

Two decades of hidden transitions:

A joint latent Markov analysis of mental health and life satisfaction trajectories in Australia, 2001–2023

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Snapshots can't tell us who stays, who recovers, who relapses

- **Prevalence and mean scores are measured at single time points**

A stable national average can hide people who remain in poor wellbeing

- **Mental health and life satisfaction are related but not interchangeable**

MHI-5 captures recent distress; life satisfaction is a broader judgment.

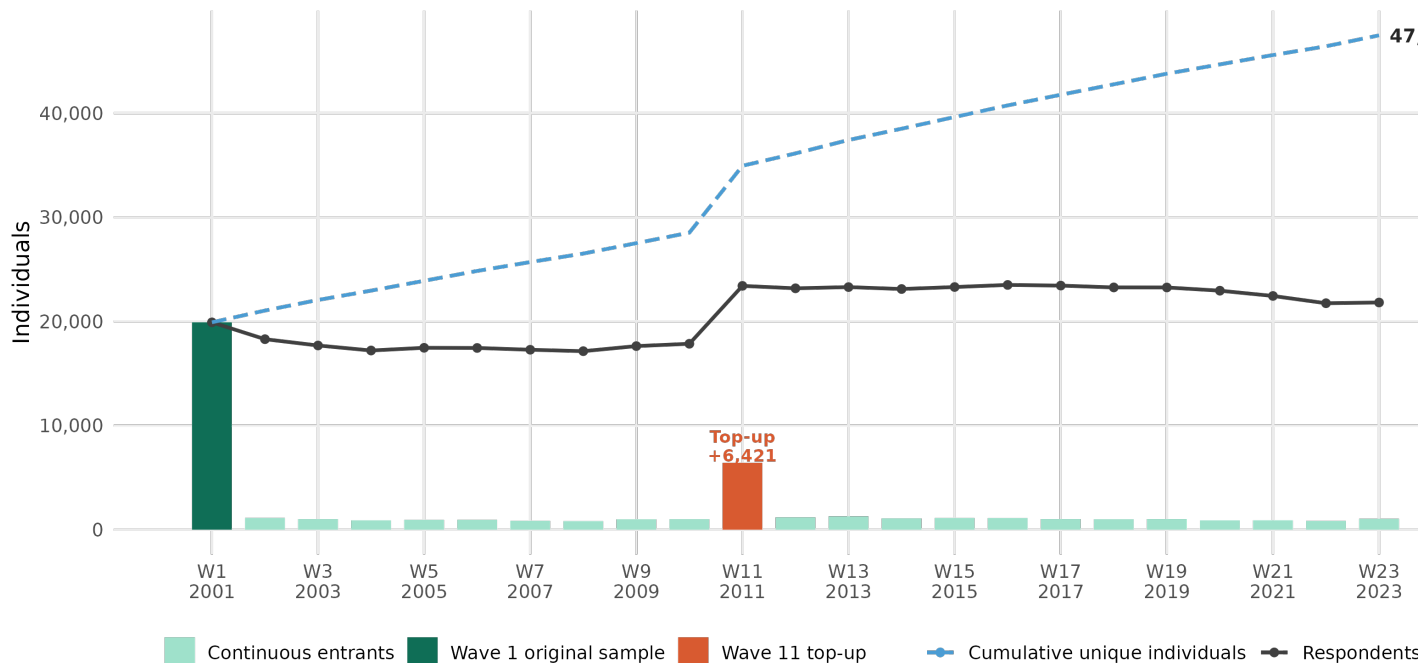
- **No single questionnaire score captures the underlying state**

Aims: (i) identify latent wellbeing states from MHI-5 + life satisfaction jointly · (ii) quantify persistence and movement over 23 waves · (iii) establish temporal ordering of change · (iv) test whether social participation buffers financial stress

23 waves of HILDA

HILDA cohort pool: actual wave-entry structure, Waves 1-23

19,914 Wave-1 sample members; 6,421 added at the Wave-11 top-up (2011); 21,143 continuous entrants (819-1,287/wave).
47,478 unique individuals; 476,702 person-wave observations; median 8 waves observed
(mean 10, range 1-23); 6,588 (13.9%) observed in all 23 waves.

