

Estimating health effects of social determinants of health and societal initiatives

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(1) Background

Social determinants of health are influential contributors to overall health outcomes.¹ Being distal, upstream, determinants, they impact health indirectly, involving many other variables in the process. This makes it quite complex (constituting so-called ‘wicked problems’) and difficult to estimate those health impacts.

This research project, funded by ZonMw, has made use of participatory qualitative conceptual modelling (group model building; system dynamics) in conjunction with subsequent quantification using longitudinal structural equation modelling (SEM), in order to enable estimating health impacts of societal initiatives² in particular. For this purpose, a full model on interrelationships between poverty and health was quantified, demonstrating the use of this approach.

(4) Quantitative modelling

The extensive qualitative model was simplified and adapted to a model that could be quantified (Figure 1).

This model:

- Was estimated using a longitudinal SEM design. Various variants of SEM could potentially be used for this, according to the specific aim of the study. Here, a cross-lagged panel model was chosen.
- Contains 10 endogenous variables that affect each other over 5 time points.
- Provides one (Granger-)causal regression coefficient for each arrow in the model.
- Can be used to subsequently run projections of indirect and complex (health) effects from current or considered interventions.
- Uses latent variables for the constructs of mental health and physical capability.
- Also includes age, sex and migration status as control (exogenous) variables.

(2) Objective

The objective of this project was to develop, describe, and demonstrate a stepwise and broadly applicable approach that can be used to obtain quantitative estimates of health outcomes, which is done by combining qualitative system-dynamics modelling with quantitative structural equation modelling. This approach is applied to the case of poverty and health in The Netherlands, in which the entire process is demonstrated.

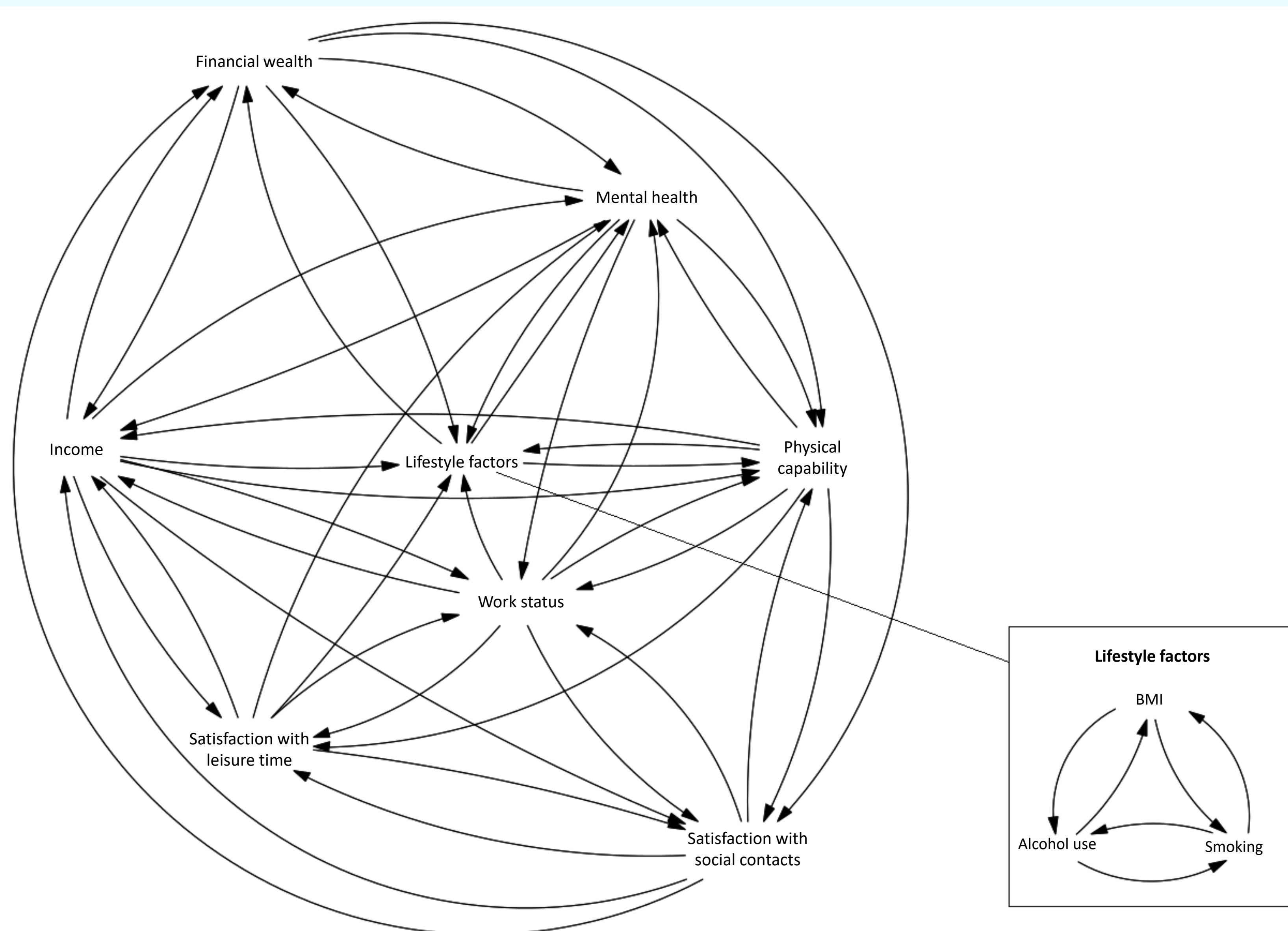


Figure 1: Structure of the adapted model that was quantified using longitudinal SEM

(3) Qualitative modelling

For the qualitative modelling, the participatory method of group model building is used, enabling a group of stakeholders (from policy and practice, who have experiential knowledge) to put their views of how the issues of poverty and health are related in a structural model, in the form of a causal loop diagram. This produces a non-arbitrary conceptual foundation of which variables to include and how they are expected to be interrelated. An extra validation check can be added by having a panel of scientific experts assess the findings and by comparing the model with current scientific literature. In the demonstration case, all of this resulted in such a model³ with:

- 39 different variables
- 71 causal arrows between those variables
- Hundreds of feedback loops, involving 29 variables

(5) Conclusions

- An approach that can be used to get hold of the complex interrelationships between social determinants of health and health outcomes was demonstrated. It produces a fully quantified model on one theme, in which all the directional arrows (as shown in Figure 1) are estimated simultaneously.
- The qualitative modelling helps to obtain a conceptual overview and understanding of the issue: which variables are deemed important and how they are expected to be related to each other?
- The quantitative side of the approach requires good longitudinal micro-level data and knowledge on the modelling process. Like with any model, it also necessitates a number of choices and assumptions that have to be made.
- With the model, for interventions that have a direct impact on one of the included (endogenous) variables, expected indirect effects on all variables in the model can be projected over time.
- A key message is that this approach can in principle be used to any relationship, no matter the complexity, provided there is sufficient data available. It is designed and well-suited to tackle wicked problems.

References

- 1 Ratcliff KS. The social determinants of health: Looking upstream. John Wiley & Sons 2017.
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- 3 Reumers L, Bekker M, Hilderink H, Jansen M, Helderma JK, Ruwaard D. Qualitative modelling of social determinants of health using group model building: the case of debt, poverty, and health. International Journal for Equity in Health 2022;21(1):1-2.