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

Tim Riffe, Angelo Lorenti, Erik Vickstrom, Marcus Ebeling, Andrés Castro

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Backstory

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

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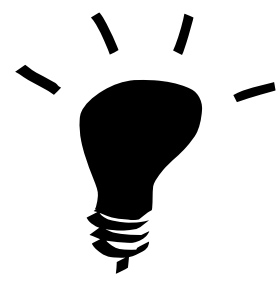
Idea: Realign sequences on transitions.



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Matrix algebra expression for average episode count (Dudel & Myrskylä, 2017-).

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∴ Question: Are bespoke algebraic derivations necessary?

Example questions:

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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 from trajectory data.

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Approach

Clocks are within and between episode timekeeping operations.

Alignment is a time structuring operation.

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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

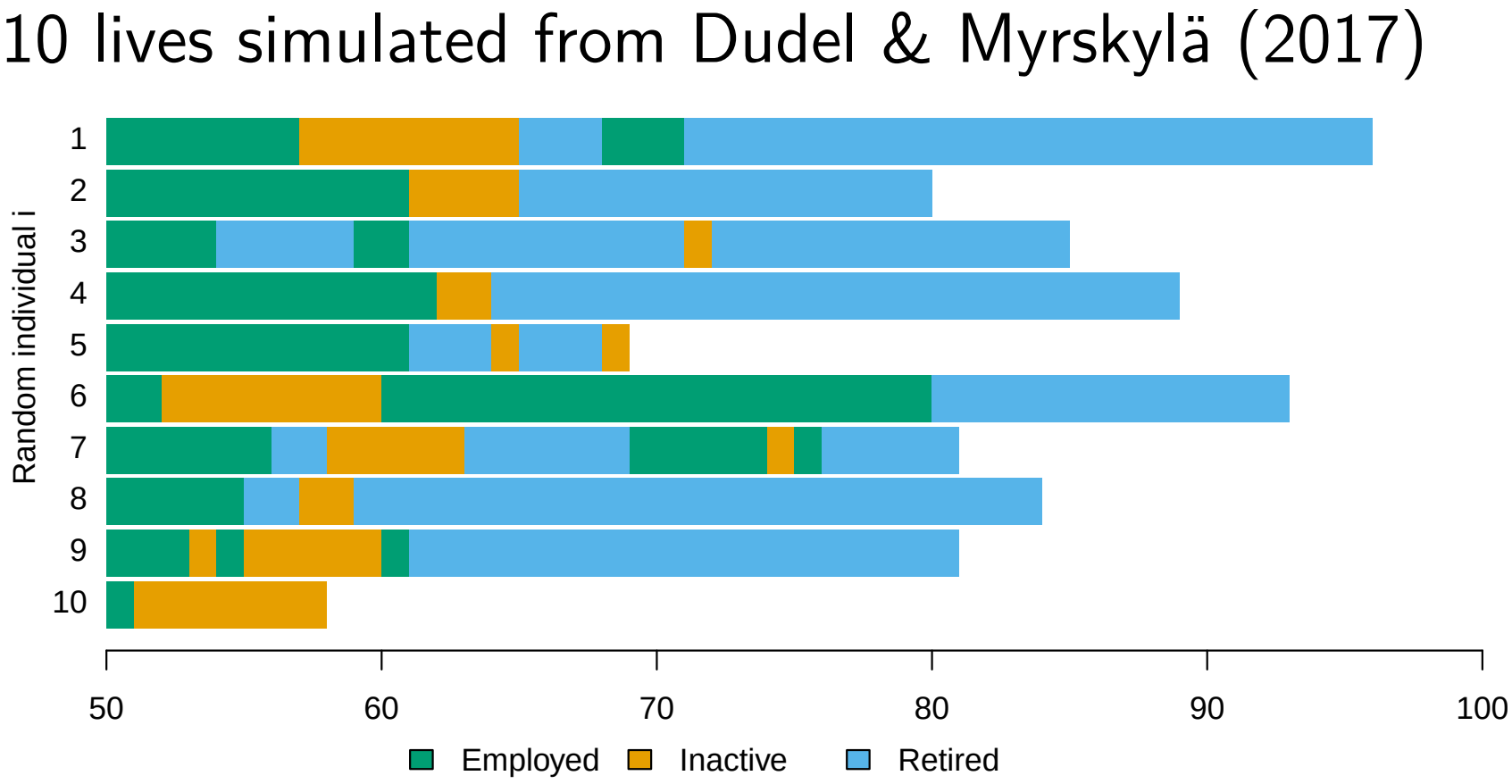
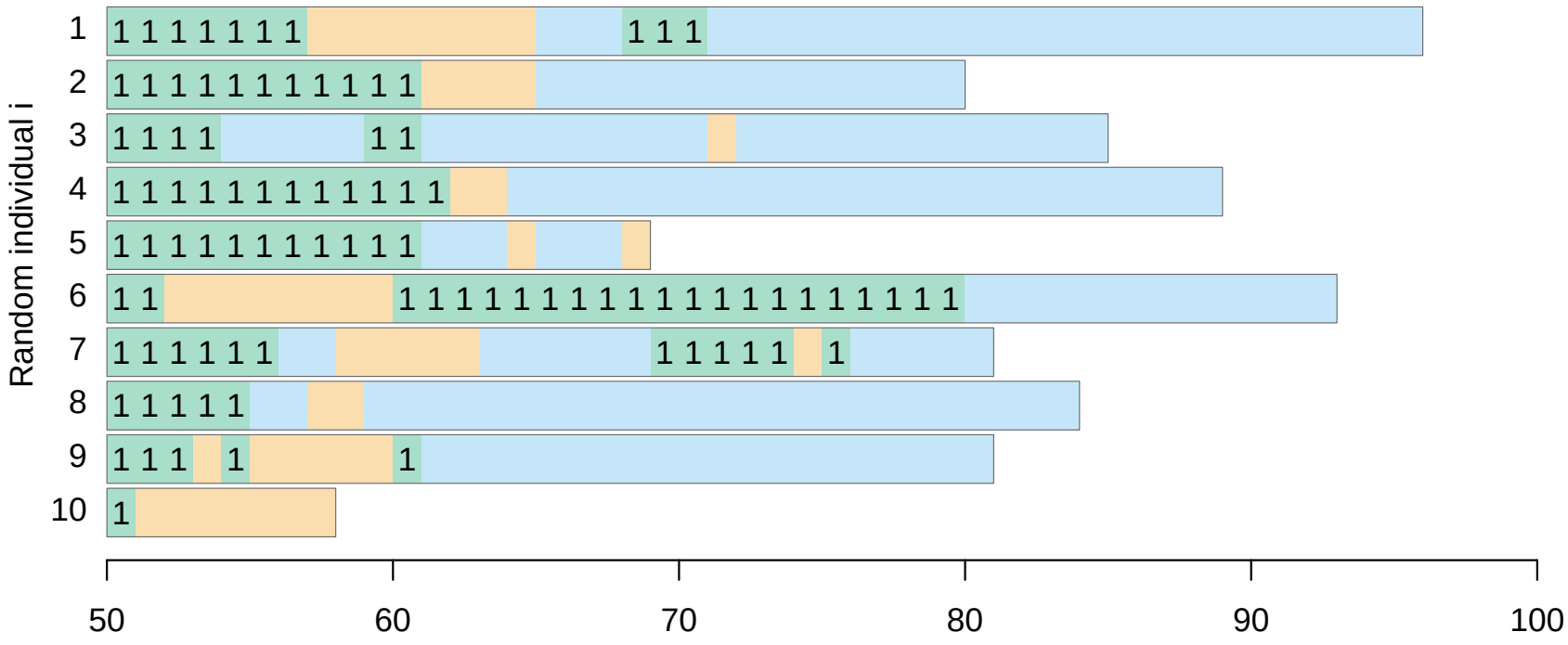


Illustration: Age structured prevalence.

Identity clock in employment state



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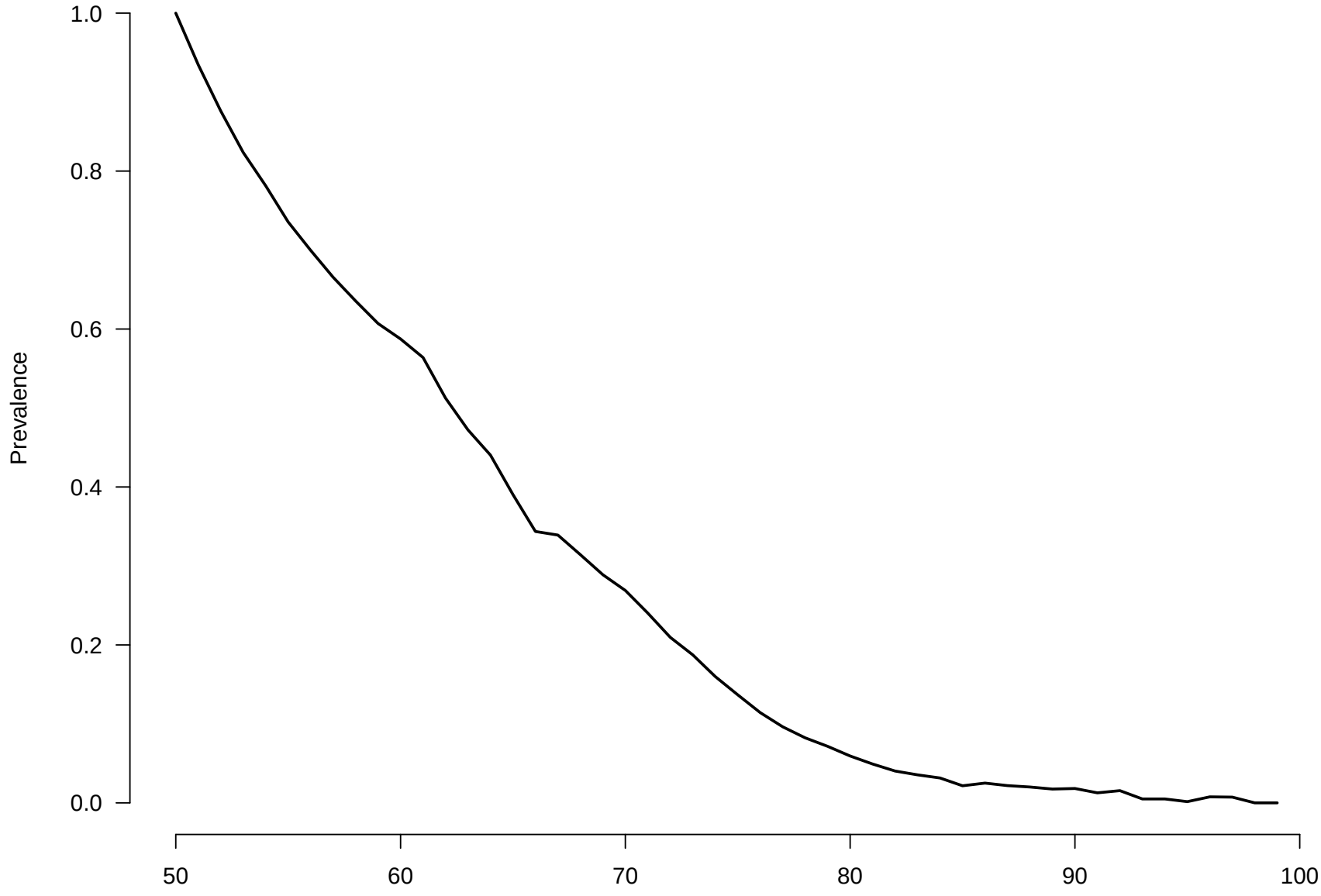


