

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

Tim Riffe and Andrés Castro

9 Oct. 2019

Backstory

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

Backstory

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

Idea: Realign sequences on transition.



Backstory

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

Backstory

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

Question: What else might we derive? ∴



Example questions:

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

Example questions:

- ▶ Do disability episodes get shorter or longer with age? And over time?
- ▶ What is the distribution of other state episode durations before cancer?

Example questions:

- ▶ 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?

Example questions:

- ▶ 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?

Problem

Tools for answering such questions are scattered.

Problem

Tools for answering such questions are scattered.

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.

Solution

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

Approach

Define episode pre-aggregation operations: **Clocks**

Define time structuring operations: **Alignment**

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 .

Illustrations

10 lives simulated from Dudel & Myrskylä (2017)

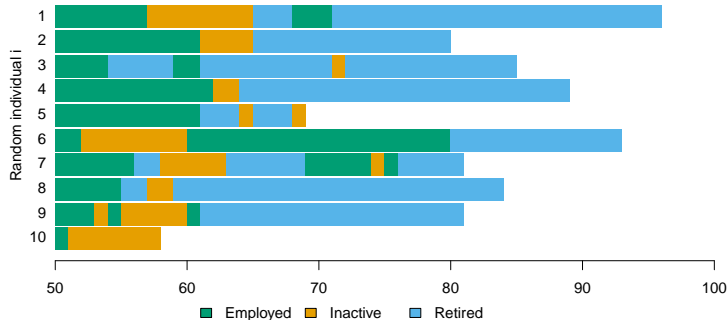


Illustration: Age structured prevalence.

Identity clock in employment state

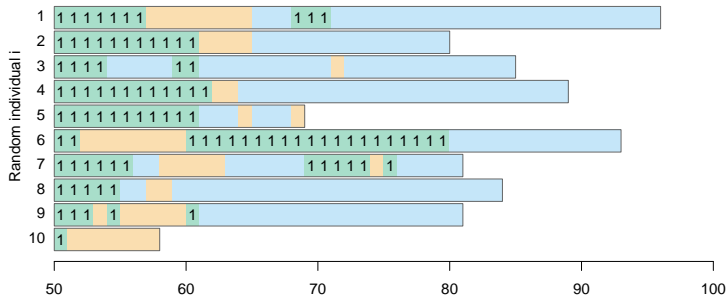


Illustration: Age structured prevalence.

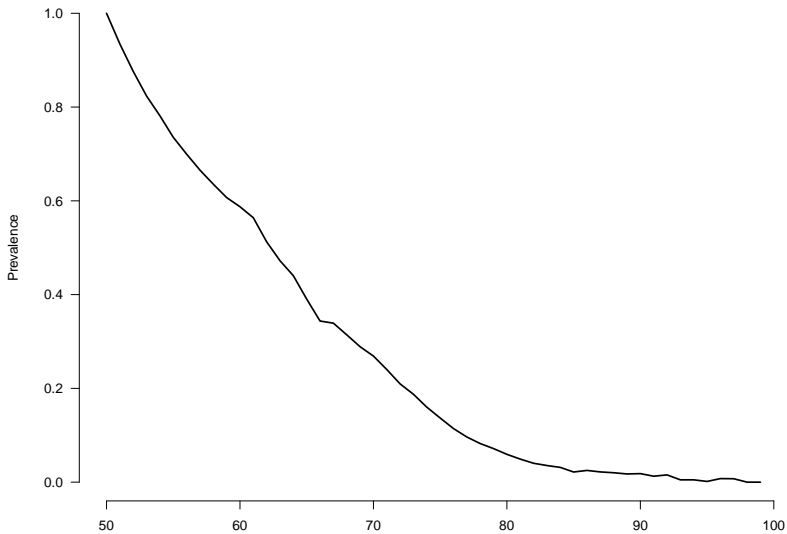


Illustration: Clocks: Duration (unconditional)