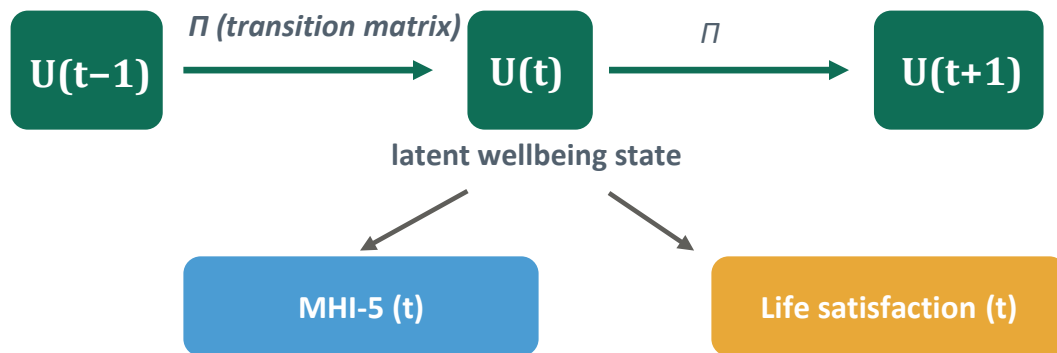


Two outcomes, modelled jointly

- MHI-5 mental health (0–100): poor ≤ 51 · moderate 52–75 · good ≥ 76
- Life satisfaction (0–10): low ≤ 4 · moderate 5–7 · high ≥ 8
- Financial stress index (0–7 hardships) and social participation frequency

A joint latent Markov model: two outcomes, one hidden process

hidden wellbeing state ($k = 4$), first-order Markov chain · transition matrix Π

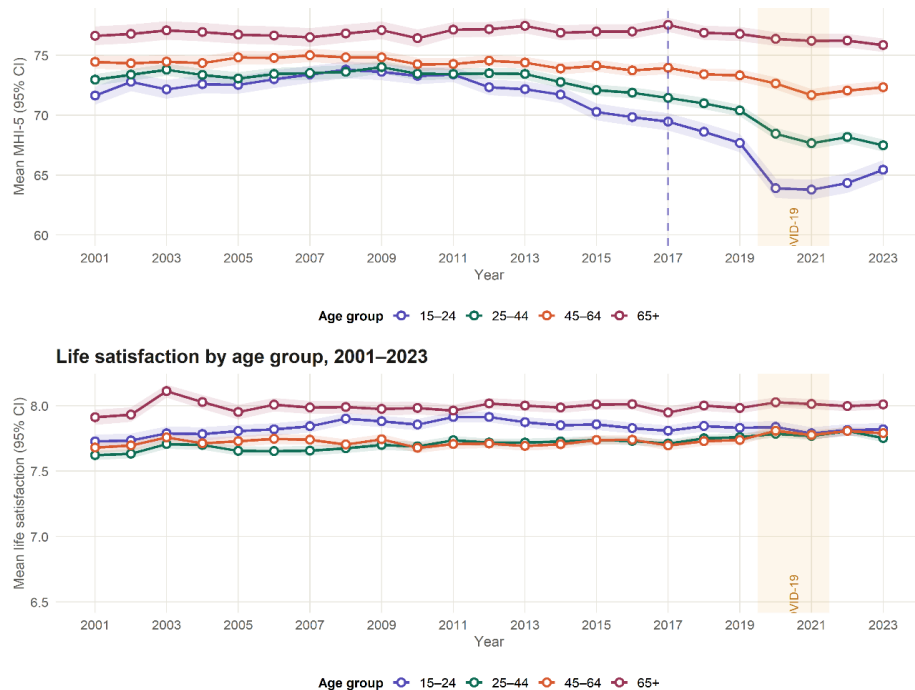


observed categories: noisy emissions Ψ of the same latent state

Analysis pipeline

- $k = 2-4$ compared by BIC, $k = 4$ strongly preferred ($\Delta\text{BIC} \geq 5,256$)
- Viterbi decoding $\rightarrow$ individual state sequences
- CLPM + random-intercept CLPM for temporal ordering (within-person)
- Mixed models: financial stress $\times$ social participation interaction

Context: mental health has diverged by age; life satisfaction has not



Young adults drive the decline

MHI-5 for ages 15–24 fell from ~2013, dropped further during COVID-19, and only partially recovered by 2023. Adults 65+ stayed highest throughout.