Illustration: Clocks: Duration (unconditional)

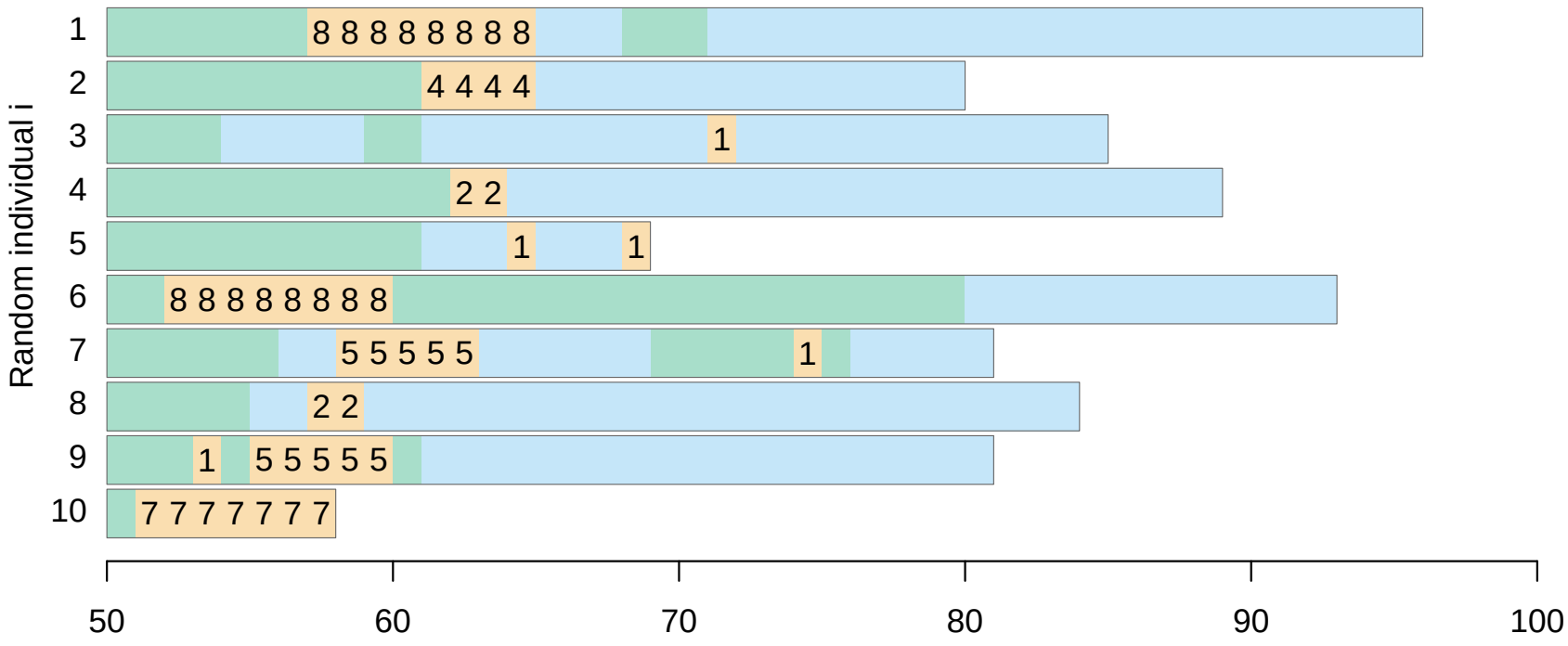


Illustration: Clocks: Duration conditioned on entry

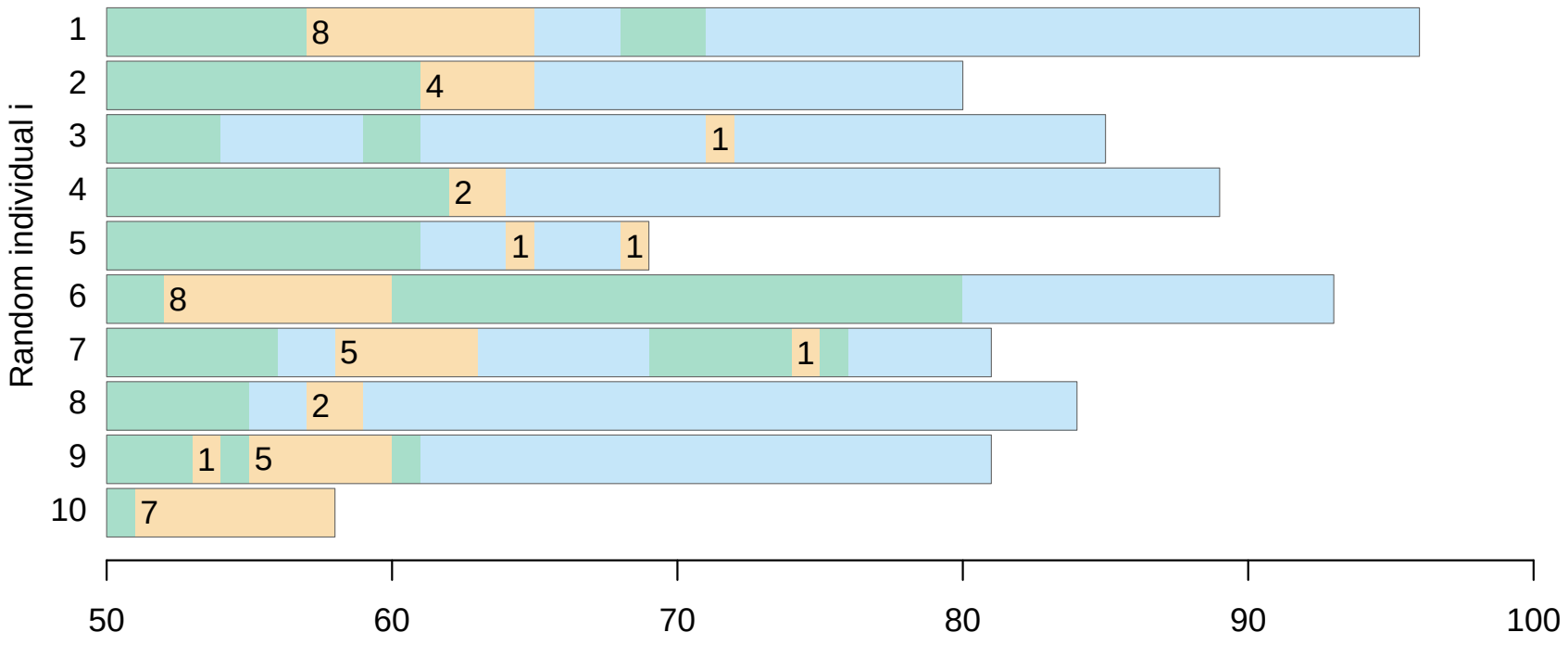


Illustration: Clocks: Duration conditioned on exit

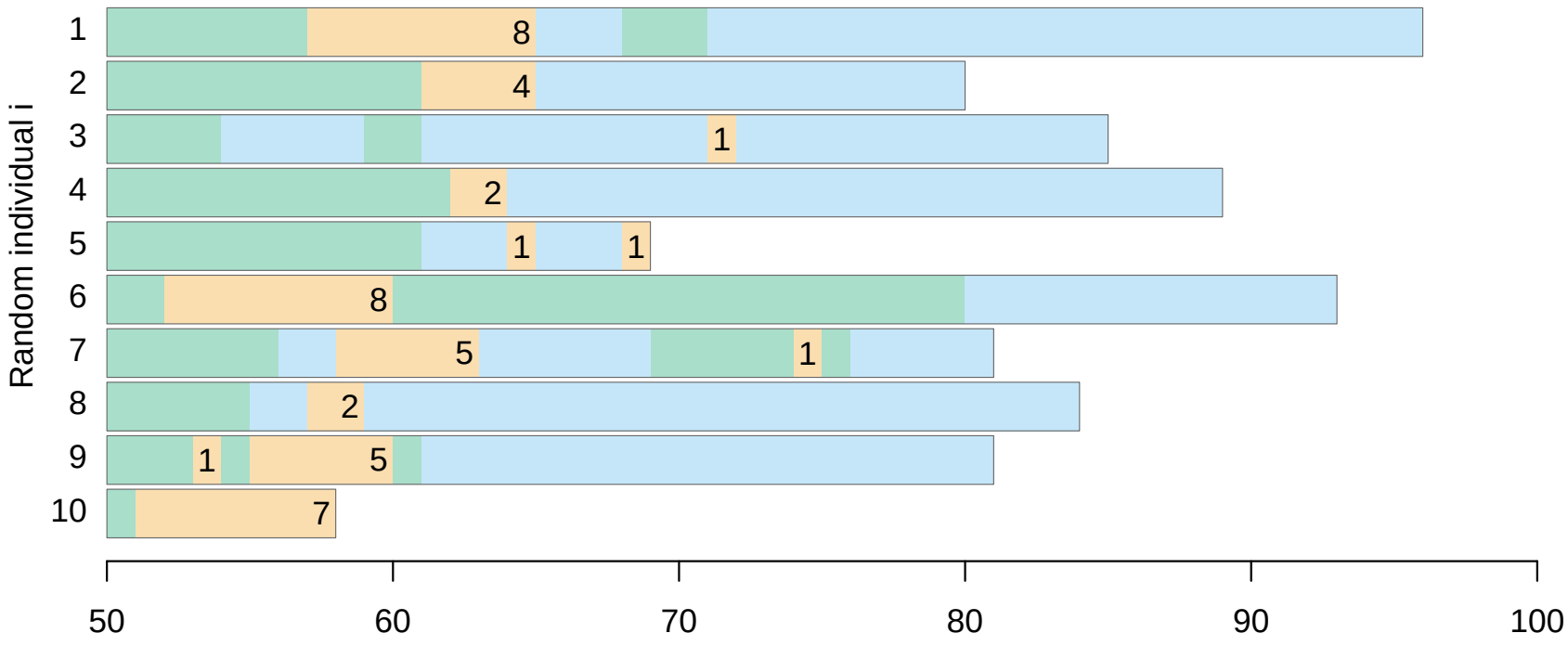


Illustration: Clocks: Order Ascending