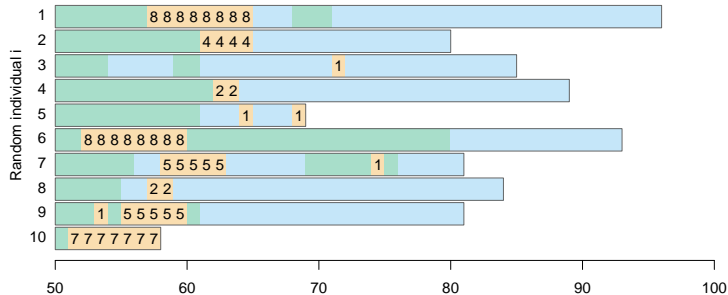


Illustration: Clocks: Duration conditioned on entry

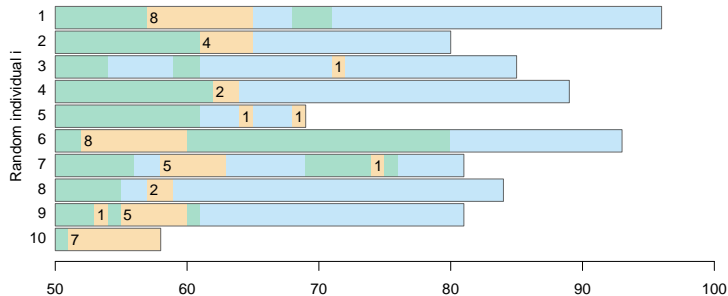


Illustration: Clocks: Duration conditioned on exit

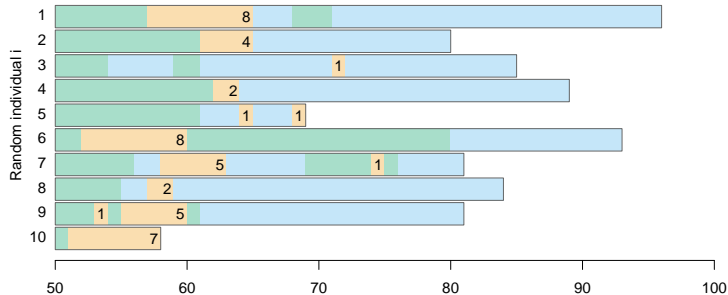


Illustration: Clocks: Order **Ascending**

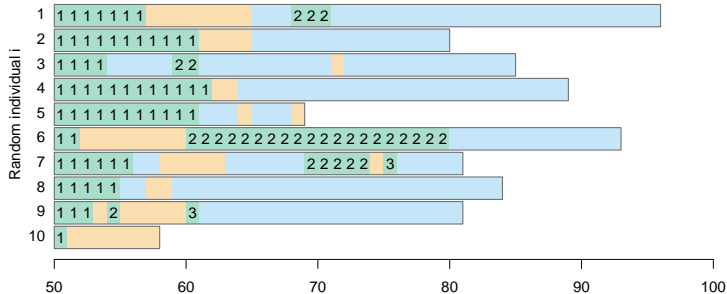


Illustration: Clocks: Order Descending

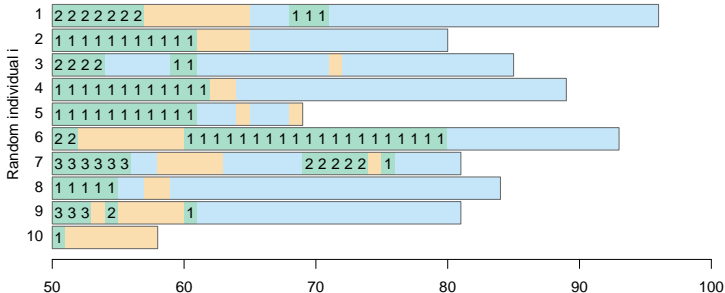


Illustration: Clocks: Steps Ascending

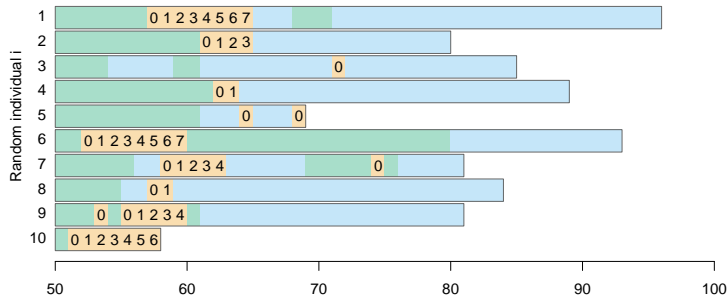


Illustration: Clocks: Steps Descending

