In brief

Test, trace, isolate and quarantine

15 November 2021

Summary

- Modelling studies have found that test, trace, isolate and quarantine can prevent transmission, reduce the reproductive number, decrease years of life lost and hospital bed use and reduce mortality.
- The elements of these programs found to be effective include a strong test component. To be strong requires high testing rates, timely contact tracing, high quarantine compliance, timely self-isolation of symptomatic individuals and quarantine of their household contacts. It also means comprehensive case finding, repeated testing to minimise false diagnoses and pooled testing in resource-limited circumstances. Effective elements also include an extended quarantine period and the use of digital tools for contact tracing and self-isolation.
- Contact tracing apps and software have been used to automate steps in the contract tracing process. They help identify contacts who have been exposed to COVID-19 which leads to placing more infected people in quarantine.
- Internationally, many jurisdictions have implemented test, trace, isolate and quarantine (TTIQ) strategies. These can have differing lengths of time in isolation, testing requirements and exceptions for vaccinated people.
- There are also many specific strategies for school settings. A surveillance program in school children found that given the low point prevalence even in a setting of high incidence, a targeted test, track, isolate and quarantine strategy for symptomatic children and school personnel is a suitable approach.
- The introduction of home self-testing may have unintended consequences. It has the potential to undermine formal testing and therefore test, trace, isolate and quarantine effectiveness, as there isn't a system that requires notification of positive tests.[1]

Background

- 'Trace, isolate, test and treat' is the strategy advocated by World Health Organization during the COVID-19 pandemic.[2]
- While elements of 'find, test, trace and isolate' strategies have long played a role in public health, COVID-19 infection has some unique characteristics to consider, such as disease transmission by presymptomatic and asymptomatic individuals and a strong age gradient in disease severity.[3]
- A pure test-trace-isolate strategy may not be practicable in some countries. Other public health measures such as social distancing are needed to mitigate the COVID-19 pandemic.[4,5]

Effectiveness of test, trace, isolate and quarantine

- Modelling studies have found:

  - testing and isolation plus contract tracing and quarantine can prevent substantially more transmission than testing and isolation alone[6]
  - the reproductive number (R) may be substantially reduced, although exceptional performance across all metrics is needed to bring R below one through test, trace and isolate alone, highlighting the need for comprehensive control strategies[7]
  - life-years lost can be decreased by 94% and reduced peak daily hospital bed use by 86% compared with testing alone[8]
  - compared with healthcare testing alone, a combination of healthcare testing, contact tracing, use of isolation centres, mass symptom screening, and use of quarantine centres reduced mortality by 94%.[8]
- Elements of the test, trace, isolate and quarantine programs that were found to be effective include:
  - border controls, restricted entry, inbound traveller quarantine and comprehensive case finding; repeated testing to minimise false diagnoses and pooled testing in resource-limited circumstances; extended quarantine period and the use of digital tools for contact tracing and self-isolation[3]
  - increased identification and isolation of symptomatic index cases, and reduction of delay between symptom onset and isolation would improve the TTIQ process[6]
  - effective test-trace-isolate programs first need to be strong in the 'test' component, as case detection underlies all other program activities. Even moderately effective test-trace-isolate programs are an important tool for controlling the COVID-19 pandemic[7]
  - the effectiveness of test and trace depends strongly on coverage and the timeliness of contact tracing. It can potentially reduce R by 26% on top of reductions achieved by self-isolation following symptoms if 80% of cases and contacts are identified and there is immediate testing following symptom onset and quarantine of contacts within 24 hours[9]
  - its success is contingent on high testing and tracing rates, high quarantine compliance, relatively short testing and tracing delays and moderate to high mask use[10]
  - self-isolation of symptomatic individuals and quarantine of their household contacts has a substantial impact on the number of new infections generated by each primary case. Adding contact tracing of non-household contacts of confirmed cases reduces the number of new infections otherwise generated by 5-15%.[11]
- A study in Seattle found with current levels of mask use and schools remaining closed, high but achievable levels of testing and tracing are sufficient to maintain epidemic control even under a return to full workplace and community mobility and with low vaccine coverage.[10]