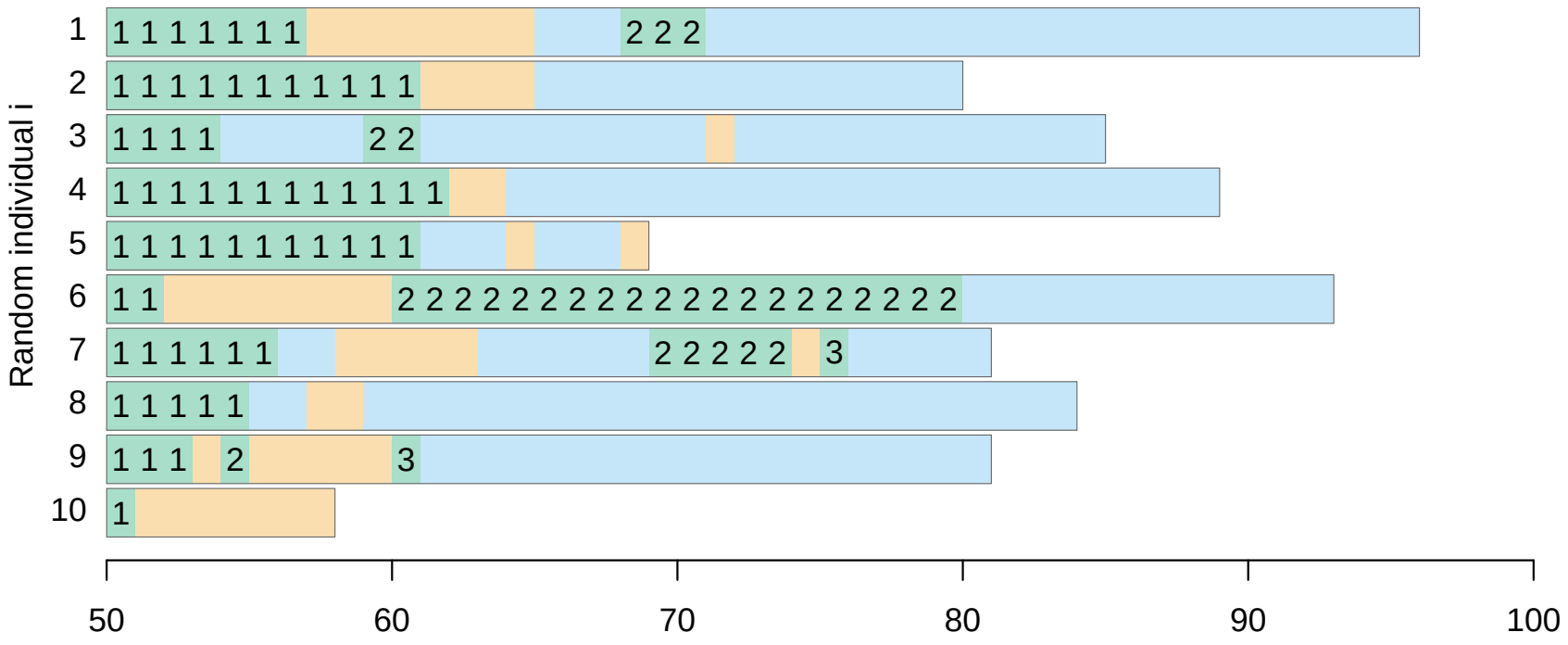


Illustration: Clocks: Order Descending

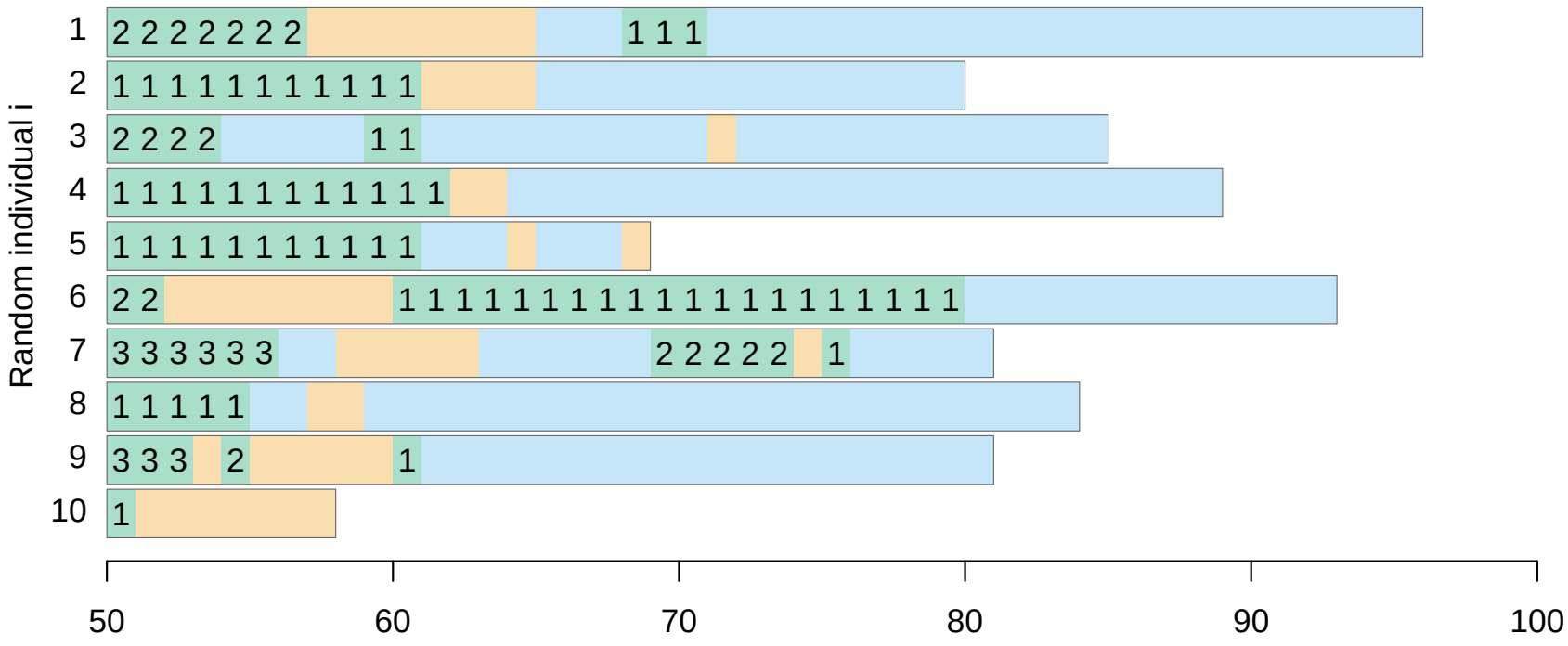


Illustration: Clocks: Steps Ascending

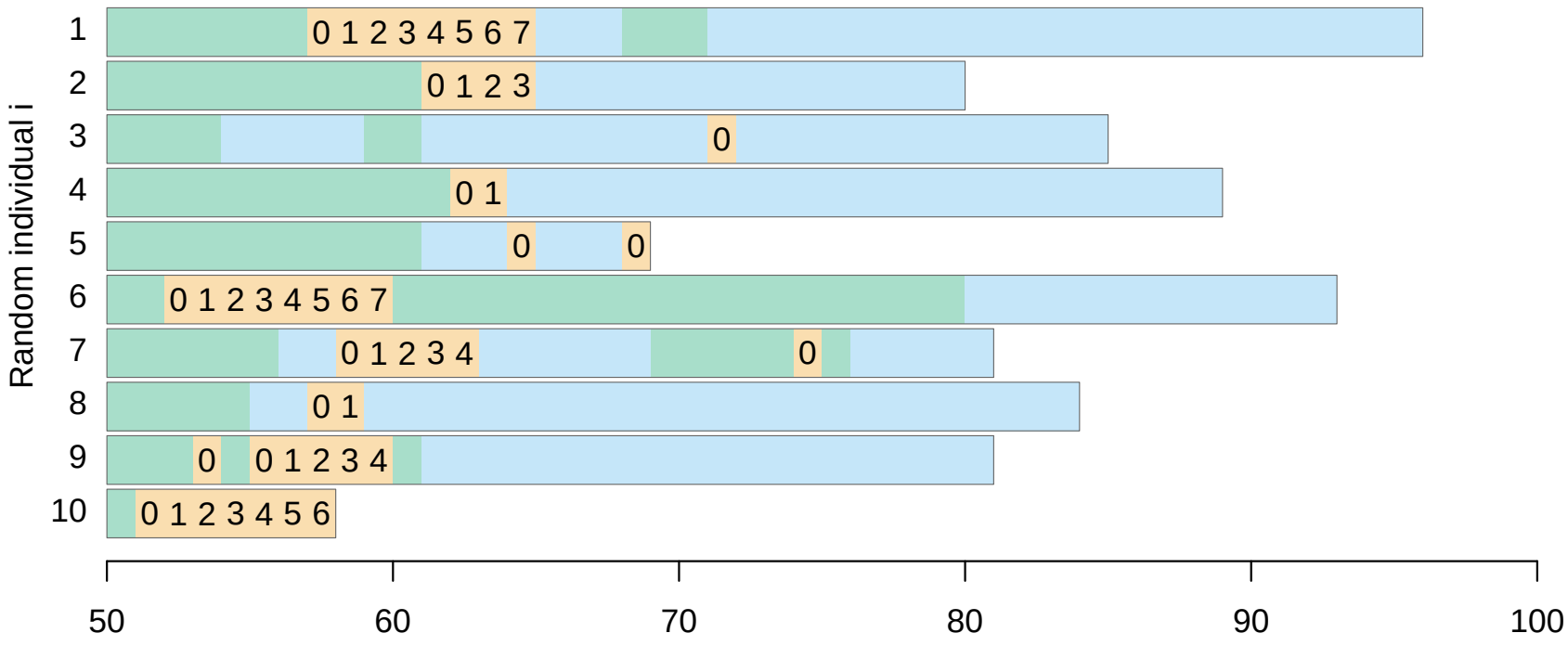


Illustration: Clocks: Steps Descending

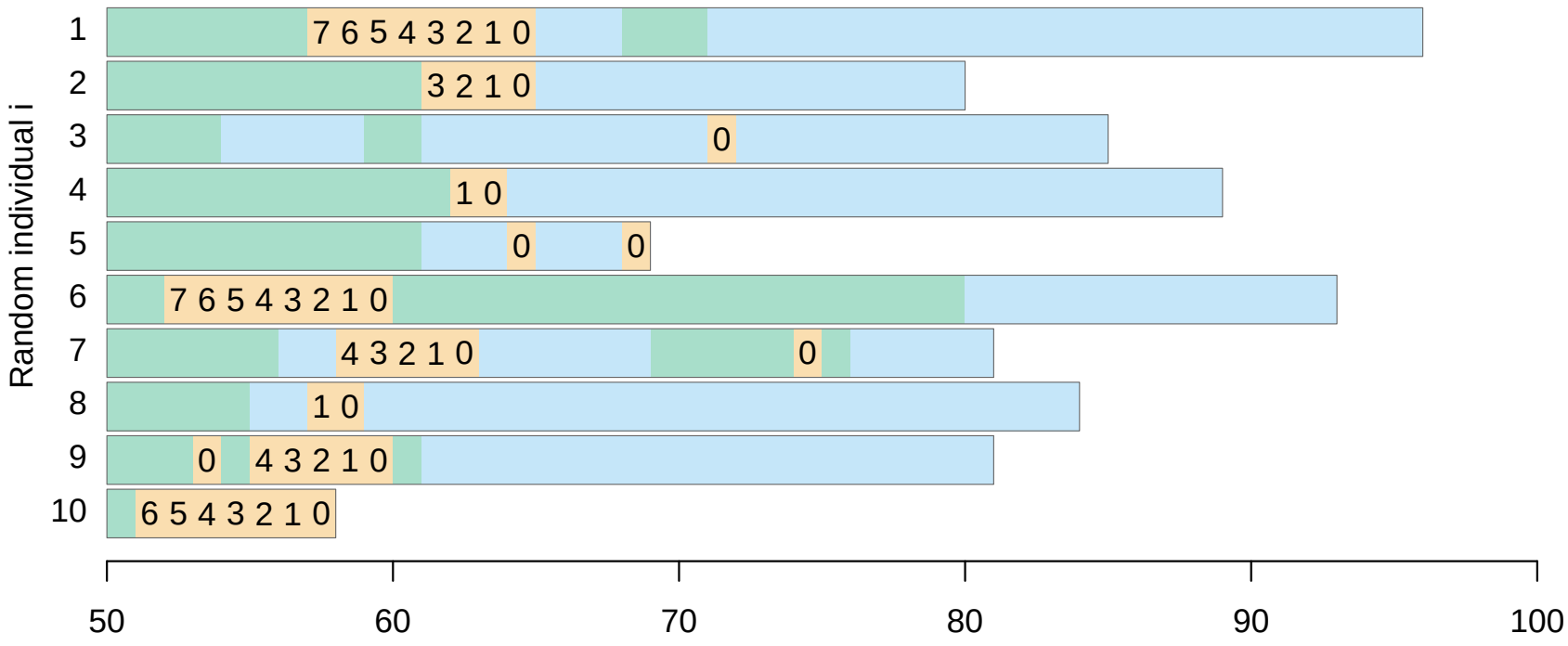


