

Wellbeing Dynamics Across Multiple Time Scales

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| What is wellbeing?





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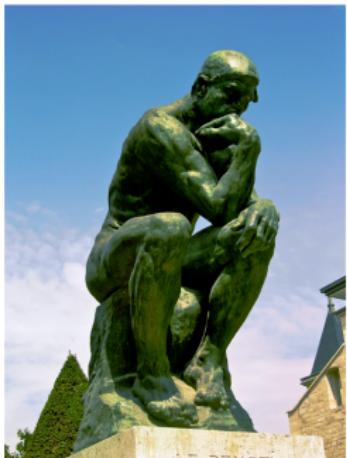


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Why is subjective wellbeing substantively interesting?





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- GDP (Gross domestic product) is flawed measure of societal performance.



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- “What makes us happy?” – fundamental question of existence.



| More specifically?





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 - But we don't know how changes in the various elements relate.





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- How do SWB domains relate, both within and between SWB domains?
 - We know this in a cross-sectional sense.
 - But we don't know how changes in the various elements relate.
- Affective dynamics at shortish time scales studied, little work on cognitive aspects / longer time scales.



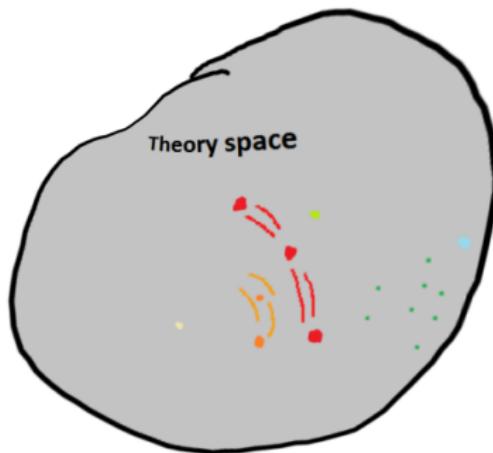


| But, science, methods?



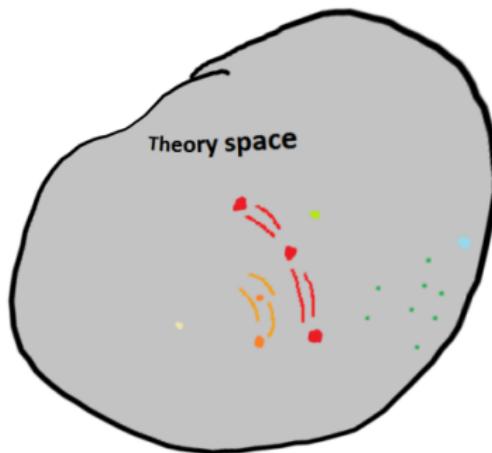


- Making sense of uncertain constructs with non-tiny dimensionality – beyond factor analysis / partial correlations.



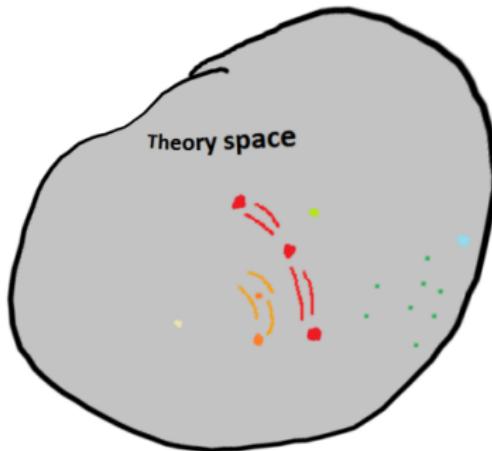


- Making sense of uncertain constructs with non-tiny dimensionality – beyond factor analysis / partial correlations.
- Dynamics at different time scales:



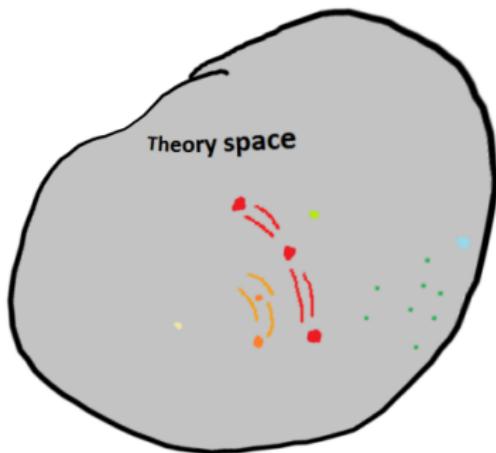


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- Dynamics at different time scales:
 - How similar / different?



