

The Wellesley Urban Health Model

OVERVIEW

MODEL DESCRIPTION

What is the Wellesley Urban Health Model?

Our health, well-being and the likelihood of becoming ill or dying are all affected by the bigger picture, by what's happening in our day-to-day lives. Broader social factors influence the conditions in which we live, grow, work, and socialize. Socio-economically disadvantaged and marginalized populations, like new immigrants and ethnic minorities, in urban settings are especially at risk of poor health due to their social conditions, or what practitioners call the social determinants of health (SDoH). These social determinants of health are known to cause population health disparities and inequities. But the social determinants of health are also interconnected, dynamic and interdependent. They are complex. Given this complexity and the relationships surrounding the contributors to inequity, assessing program and policy interventions pose a challenge, particularly when analysis of such interventions rely upon static models.

To address this challenge, the Wellesley Institute, in partnership with Lupina Foundation, has adopted a systems thinking approach to the social determinants of health. We developed a simulation model for the City of Toronto using System Dynamics modeling methodology. The Wellesley Urban Health Model simulates changes in health, social determinants and disparities beginning from the year 2006 and projecting forward to 2046, enabling users to plan and test scenarios under different assumptions. The model includes adults aged 25-64, capturing their gender, ethnicity, and immigration status. Areas of intervention include health-care access, healthy behavior, income, housing and social cohesion.

The Wellesley Urban Health Model simulates alternative scenarios to help explain the impact of interventions on poor health outcomes such as chronic disease rates, disability rates and mortality rates. The model also gives insight into how much and how quickly interventions can reduce mortality and morbidity.

The Wellesley Institute's goal is to provide a tool that will allow us, our stakeholders and other policy-makers to ask "what if" questions about policy interventions and as a result,

guide us to useful research questions and potential solutions for complex population health problems.

WELLESLEY URBAN HEALTH MODEL FRAMEWORK

The Figure 1 depicts model structure, illustrating causal relationships, and how the interventions affect model variables. The model includes eight health and socio-economic conditions with unique causal and feedback relationships, as a result of rigorous statistical testing using Canadian Community Health Survey and Census data. Five possible policy interventions options related specifically to the social determinants of health can be implemented and tested in the model. The dynamic and long-term impacts of these interventions can be examined, focusing on three health outcomes: mortality rate, disability, and chronic illness.

HOW DOES THE MODEL WORK

The Wellesley Urban Health Model simulates alternative scenarios over a timeframe of 30 years to demonstrate the relative impact of interventions on health outcomes such as chronic disease rates, disability rates, mortality rates.

Each simulation scenario is designed by specifying different parameter assumptions. There are five intervention options that can be tested. Interventions ramp up over a period of five years starting in the year 2006, and stay in place through the end of a simulation run (year 2046). Applying equally across all population subgroups, any intervention implemented (ranging from 0 to 100 percent) is designed to reduce the prevalence of a health or social adversity within the population, upon which it has a direct impact. However, the effects of the intervention are not limited to the variable upon which it has a direct impact, but rather reverberates through the system as a whole because of the inherent interdependencies. For example, if an intervention involving a 30 percent improvement in health-care access is applied, this would entail reducing the gap in poor health-care access by 30 percent, and this subsequently affects the death rate and the proportion of the population who are poor and disable. The same logic applies to all of the intervention levers in the model.

TAKE-AWAY MESSAGE

How do we improve population health? How do we reduce pervasive health inequities?

We start by addressing people’s access to good jobs, affordable housing, health care and building resilient communities. These health determinants don’t work in isolation, but rather interact and reinforce each other, to affect population health. The Wellesley Urban Health Model helps us to understand the pathways through which adverse socio-economic conditions and inequality affect people’s health, and the complex feedback relationships that reinforce these inequalities. Addressing the social determinants of health now means better health for all, not only in the present, but also in the future.

Figure 1. The figure maps causal pathways in the model. The variables in red are the intervention options. Blue arrows indicate reinforcing effects.

Fig. 1

