SARS-CoV-2 rapid antigen diagnostics: combined analysis of eight mathematical models

827

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BACKGROUND

- Antigen-detecting rapid diagnostic tests (Ag-RDT) for SARS-CoV-2 are an inexpensive diagnostic tool with fast turnaround times.
- Ag-RDTs, in combination with measures to reduce contact rates after a positive test result, can reduce the spread of SARS-CoV-2.
- Understanding when and in what settings Ag-RDTs can best be utilized to reduce transmission is critical for resource allocation.

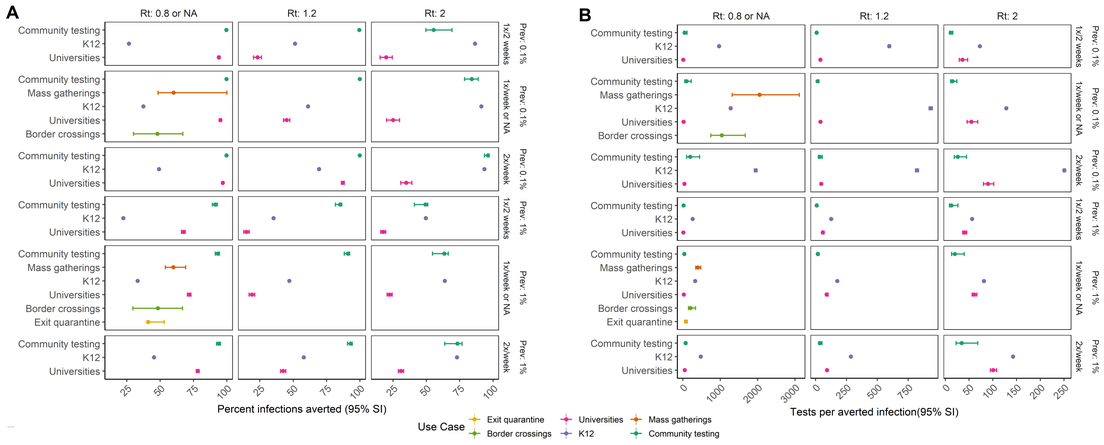
METHODS

- Our analysis synthesized the results from eight mathematical models from different modeling groups to assess the potential impact of Ag-RDT testing for SARS-CoV-2 infection across multiple use cases: (a) community testing, (b) mass gatherings, (c) K-12 schools (kindergarten to 12th grade/high school, or primary/secondary education), (d) universities, (e) border crossings, and (f) testing to exit quarantine.
- The impact of Ag-RDT testing scenarios were quantified to assess the utility of Ag-RDT across different epidemic conditions for all use cases. The models varied the frequency of testing for asymptomatic infections, proportion tested, isolation effectiveness, and timing of test.
- We conducted threshold analysis of the testing scenarios under different combinations of epidemic parameters: effective reproductive number (*Rt=0.8, 1.2, and 2.0)* and SARS-CoV-2 prevalence (0.1% and 1%).
- We calculated two outcomes relative to the status quo in each use case:
  1) impact: the percent and number of infections averted
  2) efficiency: the number of tests required to avert one infection.

Overall, there were **tradeoffs with impact and efficiency**. Increasing test frequency and proportion tested was associated with greater impact, but was less efficient. Testing strategies were most effective when ***Rt* and prevalence are low,** and most efficient when ***Rt* and prevalence are high.**

RESULTS

Figure 1. Estimates and 95% simulation intervals for (A) Percent of infections averted (impact) and (B) test per averted infection (efficiency) for all use cases



CONCLUSIONS

- When considering optimal use of Ag-RDTs, it is imperative to determine the testing strategy that balances trade-offs between feasibility, costs, and infections, and whether maximizing effectiveness or efficiency is prioritized.
- For a robust understanding of total community-level impact and cost-effectiveness, future work should aim to assess the combined impact of interventions through a single model that can consider all use-cases.

RESULTS (CONT'D)

Figure 1. Percent of infections averted (impact) with varying testing and epidemic parameters for use case (A) community testing (B) mass gathering (C) K-12 (D) university (E) border crossing (F) Exiting quarantine

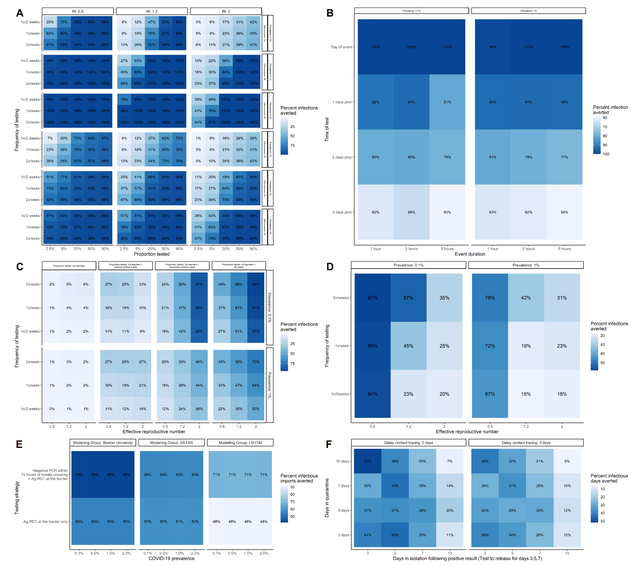


Figure 2. Test per averted infection (efficiency) with varying testing and epidemic parameters for use cases

