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

Mental health

Quality of social life
The problem with feedback loops

Mental health → + → Quality of social life
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
TLI = .994
RMSEA = .022
SRMR = .054
Demonstration case: poverty and health

Quantitative model results

N = 16045
CFI = .994
TLI = .994
RMSEA = .022
SRMR = .054

(robust fit statistics)
In conclusion
What can we do with this?

• Better understand how complex interrelationships work

• Estimate indirect effects of activities