Illustration: Alignment: Age = Birth alignment

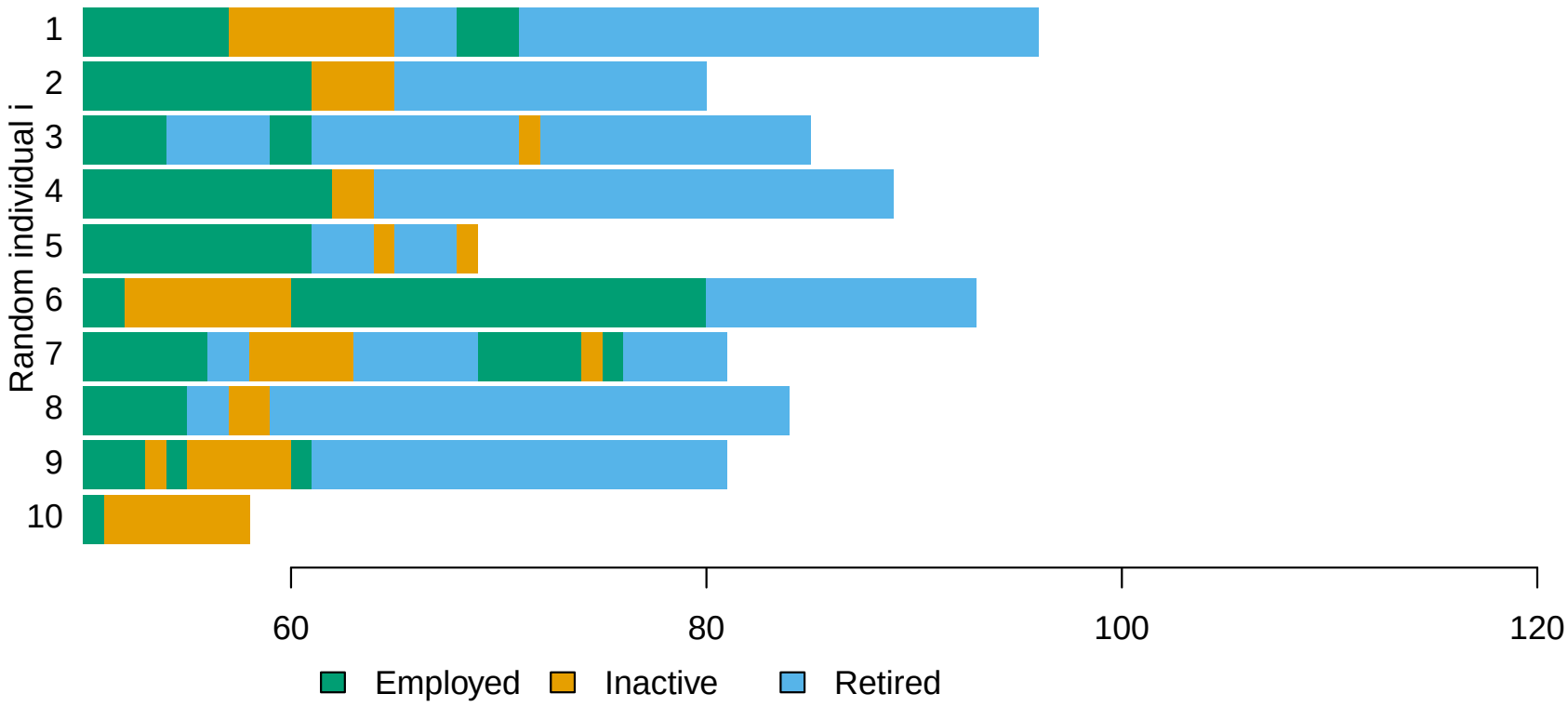


Illustration: Alignment: Death

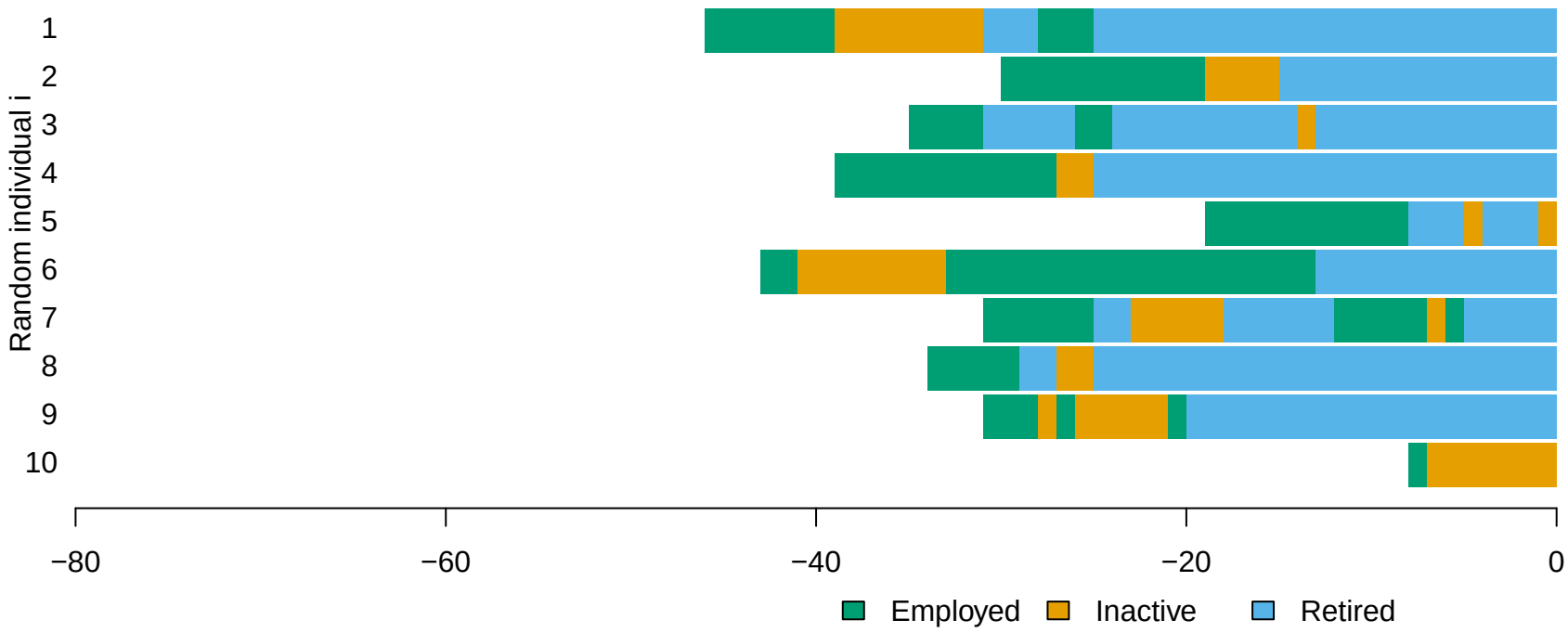


Illustration: Alignment: *Entry* to *first* retirement

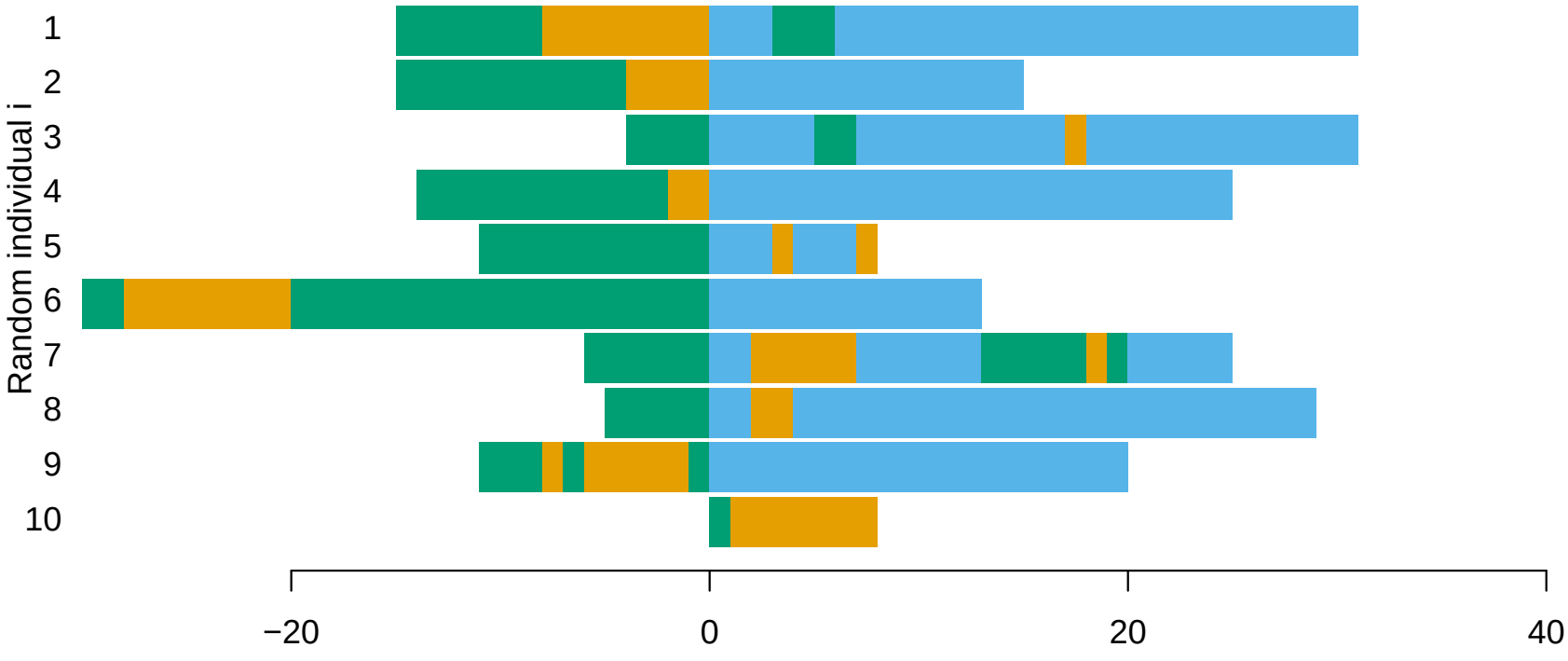


Illustration: Alignment: *Exit* from *first* employment