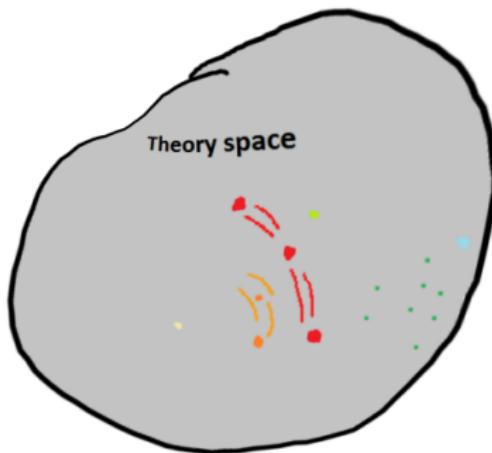


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- Dynamics at different time scales:
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 - What is a ‘between person difference’, really? Are random subject effects sometimes more problematic than helpful?





Data?





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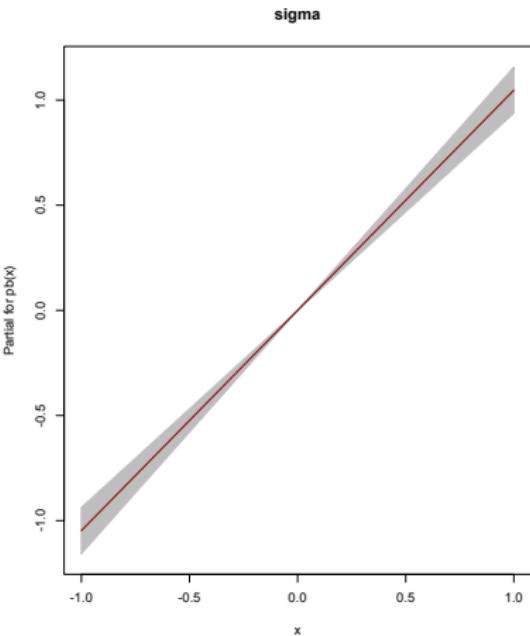
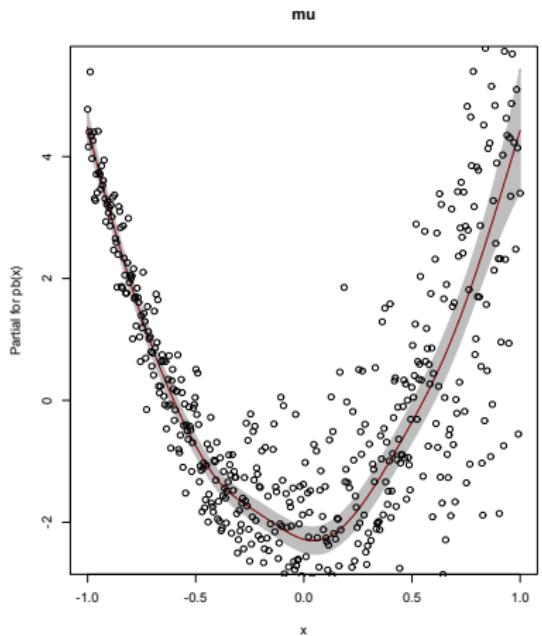
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- 5578 subjects, 3166 with >9 time points.





