

Quantifying SDOH using qualitative inputs and structural equation modeling

Social determinants of health (SDOH), the conditions in which people live and the forces shaping these conditions, are deemed to substantially influence health outcomes, but this is difficult to make tangible in a meaningful way. Their effects are mostly indirect and usually operate on multiple levels and causal directions are often reciprocal. The goal of this study is to show a way in which qualitative and quantitative methods can be combined to quantify health effects of, and impacts of interventions on, SDOH.

The approach is demonstrated by modeling the interrelationships between poverty, debt, and health in The Netherlands. This study takes a qualitative system dynamics model with feedback loops, as constructed by local stakeholders in an earlier stage, as input and conceptual starting point. The participatory model is then quantified and tested by employing structural equation modeling, using combined (longitudinal, micro-level) survey and registry data.

Benefits of longitudinal structural equation models are that complex model structures are possible, variables that are not directly observed can be included, and changes over time can be studied. The models in this paper, which fall in the category of latent curve models, show how growth curves of individuals on multiple variables behave over time and how these variables influence each other. They separate reciprocal causal arrows, estimate effect sizes for each arrow and can empirically test whether these effects change over time. This approach produces compelling evidence on effects and impacts both of and on SDOH.

Summary sentence: This study demonstrates a way in which health effects of, and impacts of interventions on, SDOH can be quantified and estimated using qualitative inputs and structural equation modeling.

Quantifying social determinants of health using qualitative inputs and structural equation modelling

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Background: our starting point

- Social determinants of health
- Complex interrelationships, ‘wicked problems’

Two-step methodological approach

1. Obtaining the conceptual model
2. Quantifying that model

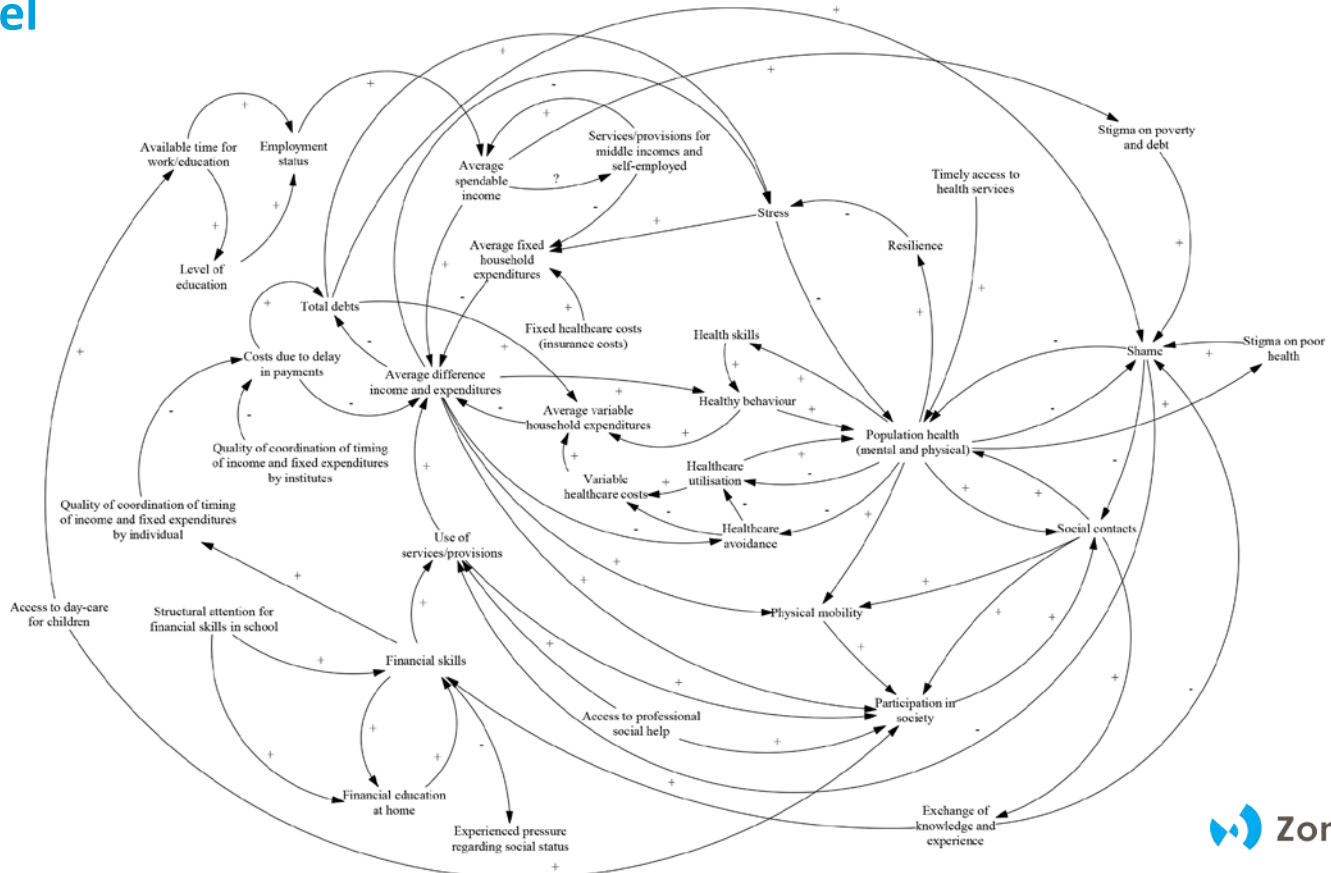
Group model building: obtaining a conceptual model

