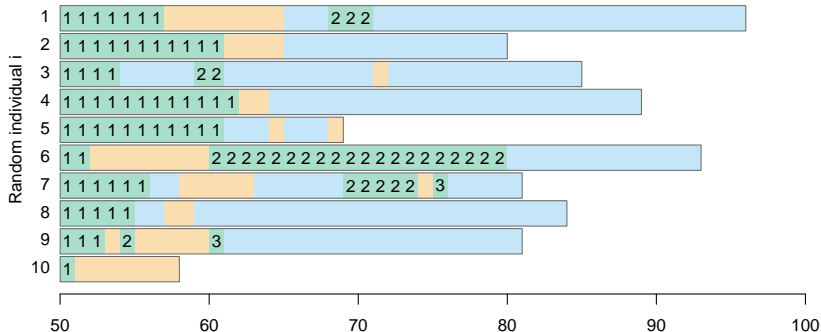


Illustration: Clocks: Order **Descending**

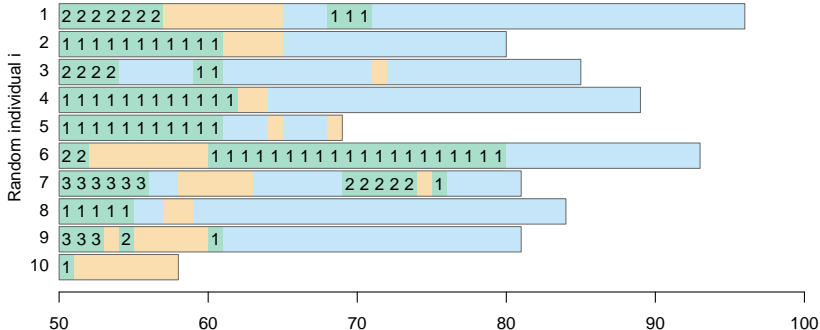


Illustration: Clocks: Steps Ascending

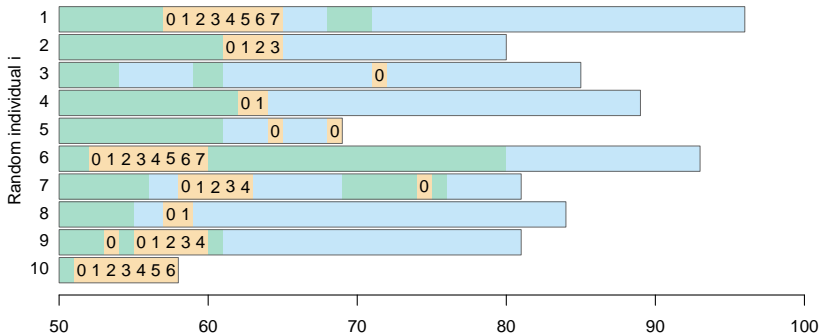


Illustration: Clocks: Steps Descending

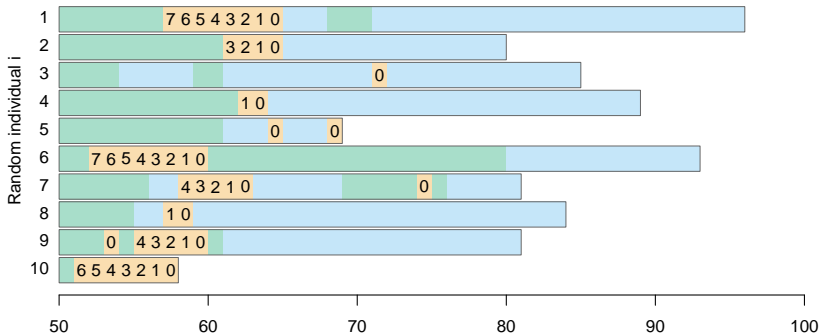


Illustration: Alignment: Age = Birth alignment

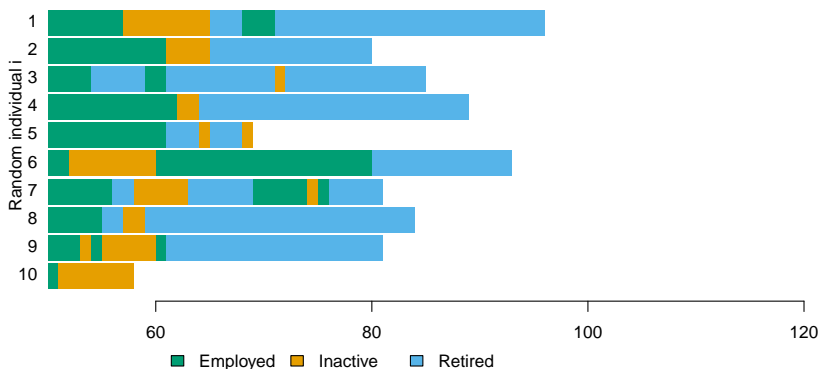


Illustration: Alignment: Death

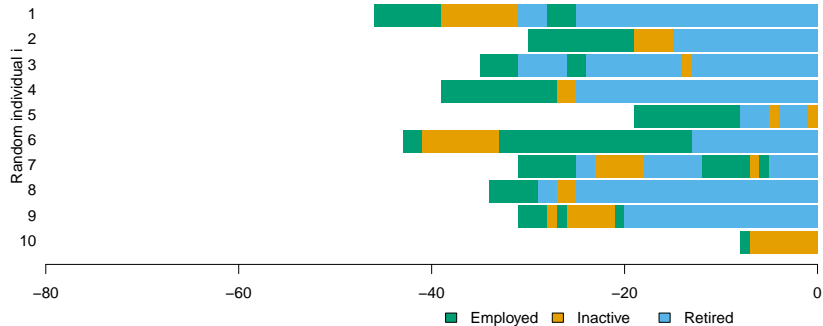