Life satisfaction barely moves

Over the same 23 years, including the pandemic, mean life satisfaction is nearly flat in every age group.

Figure 1: mean MHI-5 (top) and life satisfaction (bottom) by age group, 2001–2023; 95% CIs; shaded band = COVID-19 period.

Four latent wellbeing states



Figure 2. Latent state emission distributions for MHI-5 and life satisfaction within each latent wellbeing state. Vertical lines represent within-state medians.

Chronic Poor
initial prevalence 7.3%

Moderate
initial prevalence 18.7%

Good-Leaning
initial prevalence 38.8%

Stable Good
initial prevalence 35.1%

Wellbeing states are sticky: 91–96% persistence per wave

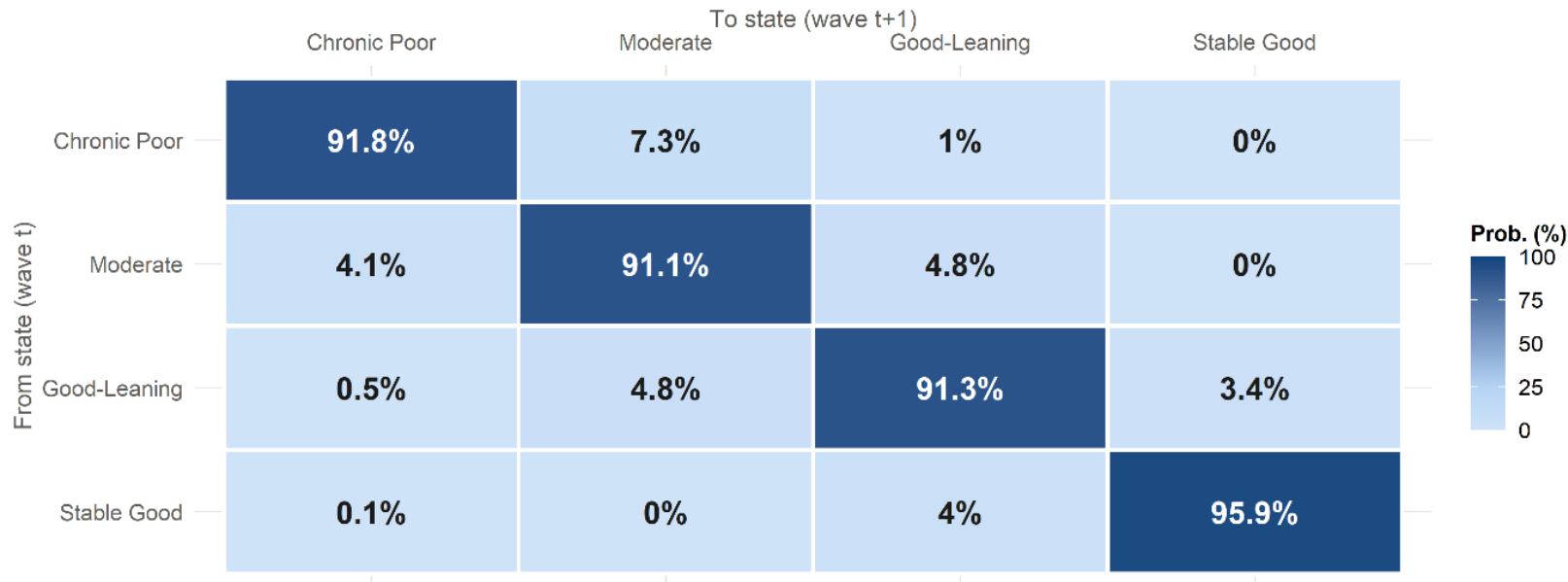
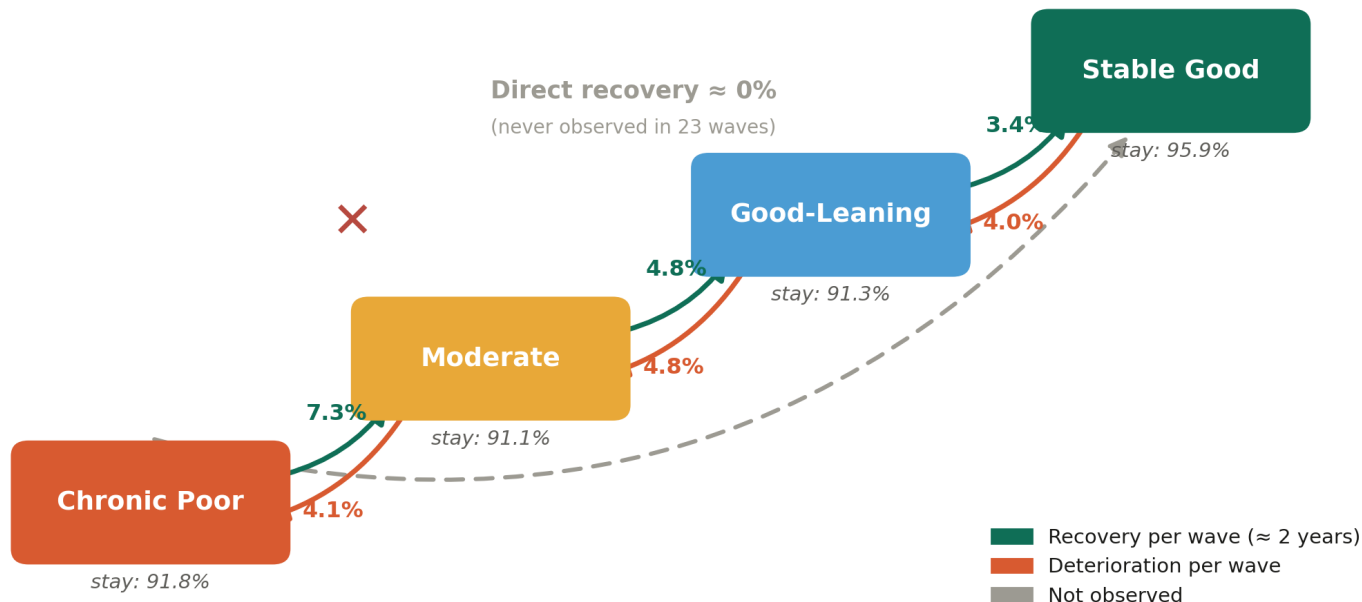