- Method to consult stakeholders
- Experiential knowledge
- Used for modelling complex systems

Demonstration case: poverty and health

Qualitative model

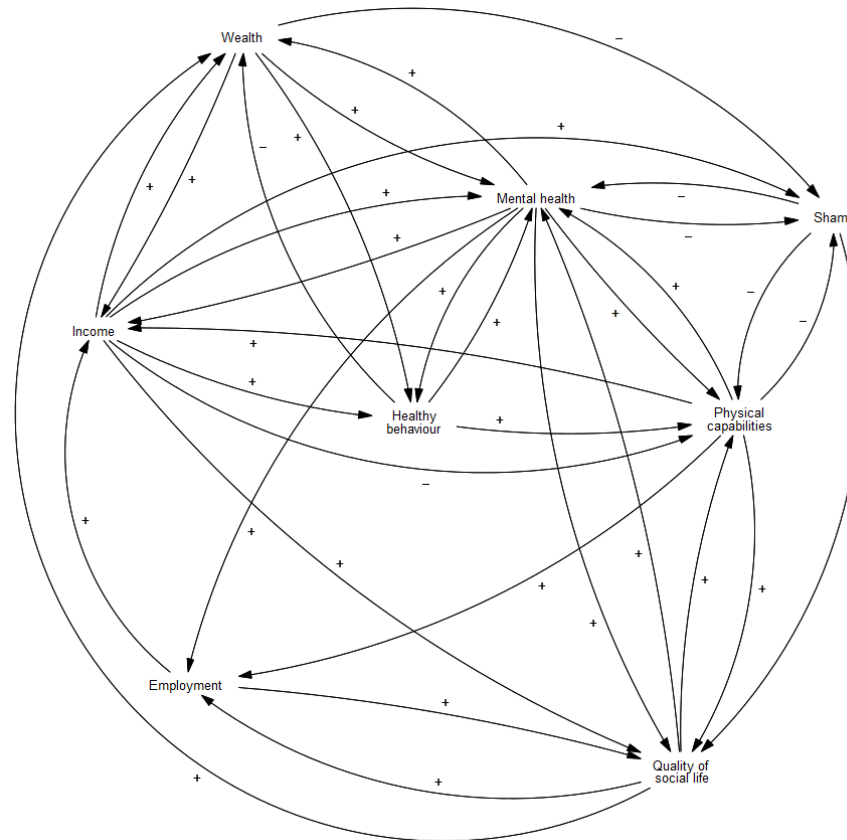
Full stakeholder model



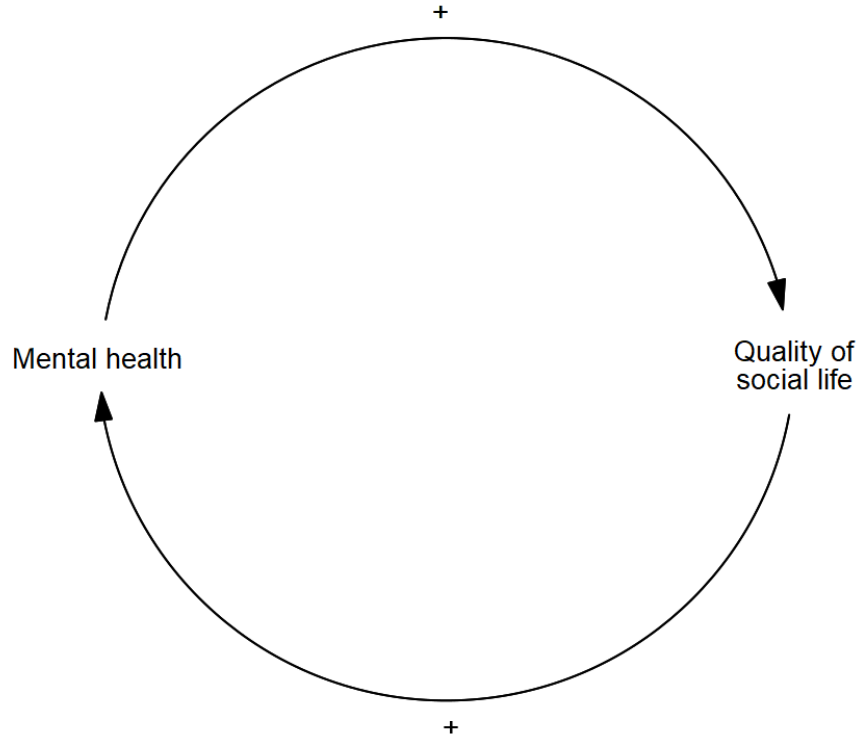
Demonstration case: poverty and health

Qualitative model

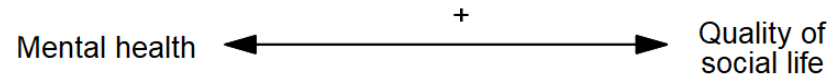
Simplified model
based on stakeholder
model