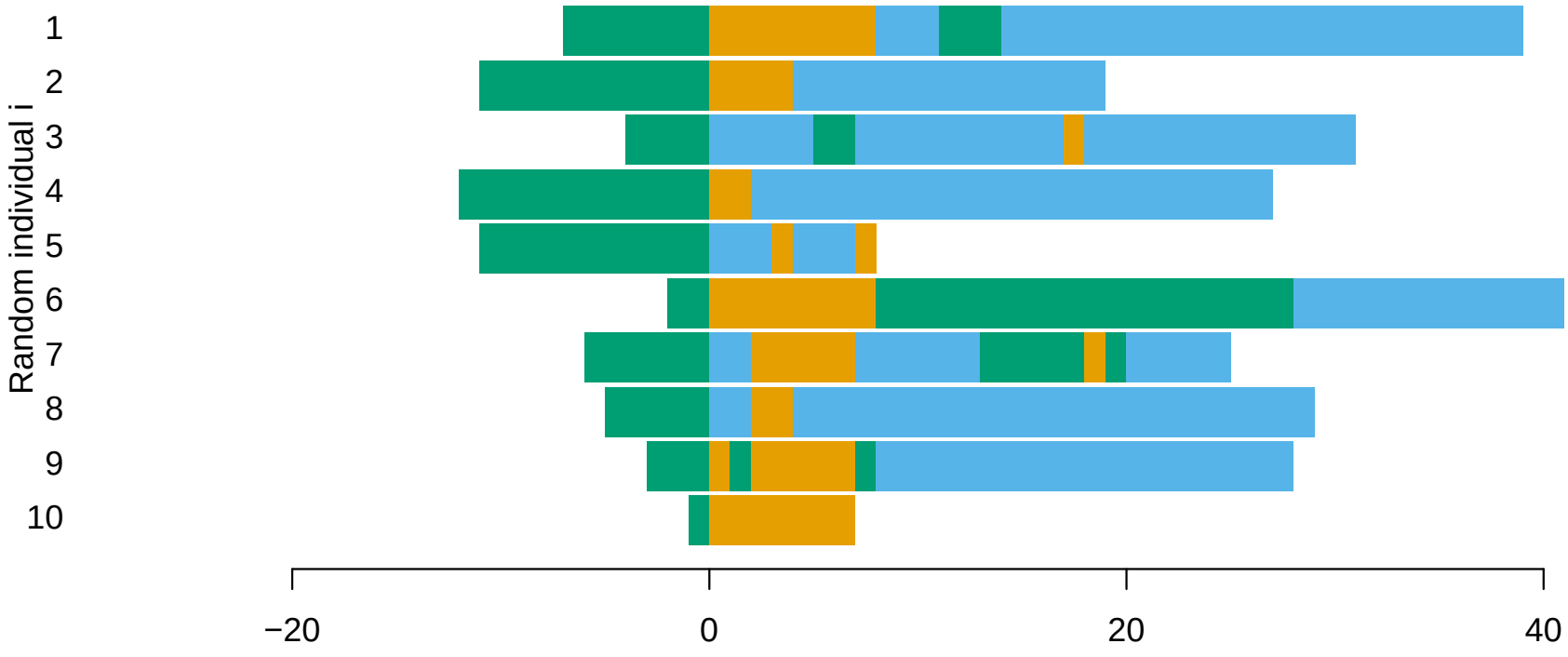


Illustration: Alignment: *Exit* from *longest* employment

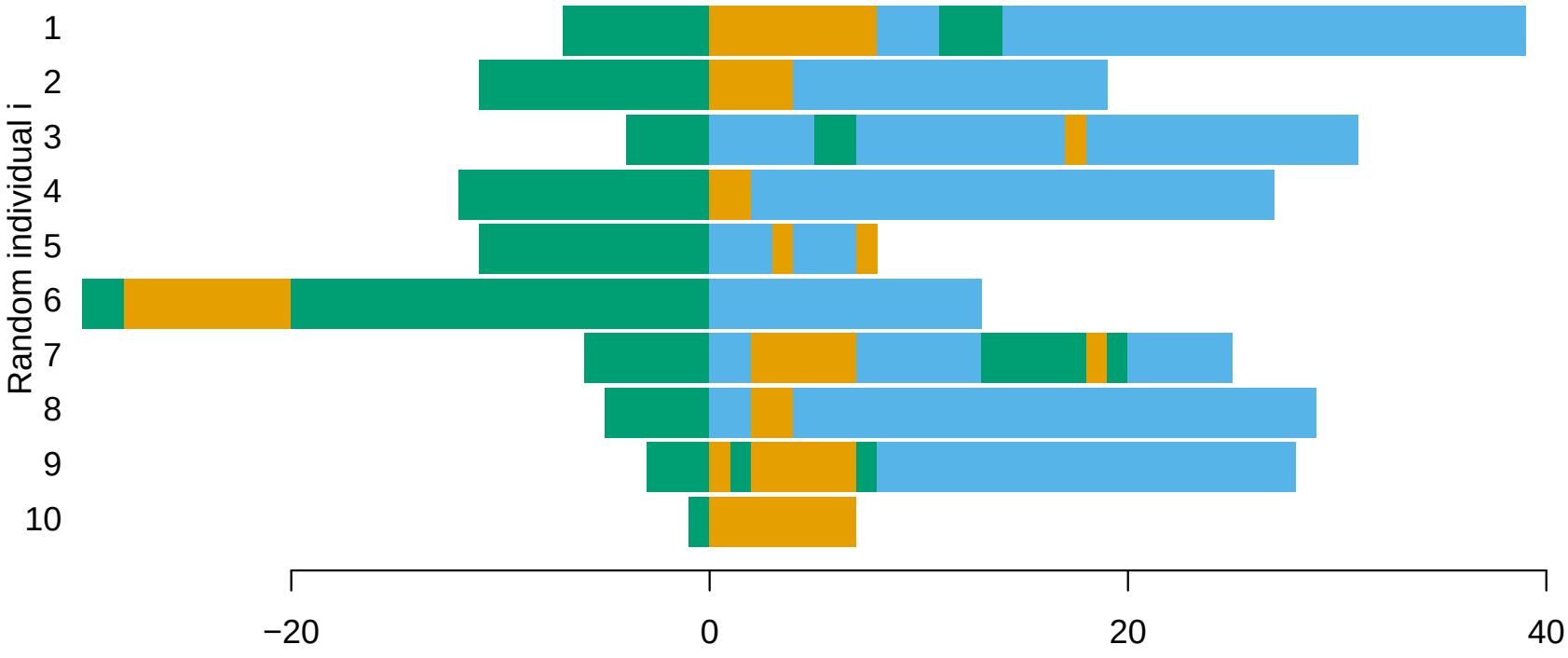
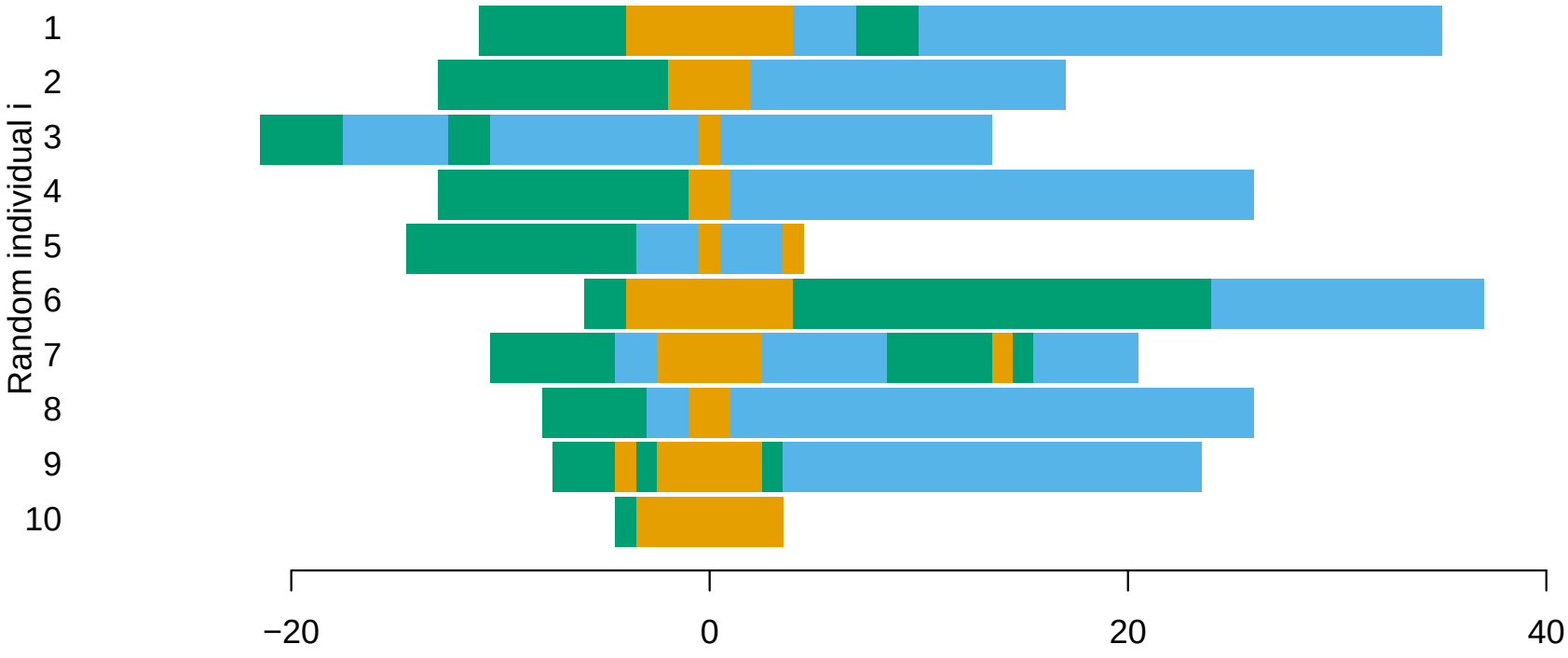


Illustration: Alignment: *Centered* on *longest* inactivity



Aggregation

Macro patterns

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