Illustration: Alignment: *Entry* to *first* retirement

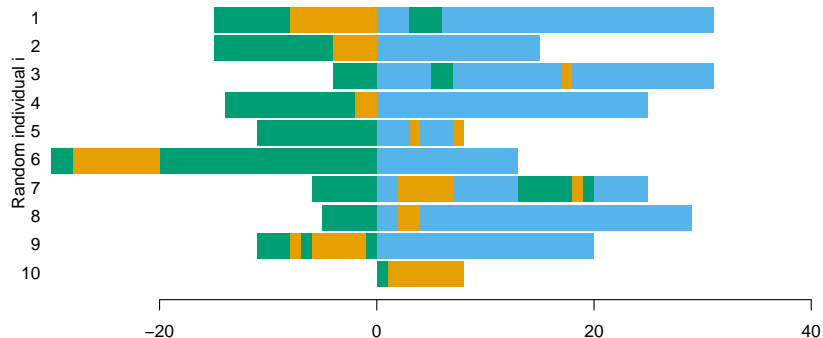


Illustration: Alignment: *Exit* from *first* employment

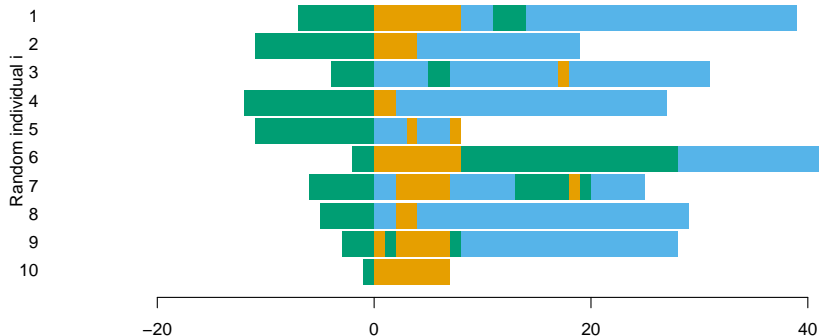


Illustration: Alignment: *Exit* from *longest* employment

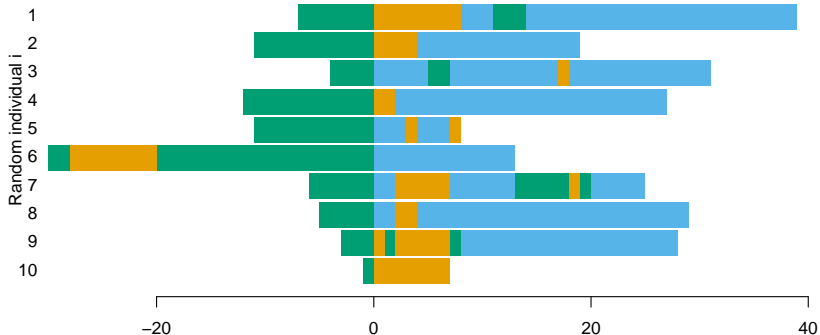
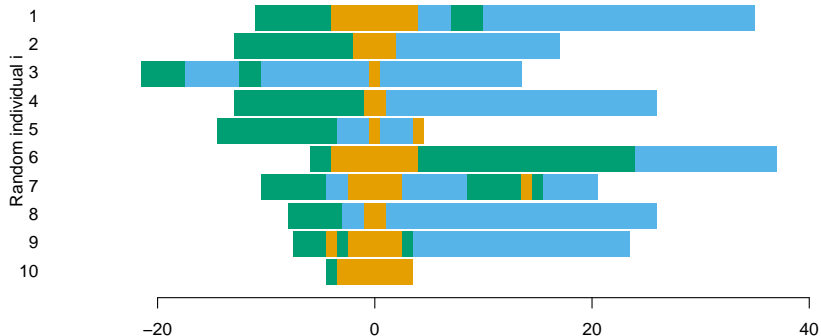


Illustration: Alignment: *Centered on longest inactivity*



Aggregation

Macro patterns

Combine clocks and alignment to aggregate (e.g. means, quantiles)