- Generalised additive model for location and scale with penalised basis splines:





- $y \sim Normal(pb(\text{time}) + pb(\text{age}) + pb(\text{obs}), pb(\text{time}) + pb(\text{age}) + pb(\text{obs}))$



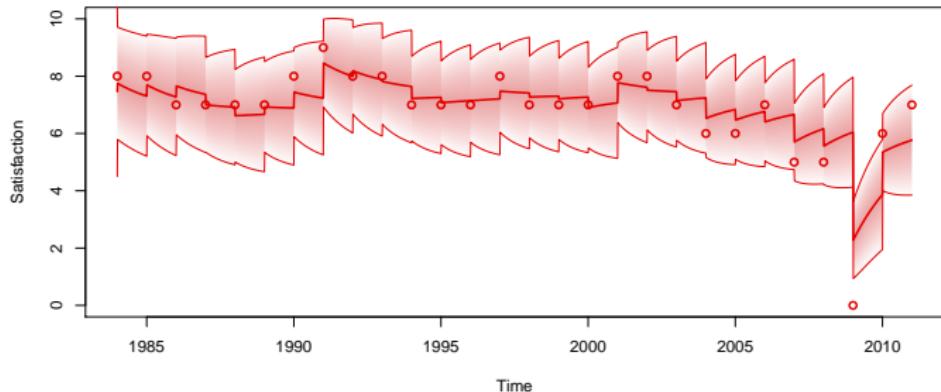
Dynamics – rough pass



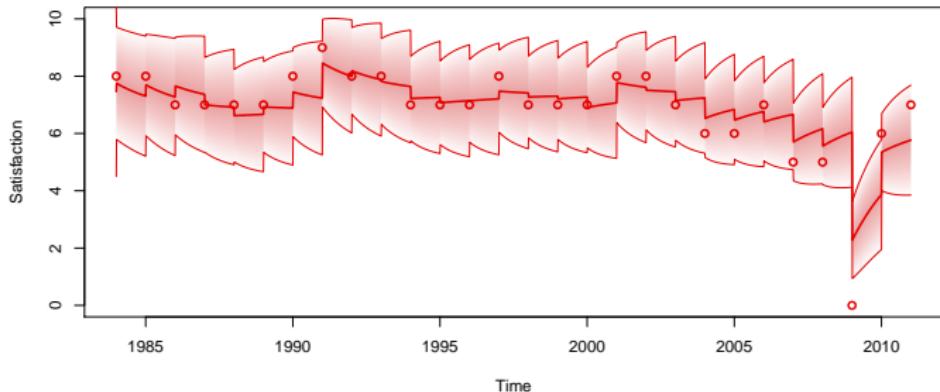


- Easy to see measurement error.
- If stable between subject differences – expect flattening of corr. before 0.



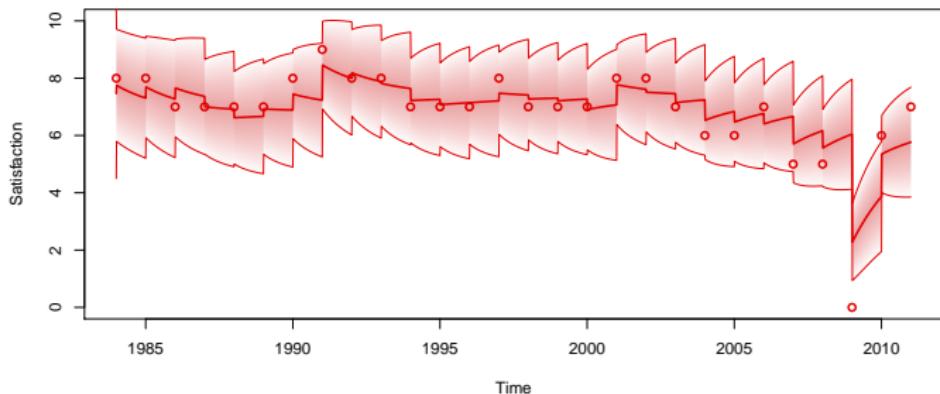


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- Latent system model:

$$d\eta(t) = \left(\mathbf{A}\eta(t) + \mathbf{b} + \mathbf{M}\chi(t) \right) dt + \mathbf{G}d\mathbf{W}(t) \quad (1)$$