Application 1: Health

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- **Simulate** discrete life trajectories

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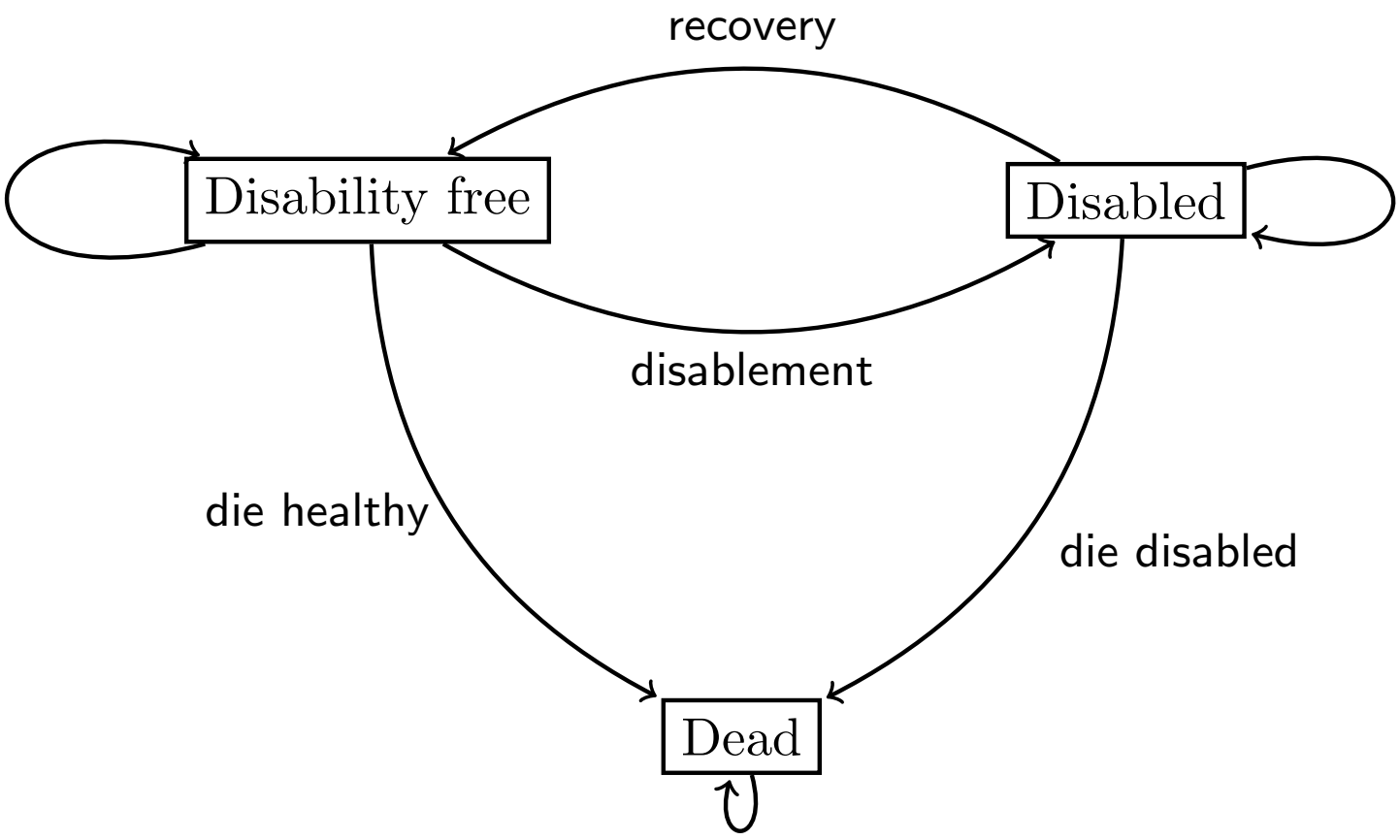
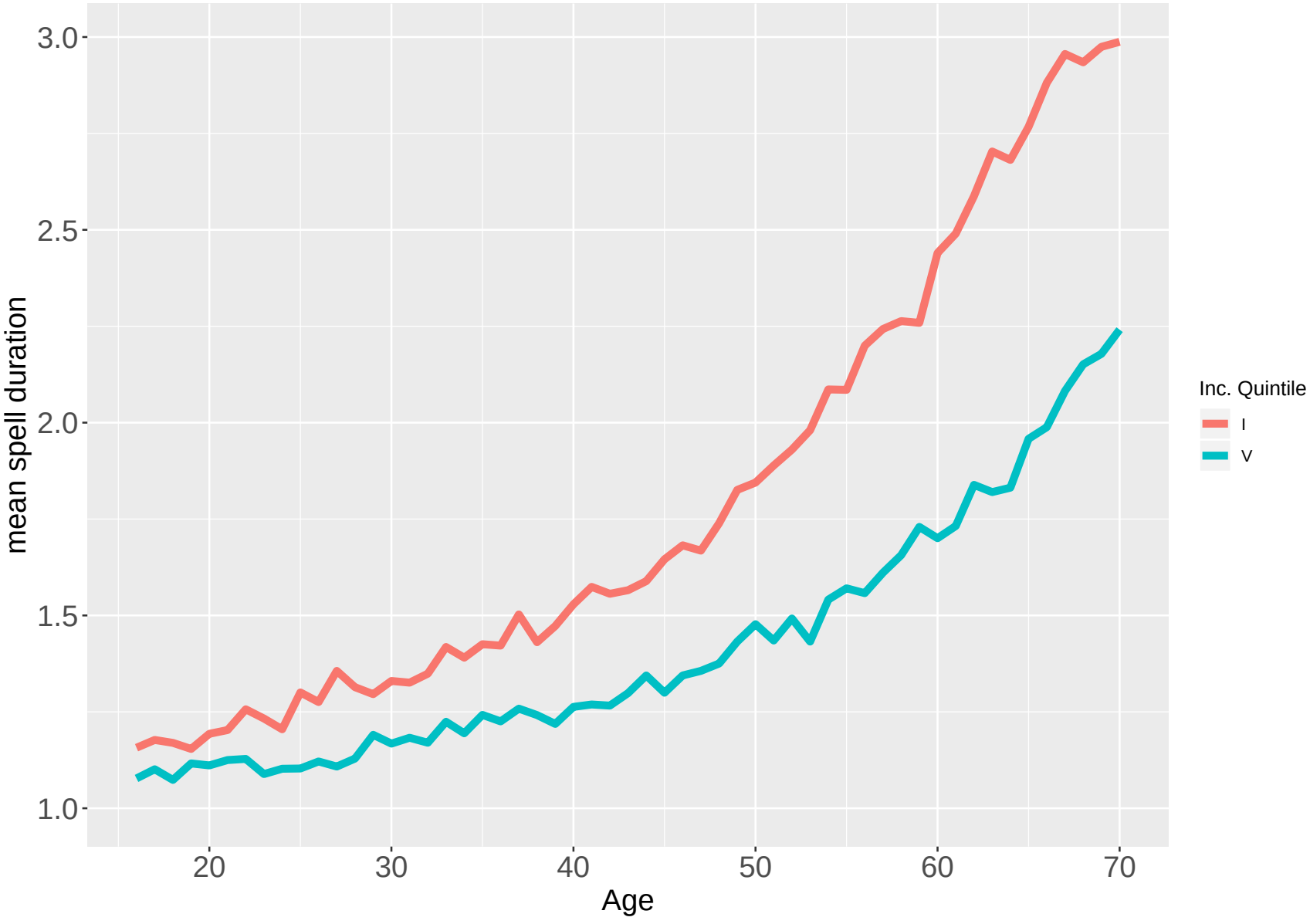
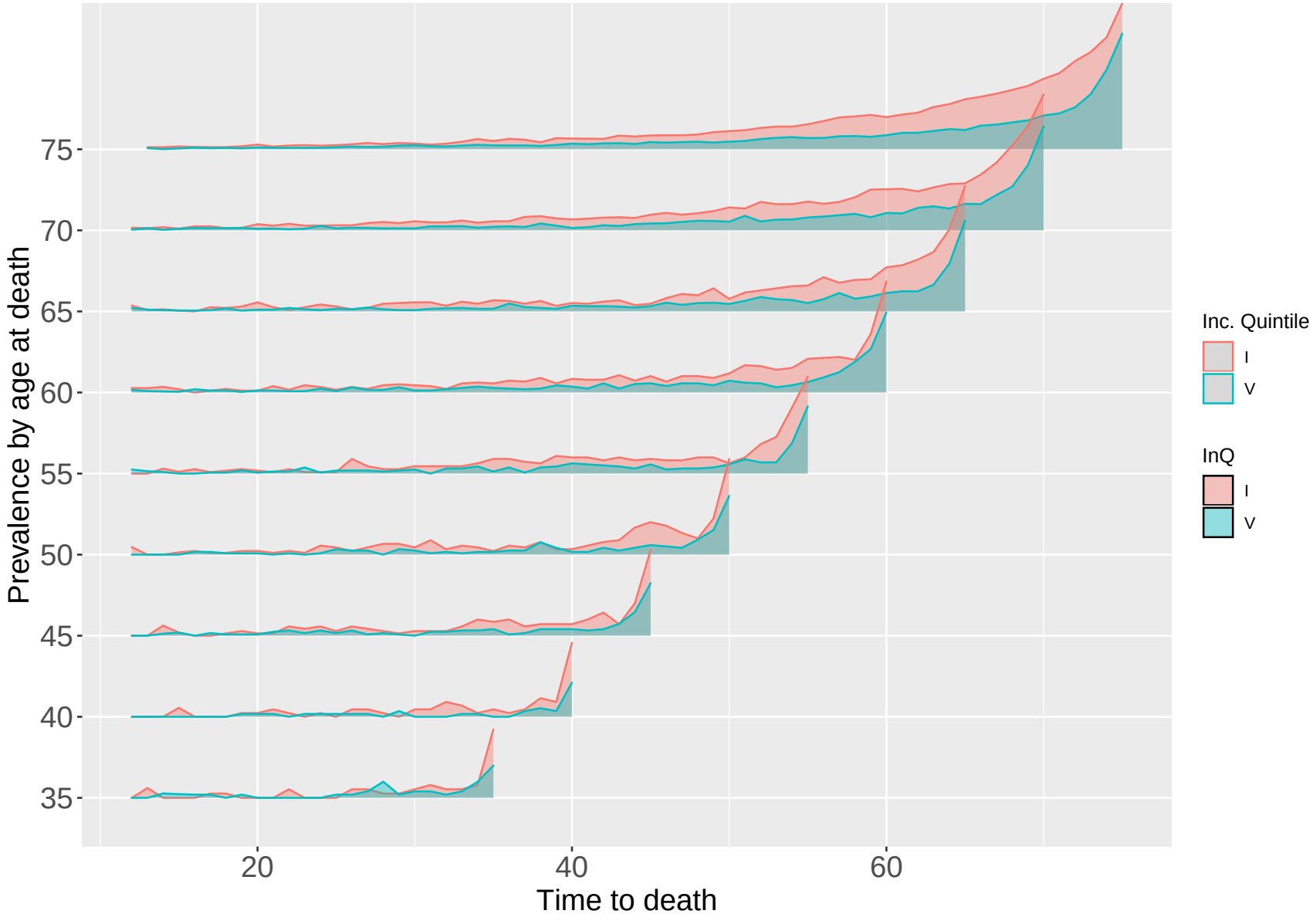