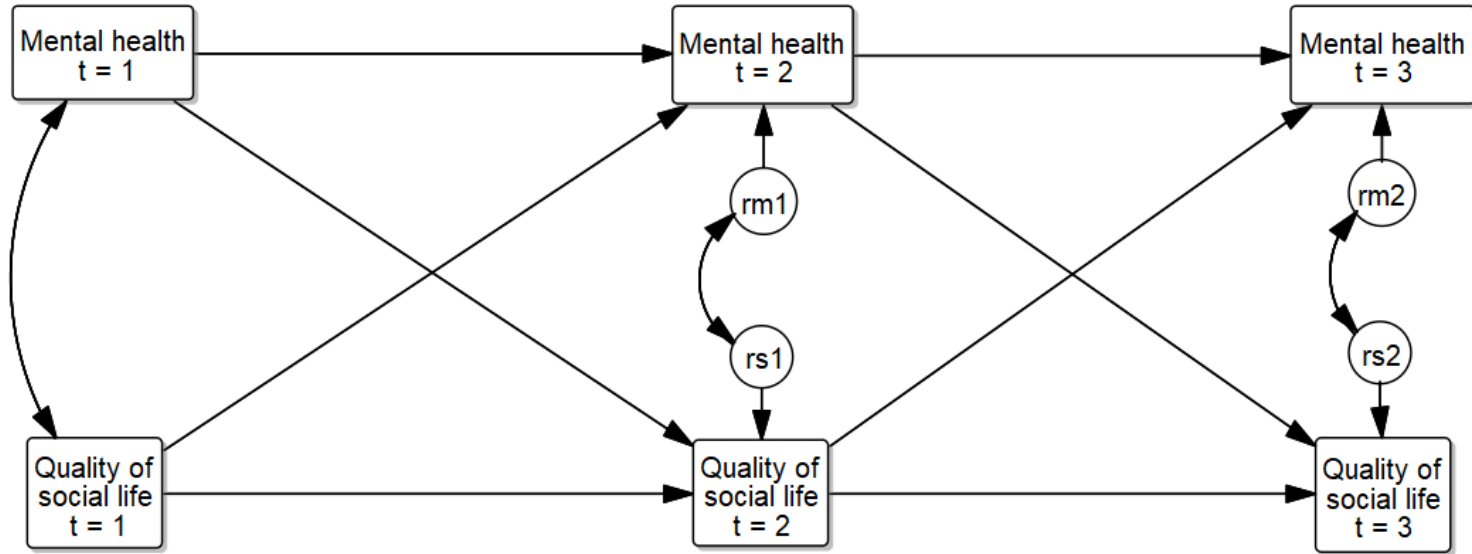
The problem with feedback loops



The problem with feedback loops



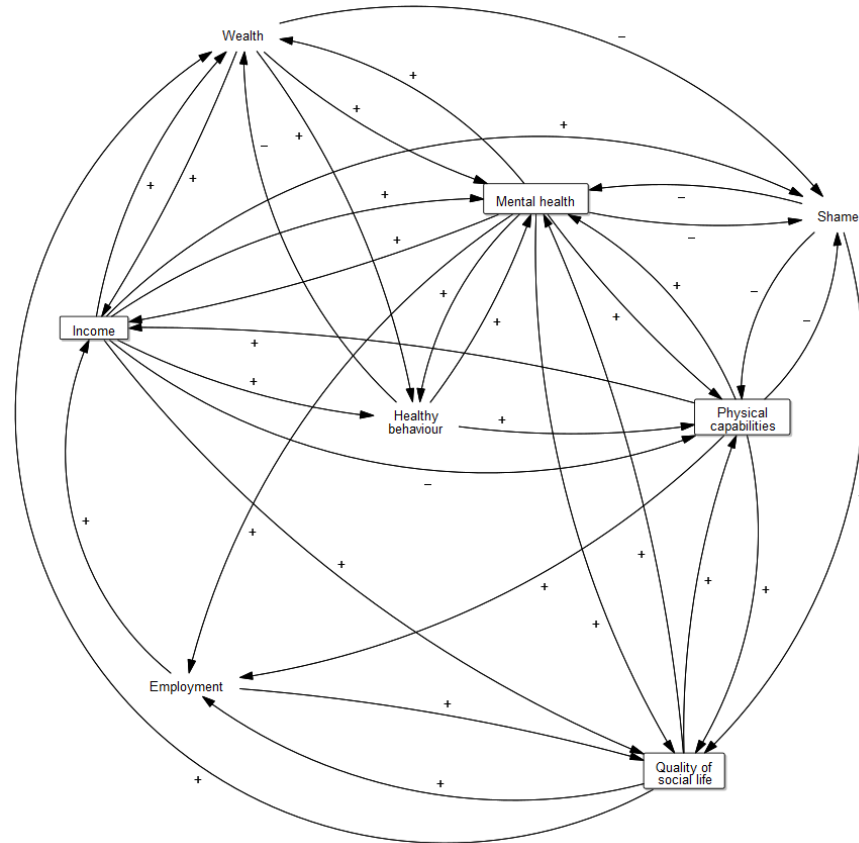
Longitudinal design: autoregressive