Step 3.6 Evidence base for airport screening

In this article, Rosalind Eggo – Assistant Professor of Infectious Disease Modelling, London School of Hygiene & Tropical Medicine and Billy Quilty – Research Assistant at the London School of Hygiene & Tropical Medicine, give an overview of airport screening as a public health measure.

An early intervention to the outbreak of SARS-CoV-2 causing COVID-19 in Wuhan was exit screening for passengers on international flights leaving China's major airports.

Thermal scanning, which can identify passengers with fever (high external body temperature), allows passengers with signs of COVID-19 to be prevented from boarding, and potentially then tested before travel. Similarly, entry screening for passengers on flights originating from the most affected regions can be used at airports to prevent infected people entering a country or region. However, the central aim of syndromic screening at airports - to prevent infected travellers from entering countries or regions with little or no ongoing transmission - depends on:

1. whether those infected but without symptoms can infect others (proportion of asymptomatic infections that are transmissible)
2. the chance of symptomatic screening detecting cases (sensitivity), and
3. the time between catching the virus and having symptoms of the disease (length of the incubation period).

Syndromic screening, as the name suggests, is only able to detect infected persons who are currently in the symptomatic phase of their infection. Based on early data from Li et al.[1], COVID-19 appears to have an average incubation period of around five days. Hence, an infected individual may travel during the incubation period, only developing symptoms afterwards. In addition, a substantial proportion of those infected only ever develop mild symptoms, which can further decrease the proportion detected by this screening method.

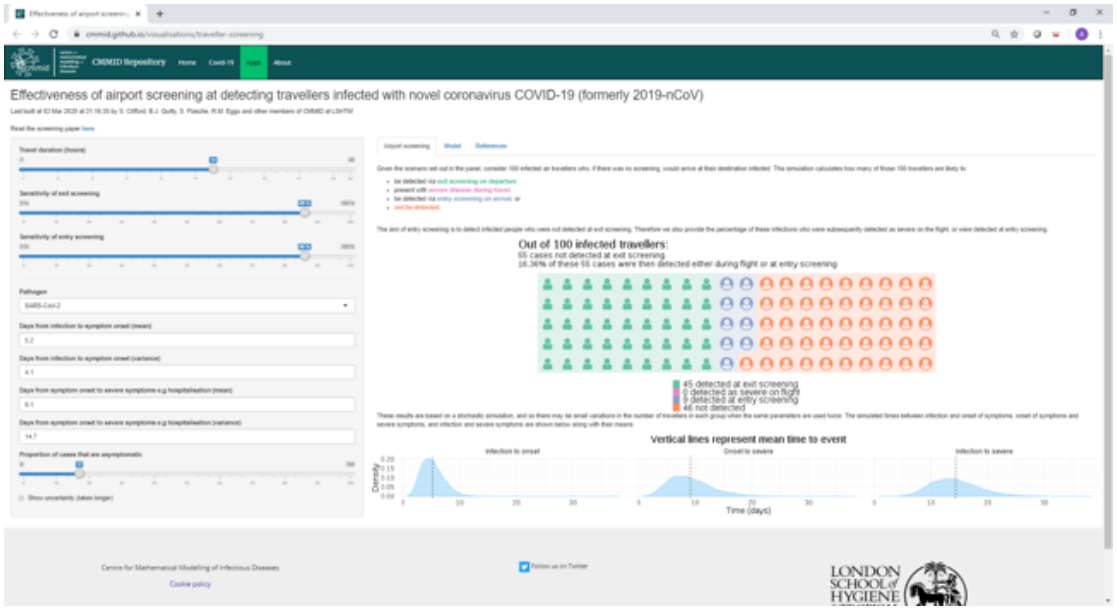
Syndromic screening identifies many people with other infections (it is non-specific) which can be resource-intensive[2]. For example, when entry screening was implemented in Australia in response to the 2003 SARS outbreak, 1.84 million people were screened, 794 were quarantined, and no cases were confirmed[3]. While some cases of COVID-19 have been identified through airport screening in the current outbreak, our estimates indicate that many infected travellers are not detected by this method.

Benefit of screening can come from information sharing, as mentioned in the first lecture this week. In many international airports, information is provided to travellers from affected regions with guidance on what to do if they develop symptoms on or after arrival[4-6].. Some countries, for example Japan, also require incoming passengers to complete forms detailing their past and future travel in order to aid contact tracing[6].

To investigate the effectiveness of screening, we devised a mathematical model to simulate the passage of 100 infected travellers planning to take a flight. Infected travellers may be at any time in infection, from recently infected, to showing symptoms, to showing severe symptoms requiring hospitalisation. Each traveller is simulated through exit screening, flying, and then entry screening. The chance of being detected at any stage of the process depends on the chance of symptomatic screening detecting cases (sensitivity) and the time between catching the virus and having symptoms of the disease (length of the incubation period).

Due to the duration of the incubation period of COVID-19, we found that exit or entry screening at airports for common symptoms was unlikely to prevent entry of all infected travellers into new countries or regions.

This work is published and there is a webapp to demonstrate the results and how the findings change according to assumptions about the natural history of infection, duration of travel, and the sensitivity of screening. While the most up-to-date data on the incubation period or the time until recovery from COVID-19 have been used in this analysis, these figures are likely to change over time as more data become available.



(Click to expand)

Figure 1. *Screenshot of Shiny app displaying the number of travellers infected with SARS-CoV-2 detected at airport exit and entry screening with baseline assumptions*[7]

See Also

Effectiveness of airport screening at detecting travellers infected with novel coronavirus

https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.5.2000080

App to model effectiveness of airport screening

https://cmmid-lshtm.shinyapps.io/traveller_screening/