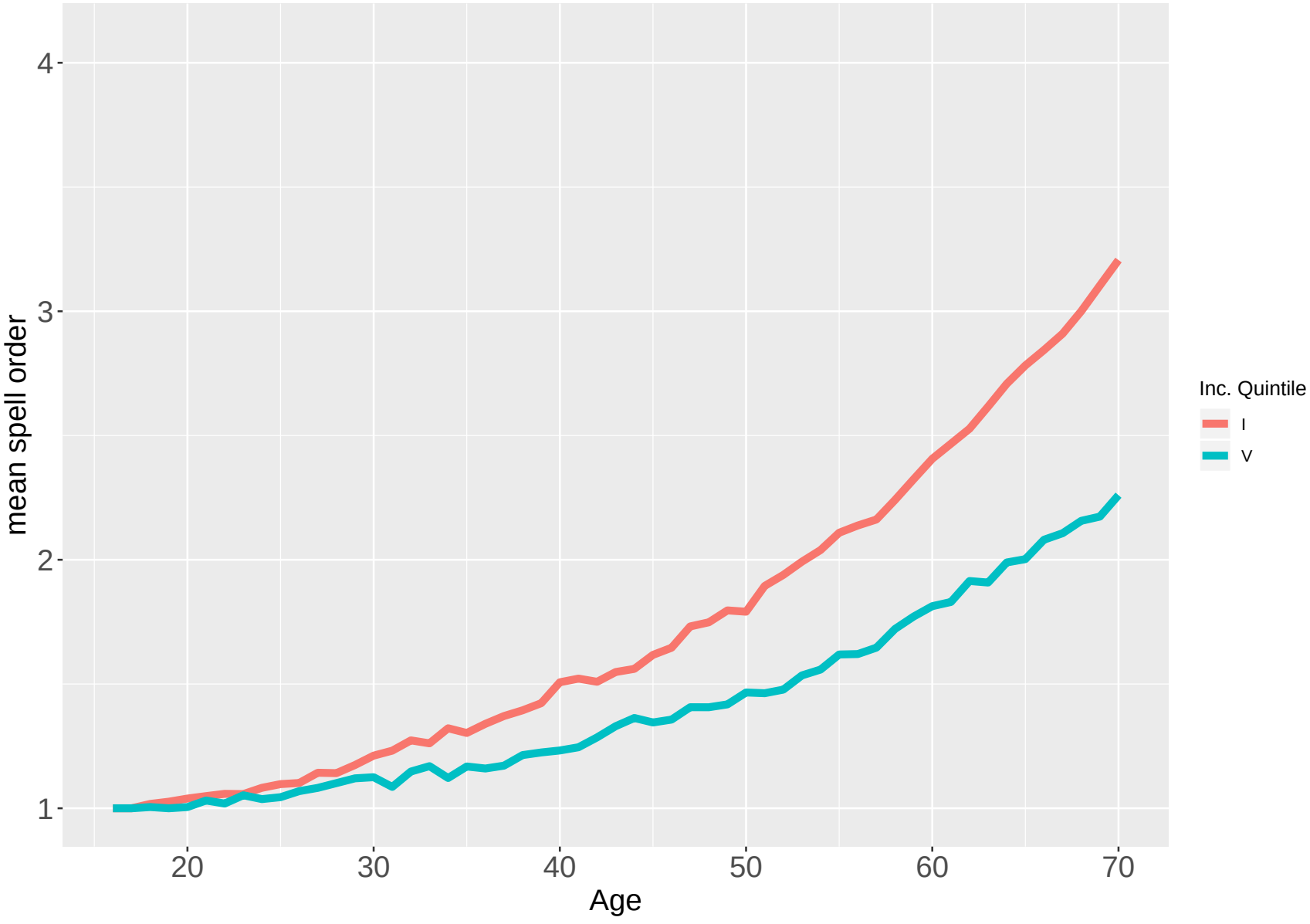
Inequality in disability spell duration



Inequality in end-of-life disability levels and dispersion



How many times have people been disabled?