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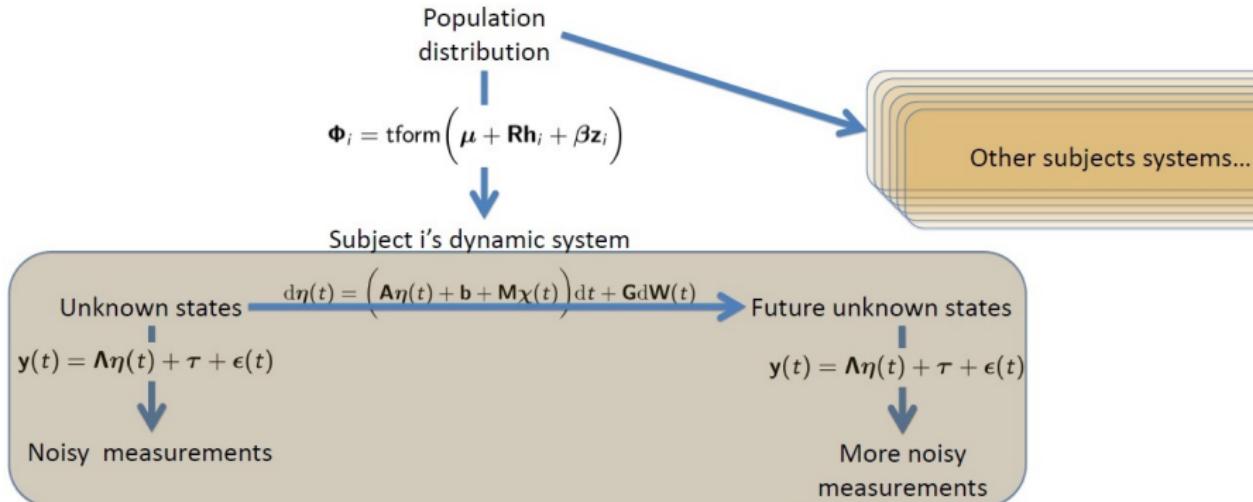
- Observation model:

$$\mathbf{y}(t) = \mathbf{A}\eta(t) + \boldsymbol{\tau} + \epsilon(t) \quad \text{where } \epsilon(t) \sim N(\mathbf{0}_c, \Theta) \quad (2)$$



Population model:

$$p(\Phi, \mu, R, \beta | Y, z) \propto p(Y|\Phi)p(\Phi|\mu, R, \beta, z)p(\mu, R, \beta) \quad (3)$$



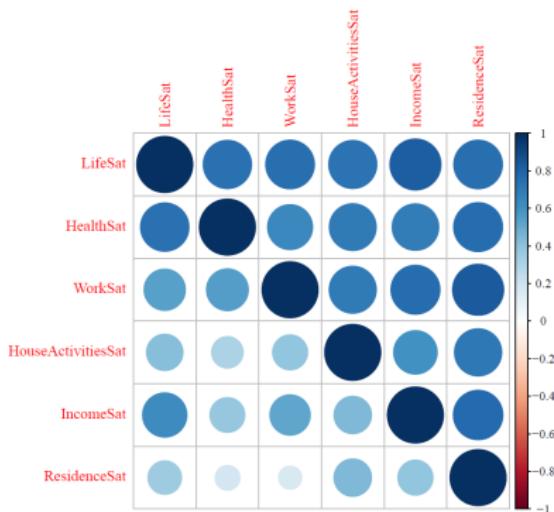


Dynamics - between vs within vs error variance



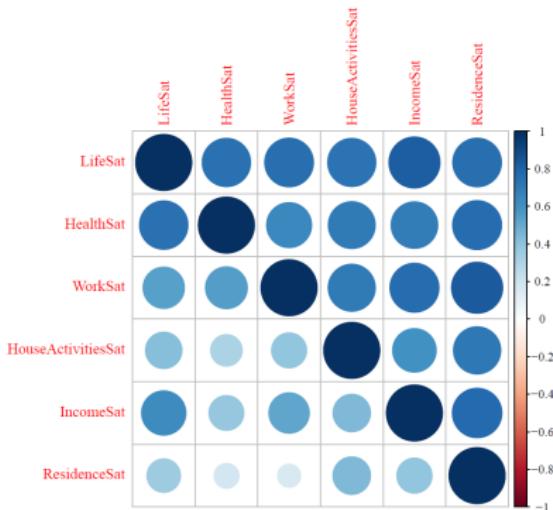


- Between: Stable subject characteristics over time span.