cross-lagged panel model



Demonstration case: poverty and health

Qualitative model

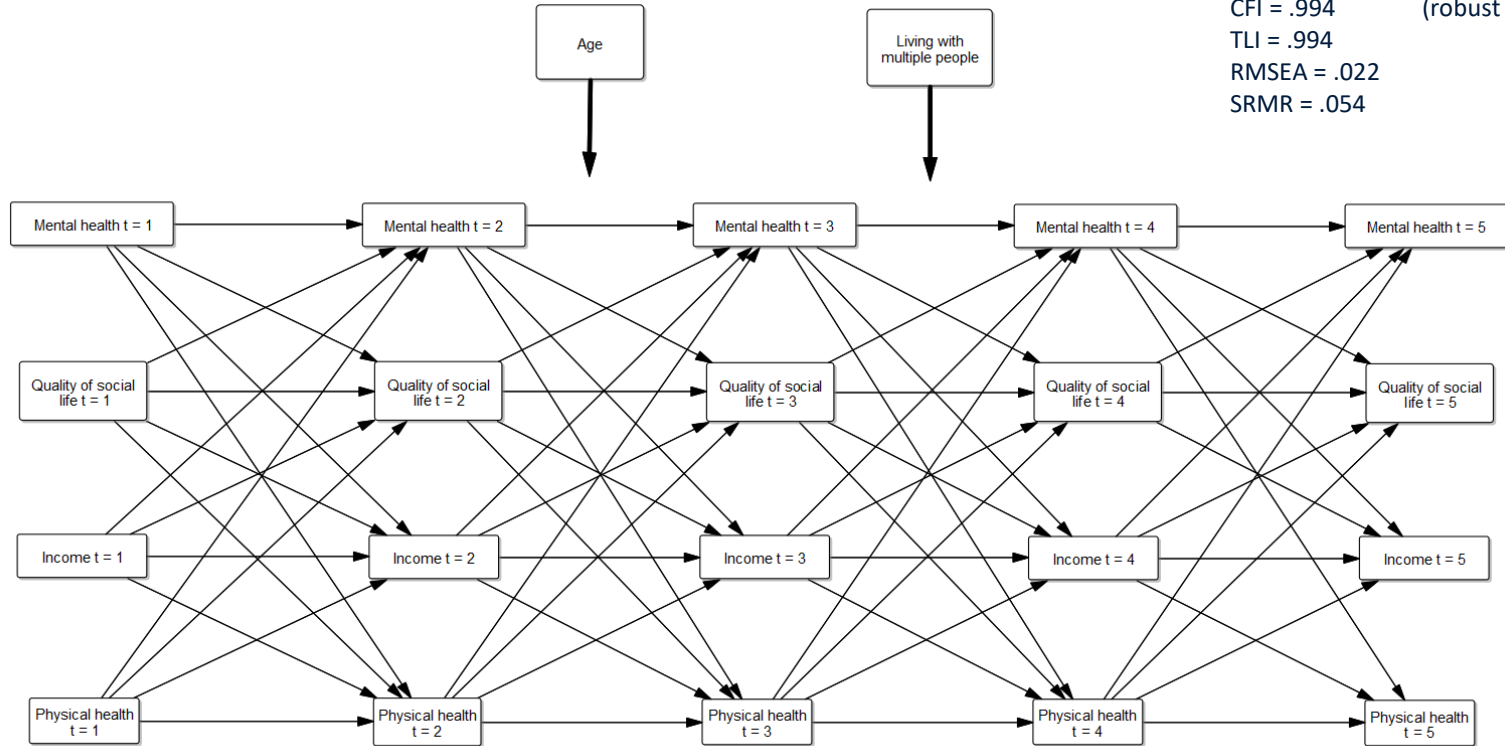
Simplified model
based on stakeholder
model