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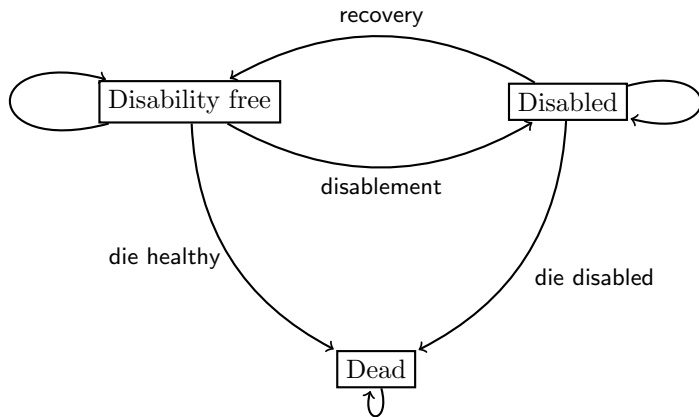
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- ▶ Multistate model of disability

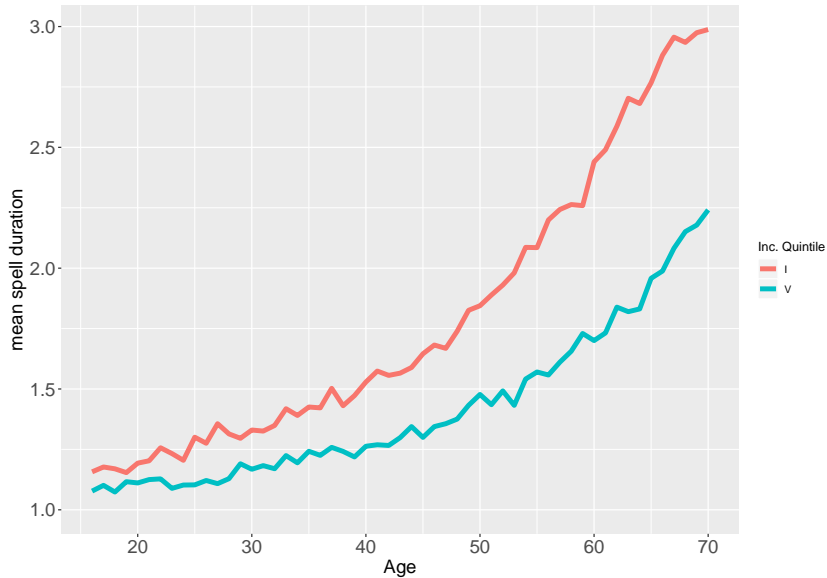
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- ▶ Italian SILC data
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- ▶ Income quintiles
- ▶ Multistate model of disability
- ▶ **Simulate** discrete life trajectories

