Contact tracing notes

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Summary

- As shelter-in-place (SIP) is lifted, we will need new strategies to contain the spread of COVID-19.
- IL needs to assess the conditions for contact tracing to be an effective intervention.
- We do not estimate the effectiveness of contact tracing here. Instead, we have used simulation models and simple assumptions around key contact tracing parameters to approximate the daily number of case workers needed to perform contact tracing through the duration of SIP.
- The remaining SIP period is a useful opportunity to measure key parameters for contact tracing in IL, which can be used to identify the potential effectiveness of contact tracing in reducing transmission.
- The following parameters must be measured to learn if contact tracing could be an effective intervention in IL:
    - Care-seeking (Test-seeking) rate of symptomatic COVID-19 patients
    - Time from symptom onset to testing
    - Turnaround time and throughput of testing
    - Number of reachable contacts
    - Compliance with quarantine
- These are acute data needs and may differ across the state and in different populations.
- At this point, we do not know if contact tracing can successfully contain COVID-19 in IL, nor do we know if it is likely to, especially after NPIs are lifted.
- Thus, the estimated need for case workers cannot be extrapolated past May 30.

Crude estimation of case worker needs over the next 3 weeks (“the spreadsheet”)

Aim: To use transmission models of COVID-19 to predict the symptomatic case burden in the entire state of IL during shelter in place, assuming program start on 4/27.

Model: Both the University of Chicago and Northwestern University have built regional models of COVID-19 transmission and calibrated their models to local data. SIP is implemented in the models and remains in place through May. We extract the portion of the model corresponding to Apr 27 - May 17, which is representative of the prevalence through the end of May, and use the predicted true count of symptomatic COVID-19 patients for onward calculations, which are performed outside the context of the simulation model. This means that in this crude calculation, contact tracing is not affecting COVID-19 transmission at all. We are just using the simulation numbers to estimate the number of case workers needed in the near term to track each case.

County-level predictions are made from proportioning regional caseload into counties according to county population.

Assumptions:

- There is a backlog of cases on the first day that require investigation. 50% of these cases will be tested and investigated. This (and other) parameters can be changed in the spreadsheet.
- 40% of new cases arising over the 3 weeks will be tested and investigated.
- Case workers have 4 days over which they need to identify contacts. This is the nearly optimal case, in which tracing begins two days after symptom onset, which is approximately four days after infectiousness.
- Each index case contacts 2 unique people per day. This number would rapidly increase when SIP ends.
- Case workers can investigate 20 people (index cases + contacts) per day

Assumptions around testing (uniform over all counties)

- For every positive test, there are 4 negative tests (based on current cumulative test positivity rate of 23%). So tests needed = number of true symptomatic cases x 5
- The actual ratio is likely to rise once testing is encouraged.

General considerations for contact tracing:

- **Duration:** The state should contact trace at least until herd immunity is attained (e.g., through a combination of infection and vaccination)--assuming contact tracing reduces transmission rates enough to offset its costs/risks. This has yet to be shown.
- **Effectiveness:** We cannot tell whether contact tracing will reduce transmission without more time to analyze the likely rates involved (e.g., time from symptom onset to testing, test turnaround time, number of reachable contacts, compliance with isolation or quarantine recommendations). However, current research suggests contact tracing (especially digital) can be effective under some scenarios in which many cases are quickly identified (Hellewell et al., 2020; Ferretti et al., 2020). But it is unlikely to suffice as the sole strategy for IL.
- **Needed information:** We suggest that initial contact tracing efforts be used to estimate some of the key parameters that determine its effectiveness. This includes the number of tests available over time, the fraction of symptomatic people who get tested (which can be inferred), the typical delay between symptom onset and decision to test, test turnaround time, the ease of reaching contacts, success with voluntary quarantine, and cost. We will need to understand if and how these key parameters differ for specific populations such as agricultural workers, students, and other vulnerable groups.
- **Post-SIP:** Once SIP is lifted and gentler interventions are used, transmission rates will be higher, and individuals will have many more contacts. The number of workers will partly depend on how effectively contact tracing reduces prevalence. We need more time to work this out. The Center for Health Security coarsely estimates that

approximately 4000 workers would be needed for a state the size of Illinois; tracing equivalent to that used in Wuhan would require hiring ~10,400 workers.

- **Risks:** Contact tracing could easily fail if
    - Quarantine is mandatory and/or insufficient support is provided to allow people to stay at home (or isolate in a comfortable place away from home), causing people to avoid testing or being traced.
    - Information is shared with law enforcement, or there are other serious concerns about privacy and who has access to, e.g., testing results
    - It is too difficult to get tested, especially immediately after symptom onset. This includes both availability of testing but also how invasive or time-consuming the process is and whether workers can take time off to get tested.
    - Testing turnaround times are too slow.
- **Digital apps:** Privacy concerns could be allayed ***or worsened*** with a digital app, depending on its features. The most effective app would be one that is widely used, ideally across multiple states. Decentralized apps that are not “always on” and do *not* involve location tracking will probably sustain the highest trust (this could rule out MDX/Google). A major advantage of digital apps is the ability to follow-up with strangers who were at the same restaurant, on the same bus, etc., which could make them critical for control if meaningful spread occurs in public contexts. Digital tracing could also reduce the number of case workers needed by making tracing more efficient.