Demonstration case: poverty and health

Quantitative model structure

N = 16045
CFI = .994 (robust fit statistics)
TLI = .994
RMSEA = .022
SRMR = .054



Demonstration case: poverty and health

Quantitative model results

N = 16045

CFI = .994

(robust fit statistics)

TLI = .994

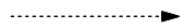
RMSEA = .022

SRMR = .054

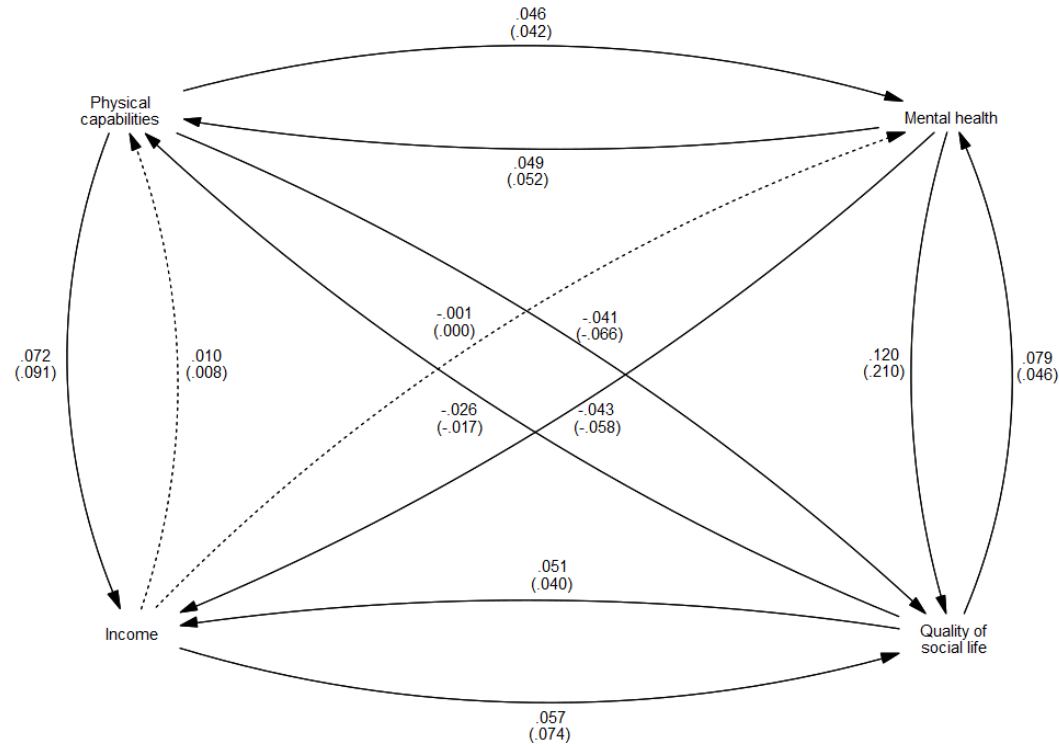
significant effect



non-significant effect



Effect coefficient:
standardised
(unstandardised)



In conclusion

What can we do with this?

- Better understand how complex interrelationships work
- Estimate indirect effects of activities