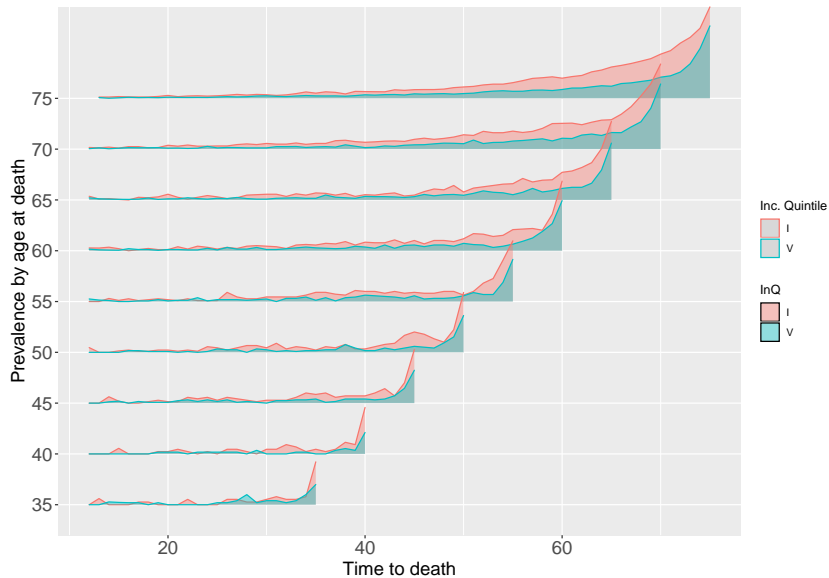
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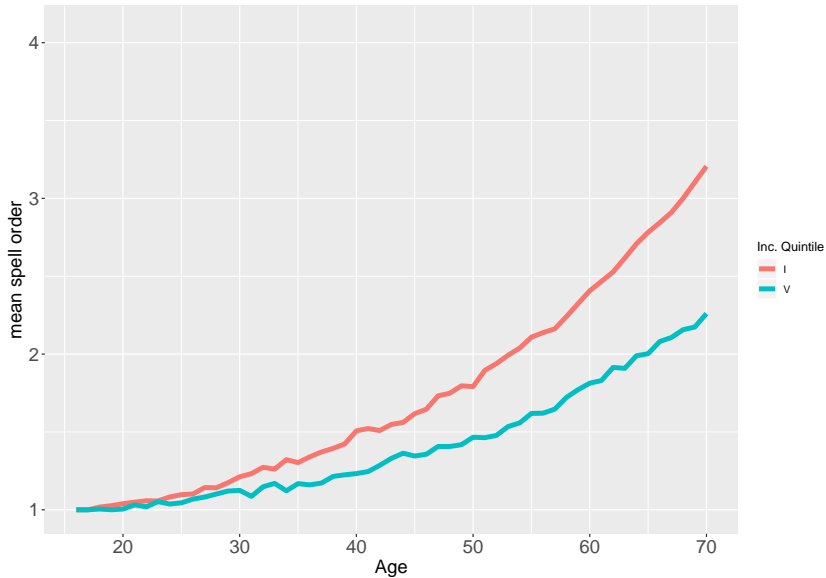
Inequality in disability spell duration



Inequality in end-of-life disability levels and dispersion



How many times have people been disabled?



