Umoya omuhle

Research Brief

Using system dynamics modelling to understand the drivers of TB transmission in primary healthcare clinics

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Umoya omuhle project team, June 2021

Summary

- Preventing infectious disease transmission in primary healthcare settings is a complex systems problem.
- A whole systems approach drawing on multi-disciplinary research and stakeholder consultation is required to tackle this complexity.
- System dynamics modelling identified three different types of changes that can help inform policy and aid critical decision-making: infrastructure, behaviour and organisational changes.

Background

The devastation caused by the COVID-19 pandemic has made the consequences of uncontrolled outbreaks more visible. As a result, understanding how diseases spread and implementing policies to optimise infection prevention and control (IPC) has been at the top of the global health agenda.

As part of ongoing work funded by the Bloomsbury SET and the ESRC, the Umoya omuhle project team researched how and why tuberculosis (TB) transmission continues to affect people in South African primary care facilities in KwaZulu-Natal and the Western Cape.

The team used system dynamics modelling, a relatively new but increasingly used method in health systems research. Originating in engineering and management, system dynamics modelling is particularly suitable for studying complex problems where multiple viewpoints need to be considered. The team conducted a range of workshops with policymakers and healthcare professionals working in clinics to identify the specific challenges they face. The workshops focused on identifying the social, behavioural and infrastructural factors that influence how IPC measures are implemented, including potential barriers or resistance to change

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Key findings

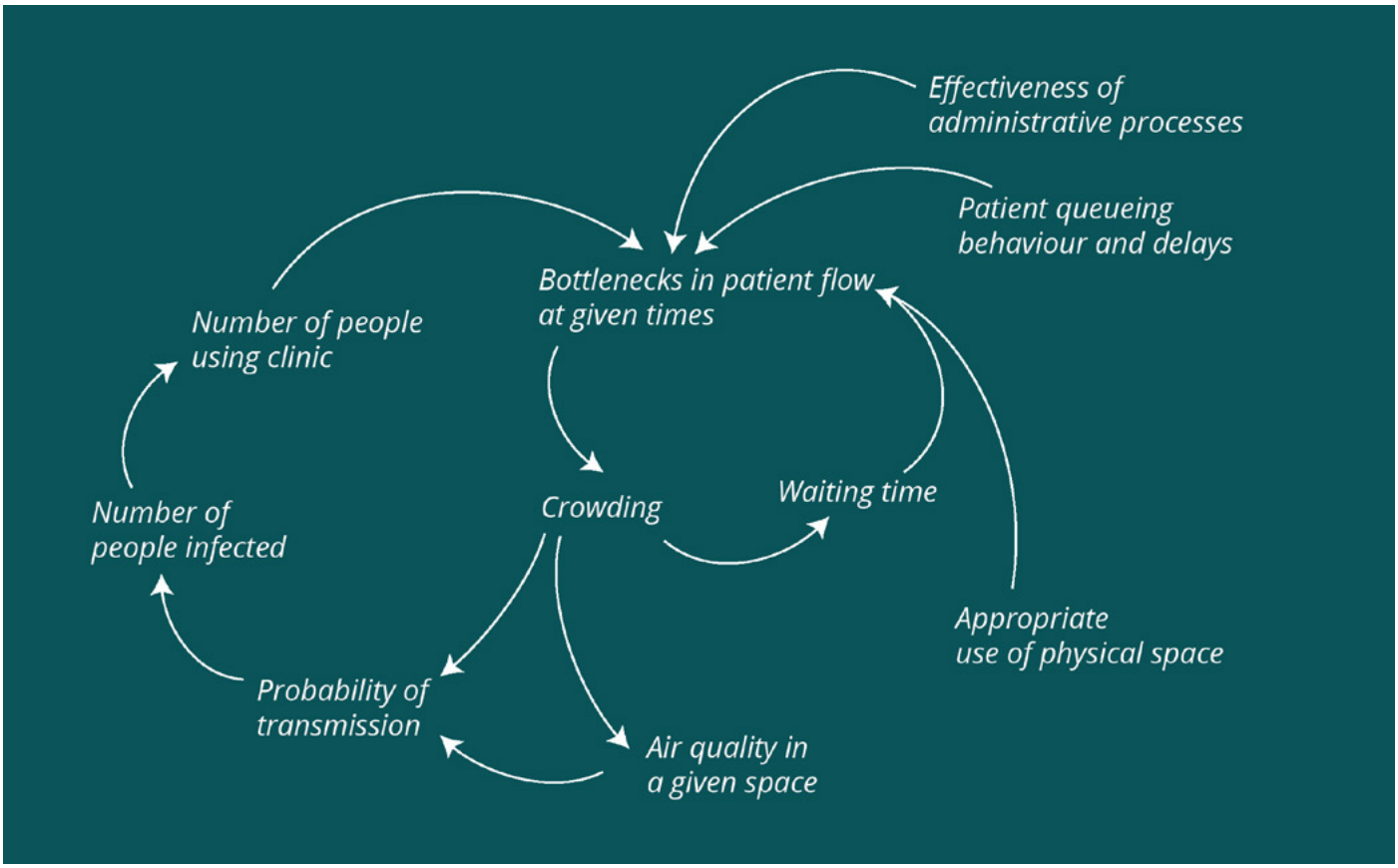
The research identified three main drivers that influence transmission of TB in primary healthcare in South Africa:

1. **High levels of clinic use at particular times create bottlenecks in patient flow and increase likelihood of transmission.** Due to limited transport and absence of appointment systems, community members tend to arrive at clinics early. Spaces become over crowded quickly. This means large numbers of patients wait together at the clinic before their consultation. The research found that many clinics have poorly ventilated areas where people congregate, substantially increasing the risk of TB transmission.

2. **Stressful working environments reduce healthcare worker motivation to implement IPC measures.** As demands on clinic staff increase, and as over crowding continues, there is increased pressure on staff time and capacity. This may negatively influence motivation to implement IPC.

3. **Limited learning within the health system perpetuates poor implementation of infection prevention and control.** Although healthcare staff and managers engage in reporting exercises, the research revealed effective mechanisms for reviewing, supervising and monitoring IPC were scarce. There is a need for learning processes that help clinics and policy makers identify implementation challenges and formulate appropriate actions and policies to improve TB IPC.

Drivers of TB transmission in healthcare clinics



Recommendations

Understanding the drivers of TB transmission in primary healthcare facilities in South Africa requires an appreciation of how health system resources, organisation and working culture interact.

Using a system dynamics modelling approach in this case identified three different types of change that could reduce the risk of TB transmission:

1. Infrastructure (clinic and building design)
2. Behaviour (health worker attitudes and practices)
3. Organisational (processes and procedures)

Infrastructure changes

- Simple retrofits such as lattice brickwork to improve ventilation at clinics
- Installation of ultraviolet germicidal irradiation lights

Behaviour changes

- Open doors and windows to improve ventilation
- Universal surgical mask wearing for patients and N95 respirators wearing for staff

Organisational changes

- Introduce appointment systems to reduce waiting times
- Introduce a queue management system to reducing crowding
- Maximise use of community medication delivery systems

Implementing interventions that cover different aspects of the health system, including infrastructure changes, behaviour changes and organisational changes, can significantly reduce TB transmission and save lives. These interventions are also likely to reduce the transmission of SARS-CoV-2.

Acknowledgements

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