Figure 3. Transitions happen almost only between adjacent states, and **0% move directly from Chronic Poor to Stable Good**.

Recovery is a staircase, not a leap



Per-wave steps

Up: 7.3% $\rightarrow$ 4.8% $\rightarrow$ 3.4% along the staircase.

Down: relapse steps of 4–5% at each level.

First exit $\neq$ sustained recovery.

Figure 4. Estimated per-wave transitions between attendance states

Leaving Chronic Poor is common, but slow, and not final

Most people eventually leave the Chronic Poor state — but slowly

$P(\text{exit} \geq \text{once}) = 1 - 0.9176^k$ · derived from fitted transition matrix · exit $\neq$ sustained recovery

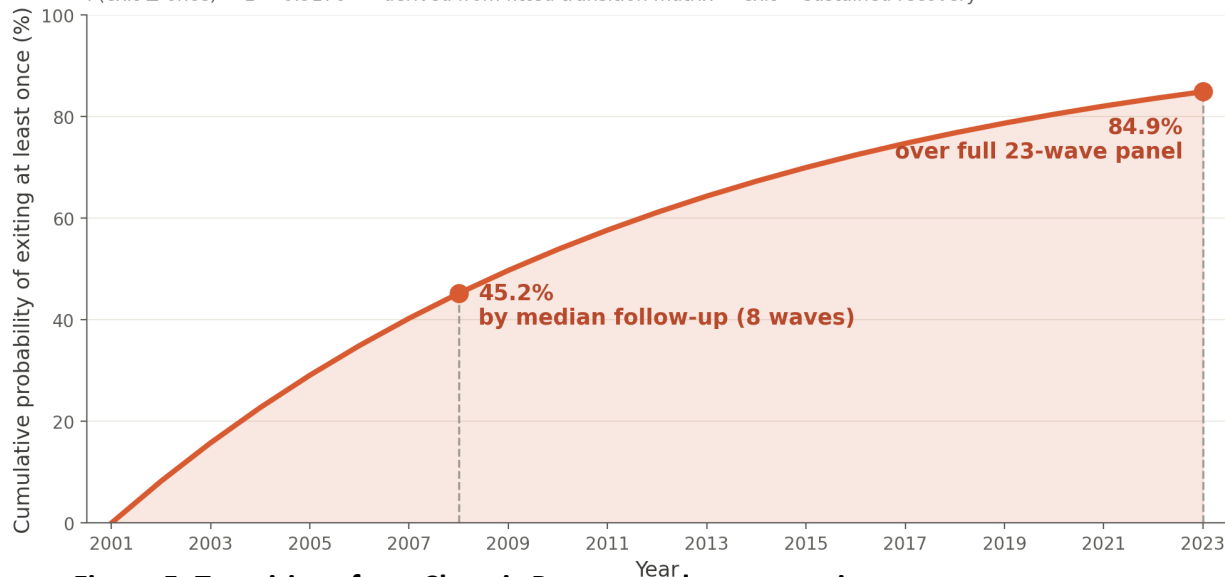


Figure 5. Transitions from Chronic Poor attendance over time.

45.2% by 8 waves

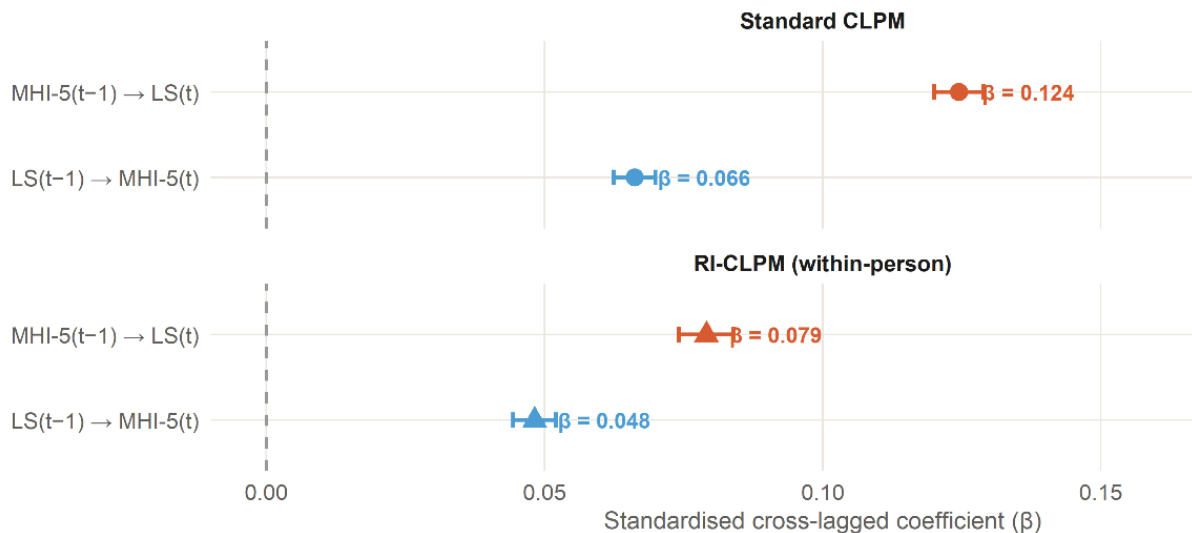
Cumulative probability of exiting at least once by the median follow-up, calculated as $1 - p^k$ using the fitted self-transition prob. $p = 0.918$.

84.9% over 23 waves

Nearly everyone who enters Chronic Poor eventually leaves it at least once. But this counts the first exit only, some people return.

Mental health moves first; life satisfaction follows

Standardised cross-lagged coefficients (β) from standard CLPM and RI-CLPM.
N = 235,191 person-waves, 25,623 individuals. Both auto-regressive paths controlled.



Top panel = Standard CLPM. Bottom panel = RI-CLPM (within-person, Mundlak approach).
RI-CLPM controls for stable between-person differences (Hamaker et al., 2015). All paths $p < 0.001$.