Other strategies

- Testing contacts to avert onward transmission might allow for a substantial reduction in the length of, or replacement of, quarantine with a small excess in transmission risk.[12]
- A strategy of contact tracing combined with efficient testing policies found the key is to test individuals with a high probability of being infected to identify them before symptoms appear. It presented a framework to achieve this goal.[13]

Technology for test, trace, isolate and quarantine

- Contact tracing apps are used to capture proximity to other enabled mobile devices via Bluetooth, report daily symptoms or record quick response (QR) code for entry or exit to key locations.[3,14]
    - In Australia, the *COVIDSafe app* helps identify and contact people who may have been exposed to COVID-19.[15]
    - Use of a digital contact tracing app in Switzerland was estimated to lead to a 5% increase in infected people entering quarantine.[16]
- Contact tracing software can automate steps in the contract tracing process. For example, it can send surveys by email or text to COVID-19 positive people and close contacts, and connect people in isolation with essential resources, including housing and healthcare.[14]
- A home quarantine app has been trialled in South Australia.[17] The *Home Quarantine SA app* includes live face check-ins, testing and quarantine schedule, daily symptom checks and health and wellbeing support and resources. New South Wales will pilot a similar app for fully vaccinated people in October.[18]

Jurisdictional test, trace, isolate and quarantine policies

United States

- **Centres for Disease Control and Prevention (CDC)**: testing is recommended for all close contacts; contact tracing is conducted for close contacts of laboratory-confirmed or probable COVID-19 patients; quarantine/isolation instructions differ depending on close contact's vaccination status and previous infection history.[19]
    - Fully vaccinated people who show no symptoms do not need to quarantine but should get tested 3-5 days following exposure.
    - People who tested positive for COVID-19 with a viral test within the previous 90 days and has subsequently recovered and remain without COVID-19 symptoms do not need to quarantine.
    - Others need to stay home for 14 days and monitor symptoms.
    - Any close contacts who have symptoms or test positive for SARS-CoV-2 should begin isolation regardless of vaccination status or prior infection.
- **CDC:** case investigation and contact tracing in K-12 schools and institutions of higher education (IHE)[20]
    - When a K-12 school or IHE is notified a person has tested positive for, or been diagnosed, with COVID-19, the school or IHE officials should notify close contacts as soon as possible. The families of close contacts in the K-12 school setting also need to be notified.
    - Students, staff and educators who have been in close contact with someone who has COVID-19 should receive diagnostic testing and begin quarantine. Exceptions to fully vaccinated or individuals with prior infection history may apply.

  - Students, staff and educators diagnosed with COVID-19 should isolate and stay away from the school or IHE premises until requirements for the end of isolation are met.
- **National Academy for State Health Policy**: program adjustments during case-surge periods across states and local jurisdictions[14]
  - Some states and jurisdictions stopped conducting widespread contact tracing. Instead they are conducting contact tracing for outbreaks in high-risk settings such as congregate living or school settings; or only in cases involving children under the age of 12 or vulnerable populations.
  - Some states and jurisdictions stopped reaching out to close contacts and started recommending positive cases to notify contacts themselves.

United Kingdom

- **England:** NHS Test and Trace program[21]
  - Individuals with symptoms must self-isolate, get tested immediately and self-isolate for at least 10 days unless they receive a negative PCR test. If they test positive, they will be instructed to share details of the close contacts through an online secure website or through calls with a contact tracer.
  - Close contacts receive an alert via text, email or phone call. They are to get tested and self-isolate for 10 full days regardless of test results.
  - Exemptions from self-isolation for contacts include close contacts who are fully vaccinated, under the age of 18 years and six months, have taken part in (or are currently part of) an approved COVID-19 vaccine trial, or are unable to get vaccinated for medical reasons.
  - Schools COVID-19 operational guidance[22]
    - It is no longer recommend that it is necessary to keep children in consistent groups ('bubbles').
    - NHS Test and Trace will work with the positive case or their parent to identify close contacts. Contacts from a school setting will only be traced by NHS Test and Trace where the positive case or their parent specifically identifies the individual as being a close contact.
    - Identified close contacts will be contacted and advised to take a PCR test. Staff who do not need to isolate and children and young people aged under 18 years and six months who usually attend school, and have been identified as a close contact, should continue to attend school as normal.
- **Wales**: Test Trace Protect[23]
  - Anyone with coronavirus symptoms should self-isolate and get a PCR test within the first five days of developing symptoms. Self-isolation is no longer required if the test is negative.
  - Individuals who do not have symptoms can get rapid lateral flow COVID-19 tests.
    - Schools and colleges, including special schools and alternative provision and childcare and play settings, will have access to rapid-result tests for staff to conduct twice-weekly testing at home before coming into the setting.
  - Close contacts of positive cases will be contacted by a contact tracer and anyone who is not fully vaccinated and aged 18 or over will be instructed to self-isolate, get tested and remain in isolation for 10 days.