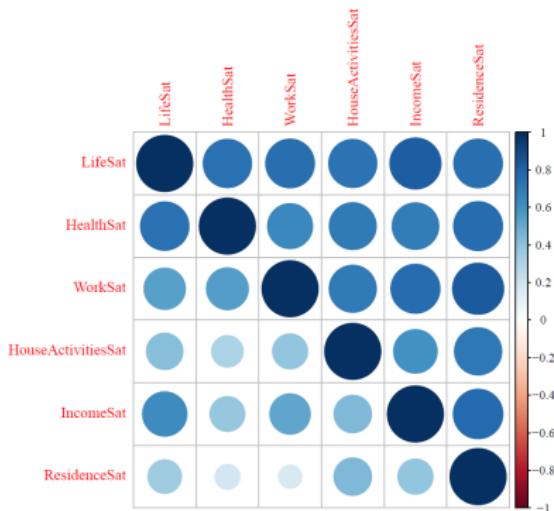


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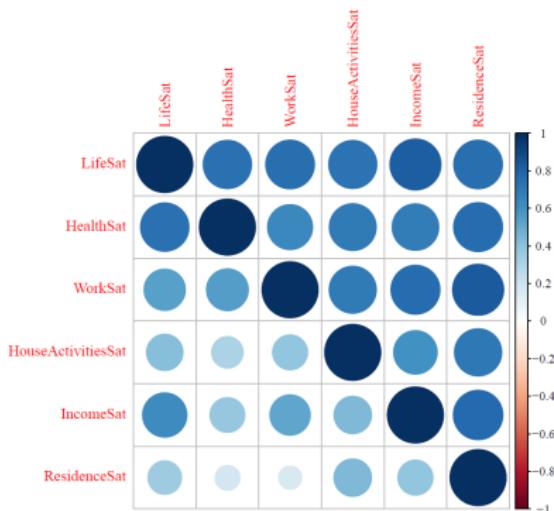


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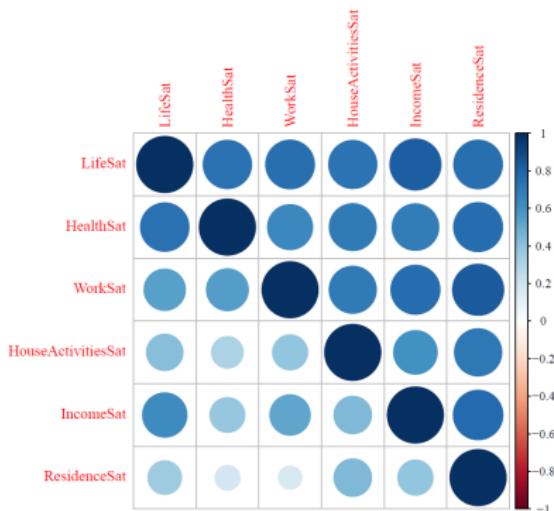


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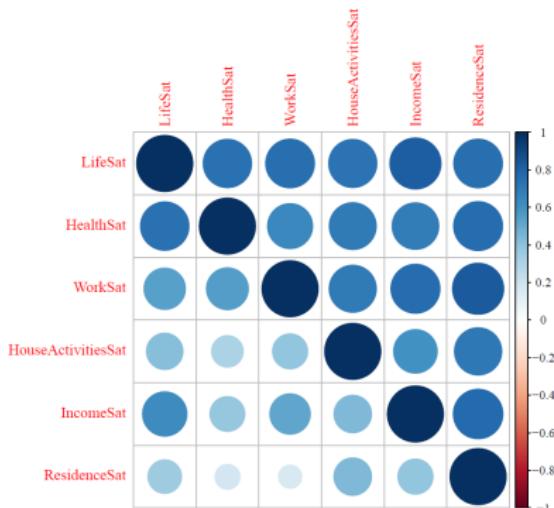


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- Error: Changing characteristics without predictive value.
 - Typically around 1/5 total variance.