Application 2: Fertility

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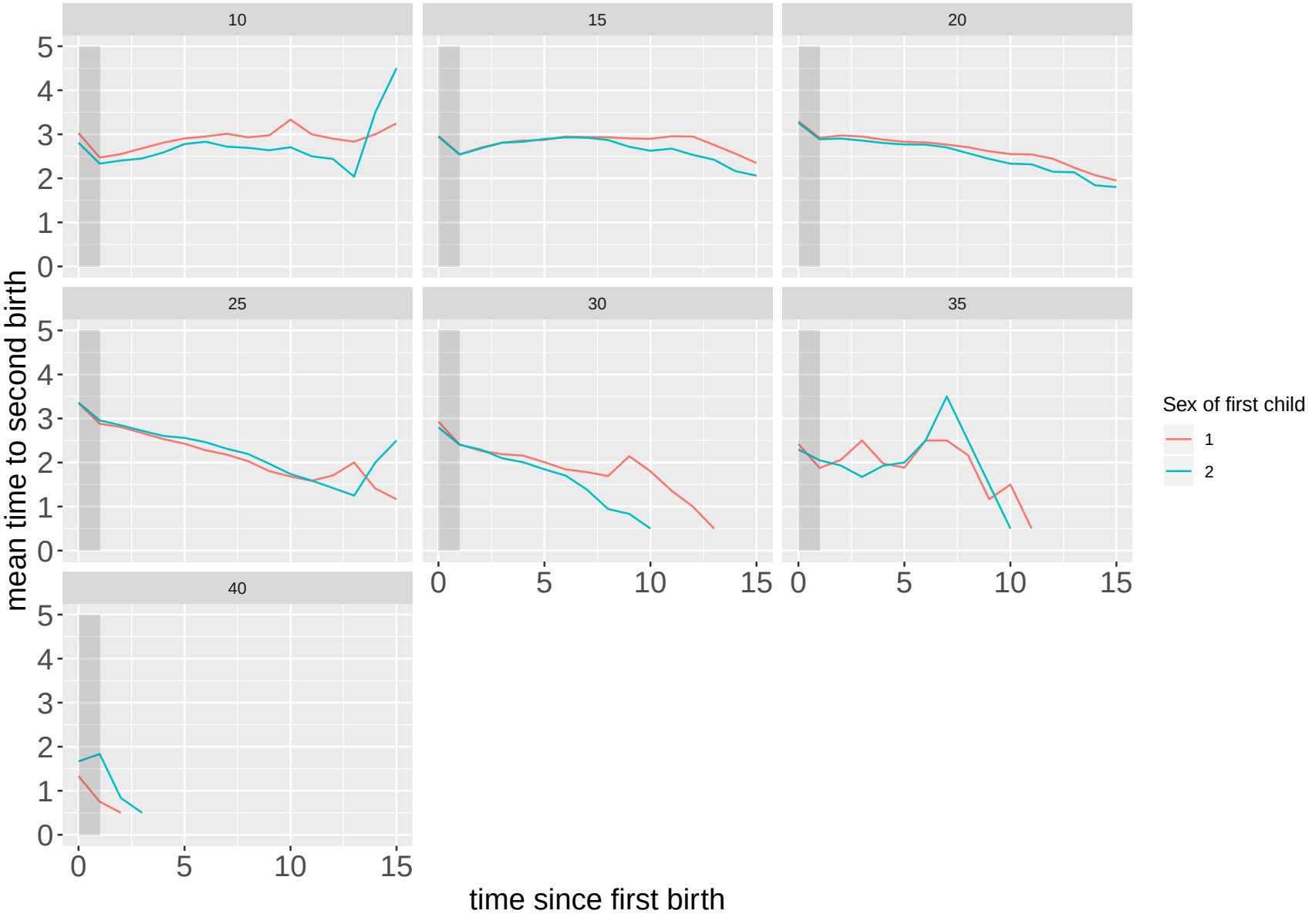
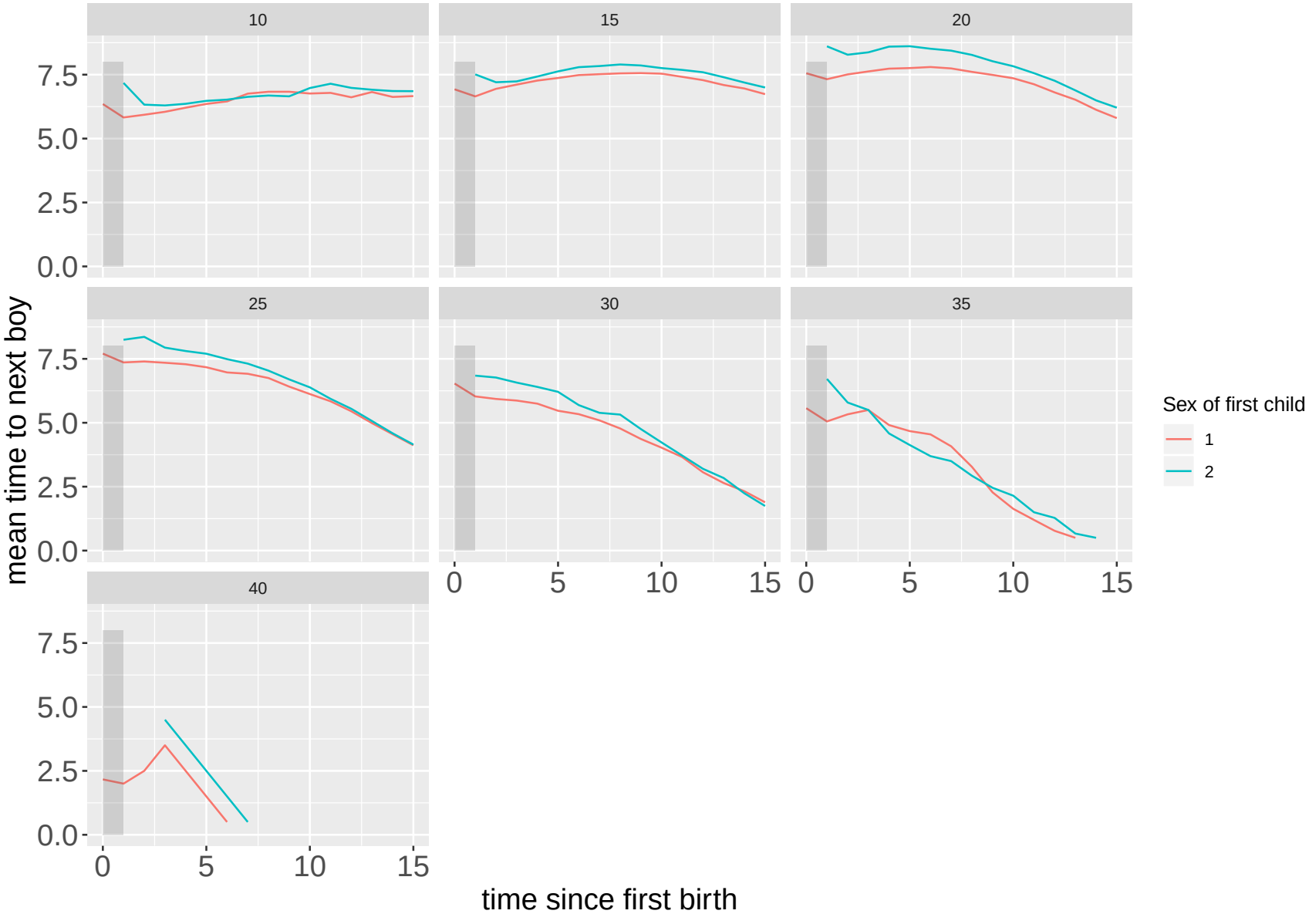
- Combine clocks and alignment

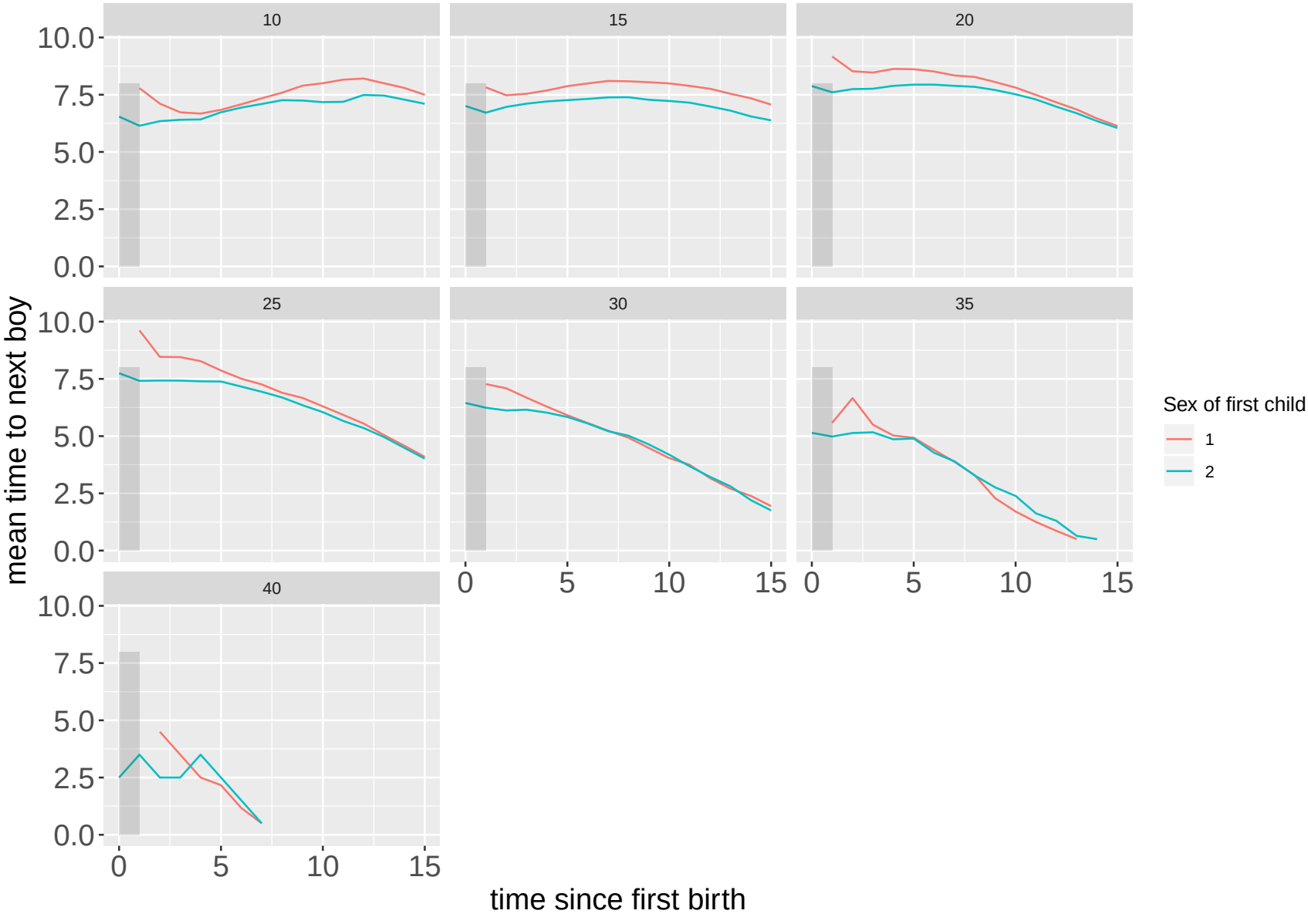
Conditional mean time to second birth



Does a first boy imply a faster next boy?



Does a first girl imply a faster next girl?



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