        - People who are fully vaccinated or under 18 are advised to take a PCR test on day two and eight.
- **Scotland**: Test and Protect[24]
    - Anyone with coronavirus symptoms should self-isolate, get tested and remain in isolation for at least 10 days unless they receive a negative test result.
    - Close contacts will be asked to self-isolate for 10 days from symptom onset in the symptomatic person.
        - Fully vaccinated adults or individuals younger than 18 years and four months should get a PCR test. Provided they return a negative PCR test result and remain asymptomatic, they may end self-isolation as a close contact.
    - Self-isolation and contact tracing for school and registered childcare settings[25]
        - High-risk contacts, such as household members or adult close contacts of adult COVID-19 cases; or close contacts who live with or had a prolonged contact with child COVID-19 cases, will be notified and should self-isolate and take a PCR test.
        - Low-risk contacts will receive information letters that advise them to take certain actions. These actions do not require self-isolation, but include important advice on symptom vigilance, LFD (a rapid self test) testing, hand hygeine and social distancing.
- **Northern Ireland:** Contact tracing and testing[26]
    - COVID-19 positive cases are instructed to complete the Digital Self-Trace service and provide details of close contacts.
    - The *StopCOVID NI proximity app* anonymously warns other app users who have been in close contact with positive cases.
    - Close contacts need to self-isolate, get tested and remain in isolation for 10 days regardless of test results. Exemptions include:
        - fully vaccinated close contacts do not need to self-isolate but should get a PCR test on day two and eight.
        - young people (aged 5-17) need to self-isolate, get tested and end the isolation if they test negative, provided they get tested on day eight or do not develop symptoms.
        - children under the age of five will be encouraged, but not required, to take a PCR test. They do not need to isolate unless they develop symptoms or have a positive PCR result.
        - close contacts with positive PCR test in the past 90 days and fully vaccinated or under the age of 18 do not need to isolate and do not need to book tests at day two and day eight.
    - Contact tracing in schools[27]
        - Children with symptoms must self-isolate at home, get tested and continue to isolate until the result is available.
        - Children who test positive must self-isolate for 10 days and not attend school during this time. Parents and guardians will be primarily responsible for informing the school principal of their child's positive result.

- If the child tests negative for COVID-19 they can return to school as normal, provided they feel well enough to do so.
- Within a school setting, a child will only be identified as a contact if they have had prolonged close contact with the positive case. It does not include all children in the same class or all those who sit next to each other.
- Whole classes ('bubbles') will no longer be asked to self-isolate if someone in a school tests positive for COVID-19.

Canada

- The Public Health Agency of Canada (PHAC) guidance for management of COVID-19 includes testing, isolation and contact management.[28]
  - Fully vaccinated contacts are considered low risk with relaxed quarantine recommendations.
  - Jurisdictions may consider reducing quarantine periods with negative test results in certain circumstances (for example, essential workers required for critical services).
- A surveillance program in school children found that a targeted test, track, isolate and quarantine strategy for symptomatic children and school personnel adapted to school settings is likely to be a more suitable approach than surveillance on entire classes and schools. This is due to the low point prevalence even in a setting of very high incidence.[30]

Singapore

- A four-pronged approach for managing COVID-19 in schools includes:[29]
  - rapid antigen tests for primary school students
  - keeping students at home if they are unwell
  - safe management measures in schools
  - ring-fencing known COVID-19 cases and contacts.

To inform this brief, PubMed and Google searches were conducted using terms "Test, trace, isolate and quarantine" OR TTIQ AND COVID -19 on 22 September 2021.

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