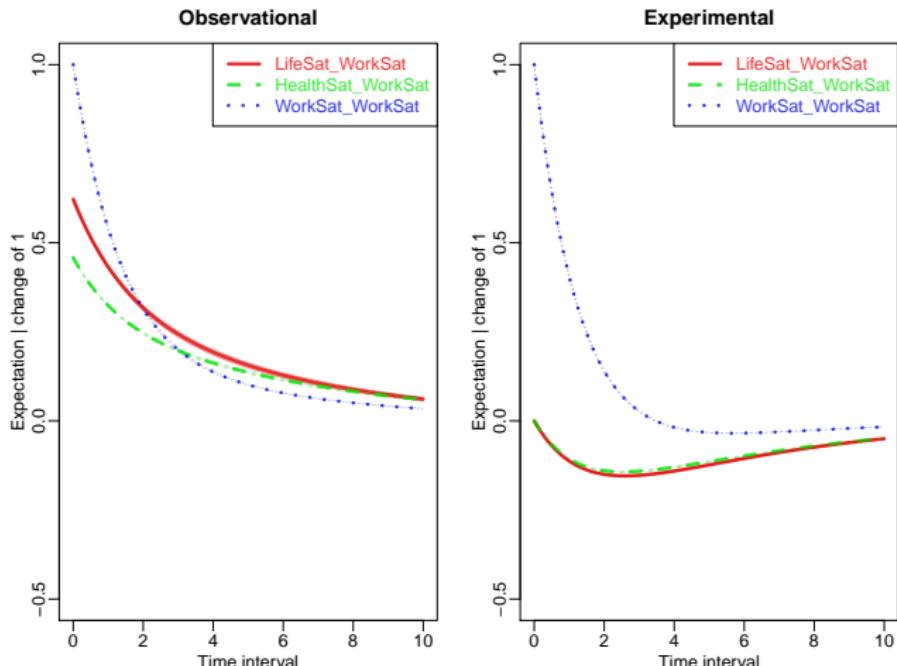


Interpreting cross-effects in context



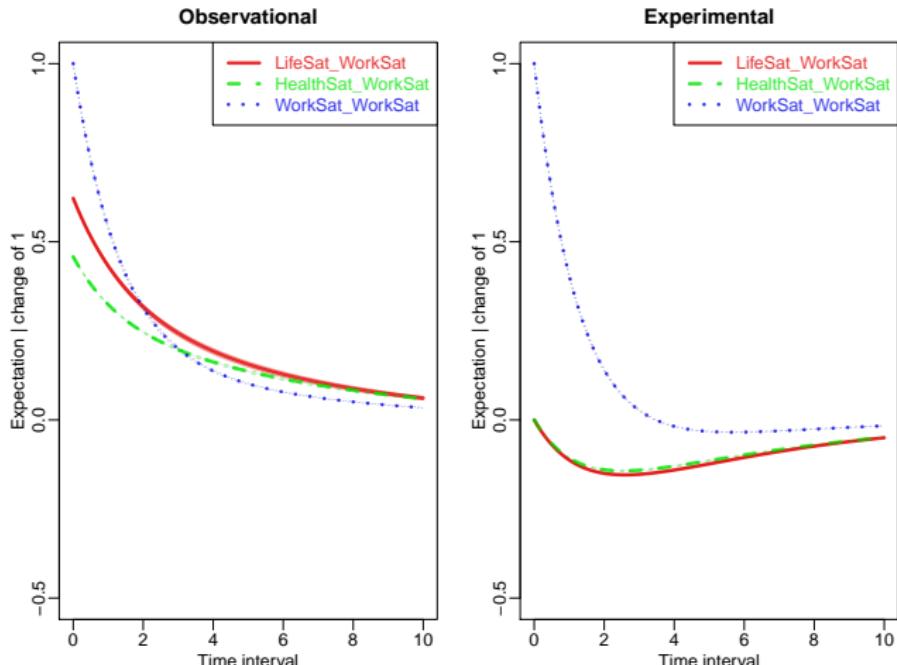


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- Sign flipping, unexpected effect directions and magnitudes.





Difficulties





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 - Classic optimization routines get stuck on ridges, Bayesian sampling too slow.



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- Thanks!