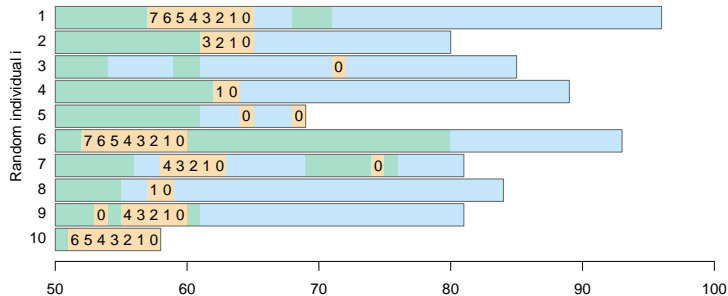


Illustration: Alignment: Age = Birth alignment

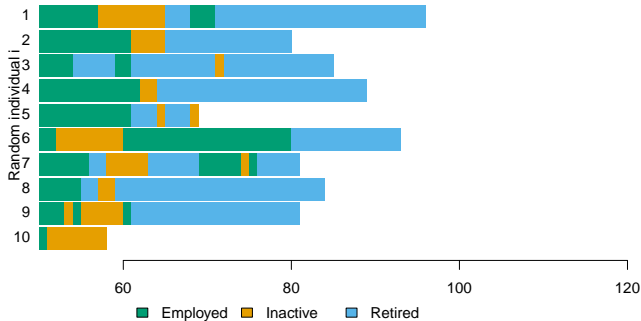


Illustration: Alignment: Death

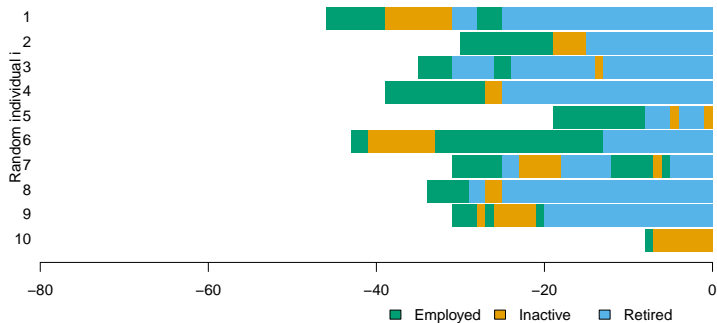


Illustration: Alignment: *Entry* to *first* retirement

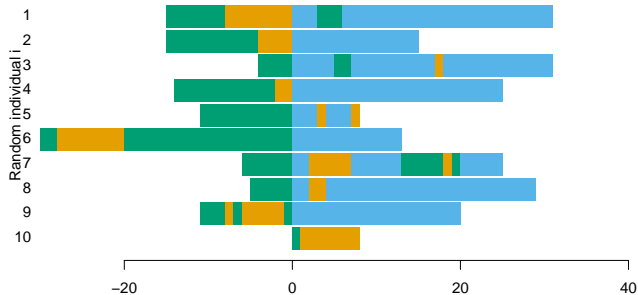


Illustration: Alignment: *Exit* from *first* employment

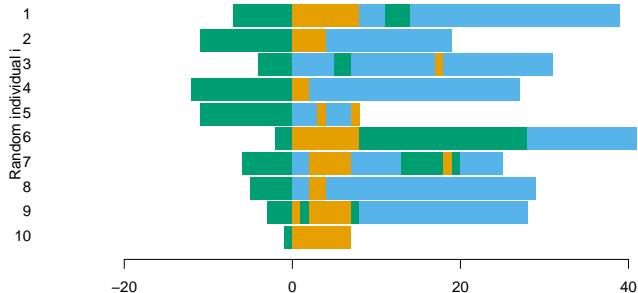


Illustration: Alignment: *Exit* from *longest* employment

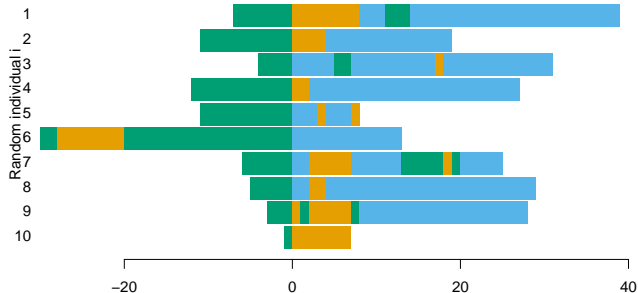
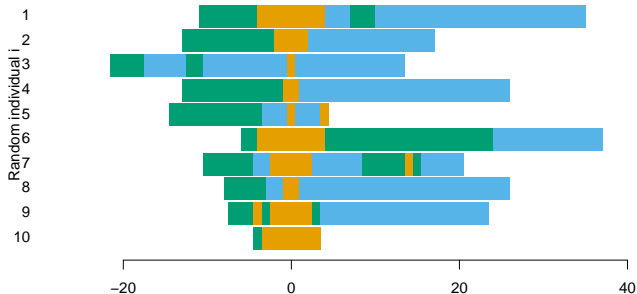