Application 2: Fertility

- ▶ Colombian DHS data, all waves

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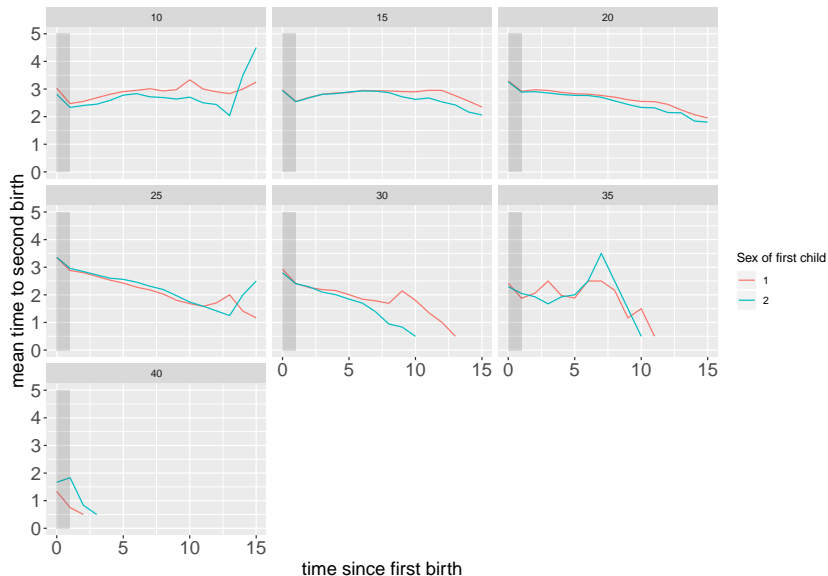
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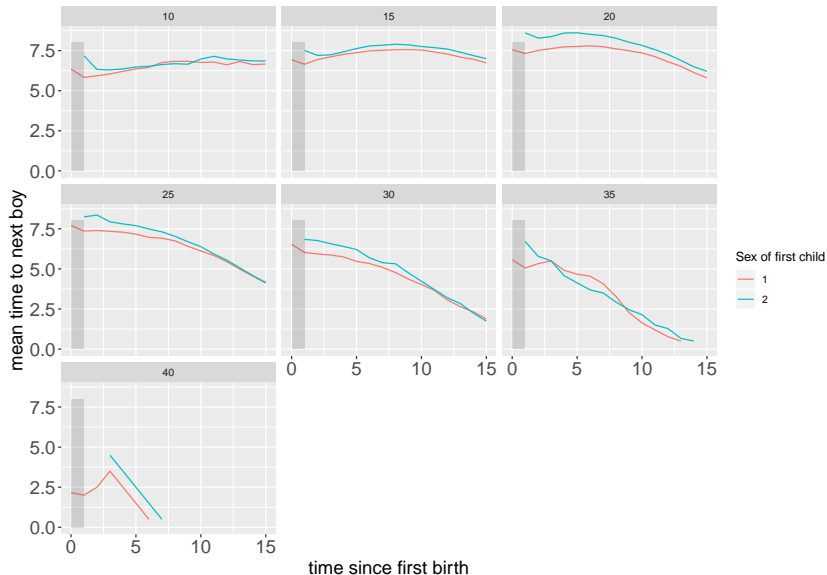
Application 2: Fertility

- ▶ Colombian DHS data, all waves
- ▶ Birth and union histories
- ▶ Completed fertility ≥ 2
- ▶ Explore birth intervals
- ▶ Combine clocks and alignment

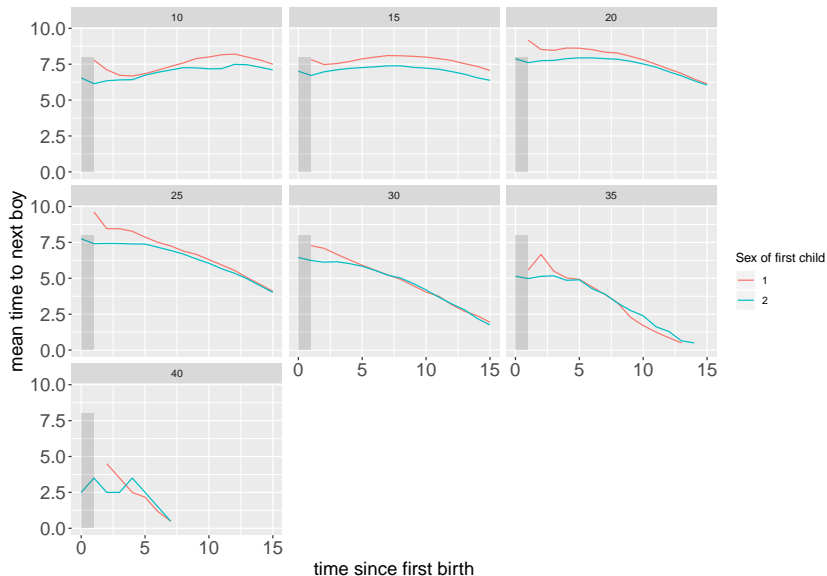
Conditional mean time to second birth



Does a first boy imply a faster next boy?



Does a first girl imply a faster next girl?



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