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SYNOPSIS

04/15/2020

Review of "Mathematical modelling of COVID-19 transmission and mitigation strategies in the population of Ontario, Canada"

Article citation: Tuite AR, Fisman DN, Greer AL. Mathematical modelling of COVID-19 transmission and mitigation strategies in the population of Ontario, Canada. CMAJ. 2020 Apr 8 [Epub ahead of print]. Available from: https://doi.org/10.1503/cmaj.200476

One-Minute Summary

- The authors developed a mathematical model of COVID-19 infection, and compared the **potential effectiveness of non-pharmaceutical interventions** applied for **fixed periods** compared to the same interventions **applied dynamically** based on **intensive care unit (ICU) occupancy** levels.
    - These interventions include: enhanced detection of cases, physical distancing, and a combination intervention.
    - The model examined outcomes over a 2-year period, at which point the authors surmised that a vaccine may be available.
- In the base case, meaning **no interventions** were applied, **56%** (95% credible interval [CrI]: 42-63%) **of the population would be infected**. This ranged from 30% (95% CrI: 21-36%) in individuals aged 70 and over to 77% (95% CrI: 63-83%) in those aged 5-14 years.
    - Any of the 3 interventions, if applied for limited time (i.e., 6 months or less) and then lifted, would achieve high attack rates as in the base case.
- The authors find that **dynamically implemented interventions could achieve relatively low attack rates** in the population, with relatively lower total intervention duration (e.g., 13 months of physical distancing, cycled on off, would result in an overall attack rate of 2%).
    - The physical distancing and combination intervention scenarios would reduce the median number of cases in ICU below the estimated capacity in Ontario.
    - Nevertheless, the total intervention duration in the dynamic scenarios remained relatively long.

Additional Information

- The authors used a compartmental Susceptible-Exposed-Infectious-Resistant model, with standard assumptions regarding the characteristics of COVID-19 transmission and severity.

PHO Reviewer's Comments

- Among these assumptions, is one that all cases are admitted to ICU before dying. The dynamic intervention effectiveness is dependent on this assumption, as a sensitive indicator of current transmission in the community is necessary. Current outbreaks and deaths in long-term care homes suggest that not all severe COVID-19 cases make their way into the ICU before death. This could mean that the threshold occupancy for intervention may have to be lower to achieve the outcomes described in the model, or that ICU occupancy may not be a good indicator of institutional outbreak activity.
- For dynamic interventions to be effective, appropriate and sensitive metrics of infection circulation across regions, in the community, and in institutional settings are necessary.

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Review of "Mathematical modelling of COVID-19 transmission and mitigation strategies in the population of Ontario, Canada". Toronto, ON: Queen's Printer for Ontario; 2020.

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