■ $\approx 2\times$ asymmetry

MHI-5(t-1) → LS(t): $\beta = 0.124$
(0.120–0.129)

LS(t-1) → MHI-5(t): $\beta = 0.066$
(0.063–0.070)

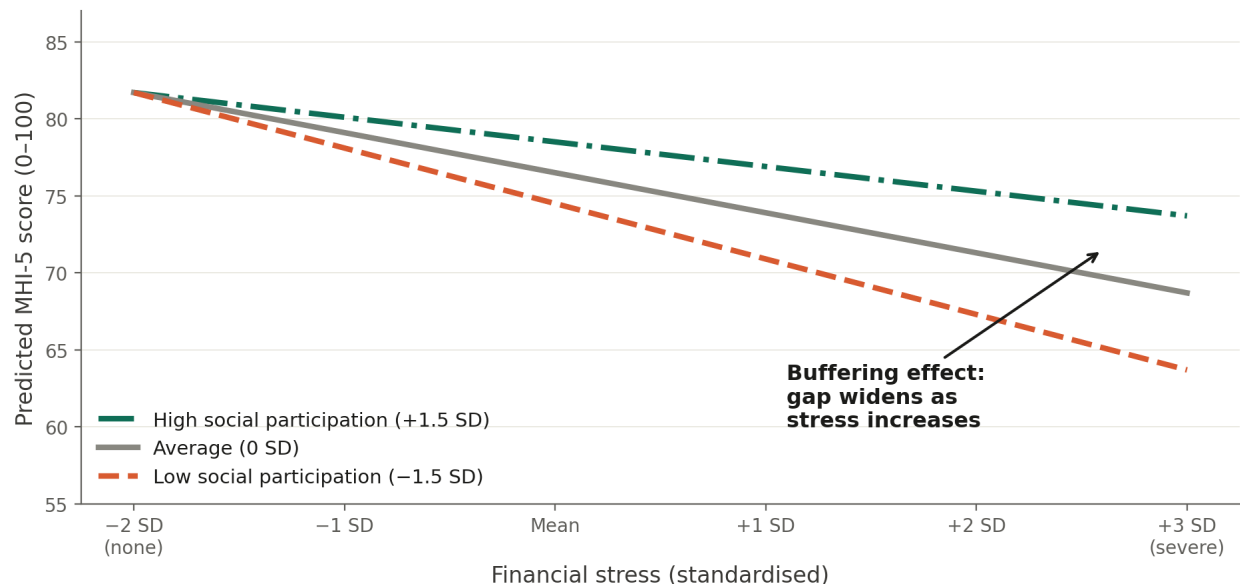
Ratio $\approx 1.9\times$ (standard CLPM).

■ Holds within person

RI-CLPM (Mundlak): 0.079 v
0.048 ($\approx 1.6\times$). Not an artefact
of stable between-person
differences. Temporal ordering,
not causation.

Figure 6. Standardised cross-lagged coefficients, 235,191 person-waves, 25,623 individuals; all paths $P < 0.001$.

Social participation buffers the financial stress-mental health association



Interaction

Higher financial stress → lower MHI-5. The slope is markedly flatter for people with frequent social contact; the gap widens as stress increases.

Observational

Mixed model with a person-level random intercept and DAG-selected covariates. Association and effect modification, not proof that participation causes better mental health.

Figure 7. Predicted MHI-5 by standardised financial stress at ± 1.5 SD of social participation; $\text{Irt } P < 0.001$.

What this means for policy and services

- 1 Fund for staged recovery, not single episodes**
No direct Chronic Poor → Stable Good transitions: plan reviews and relapse monitoring after first improvement, especially in primary care. Symptom relief is a waypoint, not the endpoint.
- 2 Financial hardship policy is mental health policy**
Income support, financial counselling, and hardship protections for essential services act on a measured correlate of the wellbeing process, and reach people years before services do.
- 3 Monitor trajectories, not just prevalence**
Stable averages hid a persistent Chronic Poor state and a slow staircase of recovery. National monitoring should add persistence and transition measures, which can be estimated from existing HILDA data.

Evaluate community participation / social prescribing as prevention investments, particularly for people under financial stress.

Take home

- Four highly persistent wellbeing states (91–96% annual persistence) underlie MHI-5 and life satisfaction jointly.
- Recovery is staged: no direct one-year Chronic Poor → Stable Good transitions; the Moderate state is an obligatory gateway, and relapse is real.
- 85% of people who enter Chronic Poor exit at least once over 23 waves: chronicity is not destiny, but exit is slow and not always sustained.
- Mental health changes precede life satisfaction changes ($\approx 2\times$ asymmetry; holds within person): distress is the earlier signal for prevention.

States are statistical summaries, not diagnoses. Transition estimates are time-homogeneous averages; cross-lagged results are observational.

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Thank you

Questions