Illustration: Alignment: *Centered* on *longest* spell of inactivity



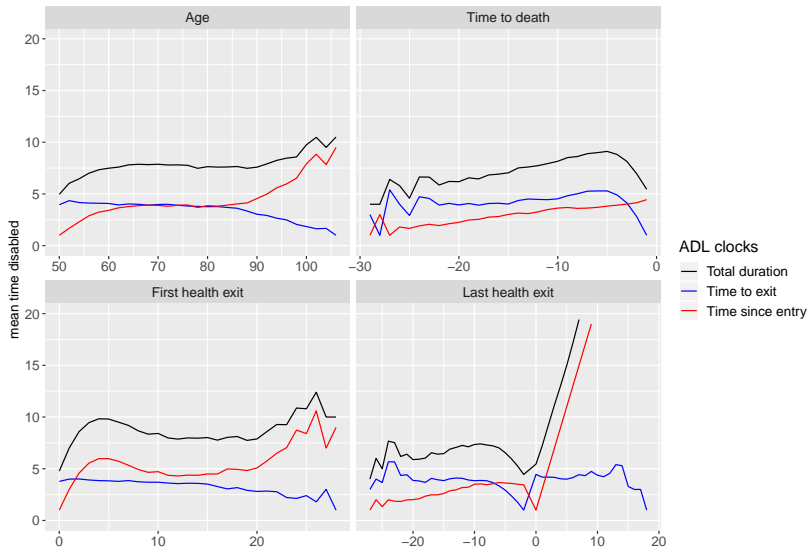
Macro patterns

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

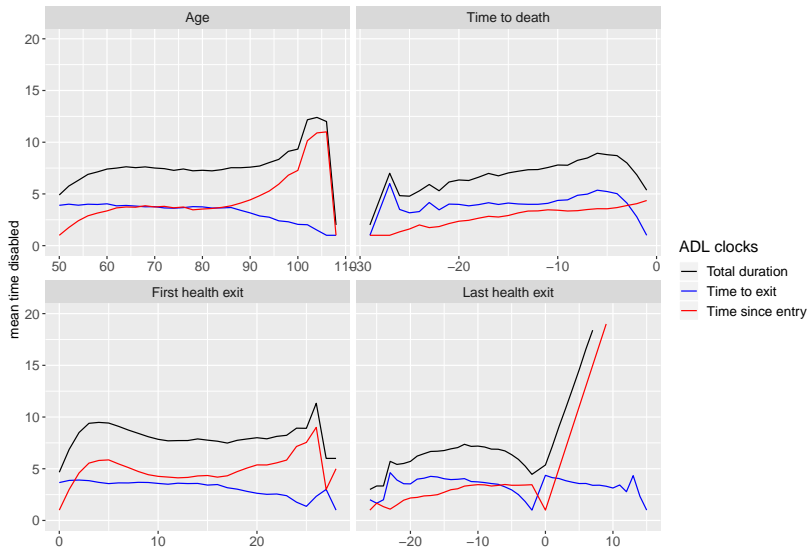
Macro patterns: Inactivity step clocks by 3 alignments



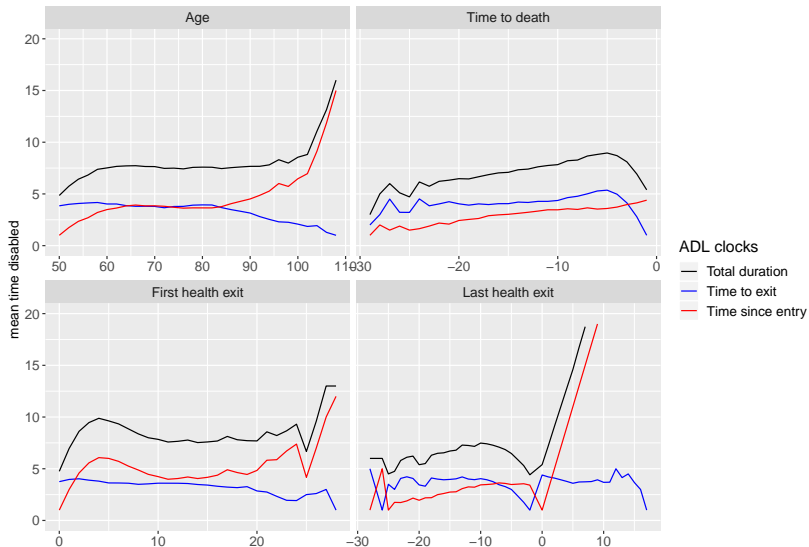
Macro Patterns: ADL step clocks, 4 alignments, 1996



Macro Patterns: ADL step clocks, 4 alignments, 2006



Macro Patterns: ADL step clocks, 4 alignments, 2014



Conclusions

- ▶ Many potential measures

Conclusions

- ▶ Many potential measures
- ▶ Measures translate to natural language

Conclusions

- ▶ Many potential measures
- ▶ Measures translate to natural language
- ▶ R package `Spells` in beta version

Conclusions

- ▶ Many potential measures
- ▶ Measures translate to natural language
- ▶ R package `Spells` in beta version
- ▶ grammar still in development

Conclusions

- ▶ Many potential measures
- ▶ Measures translate to natural language
- ▶ R package `Spells` in beta version
- ▶ grammar still in development
- ▶ Searching for diverse applications



Thanks!

Tim Riffe & Andrés Castro