TESTING COHORTS AND TESTING FREQUENCY

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My lab has created a scenario-building tool (`https://mggg.github.io/uni-calculator/`) to help university leadership arrive at plans for COVID testing cohorts and frequency for the Fall 2020 semester. Our intention is to help universities plan a bulk testing commitment this month, such as (but not exclusively) the testing service to be offered by the Broad Institute. Feel free to reach out to me at Moon.Duchin@tufts.edu.

MODELS OF TESTING FREQUENCY

Quick review of testing frequency suggestions for *surveillance testing with isolation* strategy, without assumptions on contact tracing.

- Rochelle Walensky's team (Harvard Med) recommends Q3 (that is, every three days) testing in order to keep the total number of infections minimized while keeping costs in reasonable range.
- Peter Frazier's group (Cornell operations research) recommends Q5 testing but does not consider exogenous shocks, may increase frequency when that parameter is added.
- The IDSS COVID Collaboration (contact: Peko Hosoi at MIT) finds that Q12 testing suffices for stability (i.e., to prevent exponential outbreak within campus) with $R_0 = 2$ and 100% sensitivity, and Q5.6 suffices with $R_0 = 2.5$ and 70% sensitivity. The group's survey of models indicates that Q12 testing could result in over half of campus infected, while Q3 is likely under 1%.

Bottom line: a strategy where every individual is tested twice weekly would be in line with all available credible models. A weekly strategy is still extremely helpful for maintaining a steady and tolerably low infection rate on campus.

PRICES

Recall that Q7 means testing once weekly and Q3 means every three days, etc. The per-test cost at Broad will likely be between $22 and $25.

[per person costs for 80 days @$**25**: Q7 $286, Q4 $500, Q3 $667]

[per person costs for 80 days @$**22**: Q7 $251, Q4 $440, Q3 $587]

BUILDING TESTING COHORTS

One way to approach the planning problem is to build a high-testing cohort (H) and a medium-testing cohort (M) to decide on the testing volume you will commit to. Further testing can be handled by bundling ad hoc and low-frequency testing into a low-testing cohort (L). We won't focus on the L group here.

Here is one way to consider your cohort construction: build the high and medium cohorts from people who have the most in-person contact on campus, including those who visit campus most regularly or who live there.

HOW TO USE THE CALCULATOR TOOL

Find your university in the dropdown, which will pre-fill student numbers. You must enter the faculty and staff numbers to start with. Choose a scenario from the four provided below, or build your own. This lets you arrive at the number of individuals in the H and M cohorts. Specify the testing frequency for each, and you can calculate a per-person price for the term. Total cost of full testing protocol is also provided.

Date: June 15, 2020.

Scenarios – strictly illustrative

Scenario 1: A large highly residential university. The student life is very campus-centric and there are a large number of grant-funded research labs that need staffing. A large number of students are from overseas and are unlikely to be able to return to campus in person.

student enrollment 70% of usual

80% of enrolled students come to campus at least weekly

(70% visit $\geq 3\times$, 10% visit 1-2$\times$)

80% of tenure-stream faculty come to campus at least weekly

(50% visit $\geq 3\times$, 30% visit 1-2$\times$)

60% of usual campus staff workforce comes to campus at least weekly

(30% visit $\geq 3\times$, 30% visit 1-2$\times$)

and an additional 250 contract staff come to campus $\geq 3\times$/week

(no occasional contract staff)

Scenario 2: A large, less-residential university. In normal times, many students commute. Larger number of part-time instructional staff.

student enrollment 40% of usual

90% of enrolled students come to campus at least weekly

(45% visit $\geq 3\times$, 45% visit 1-2$\times$)

60% of tenure-stream faculty come to campus at least weekly

(30% visit $\geq 3\times$, 30% visit 1-2$\times$)

50% of usual campus staff workforce comes to campus at least weekly

(40% visit $\geq 3\times$, 10% visit 1-2$\times$)

and an additional 250 contract staff come to campus $\geq 3\times$/week

(no occasional contract staff)

Scenario 3: A medium university with graduate programs. This campus has a very limited number of adjunct-style instructional faculty. However, a substantial share of the tenure-stream faculty are electing for either all-virtual instruction or for hybrid teaching with one day per week on campus. The campus-employed staff can mostly work from home, and only a small number of staff are deemed essential for lab research operations.

student enrollment 85% of usual

90% of enrolled students come to campus at least weekly

(80% visit $\geq 3\times$, 10% visit 1-2$\times$)

65% of tenure-stream faculty come to campus at least weekly

(15% visit $\geq 3\times$, 50% visit 1-2$\times$)

25% of usual campus staff workforce comes to campus at least weekly

(25% visit $\geq 3\times$, 0% visit 1-2$\times$)

and an additional 150 contract staff come to campus $\geq 3\times$/week

(no occasional contract staff)

Scenario 4: A small college with very high residency rate and limited dormitory space. No feasible options for de-densification at full residency. A decision has been made to limit campus residency to first- and fourth-years (say), with all second- and third-years studying virtually.

student enrollment 90% of usual

50% of enrolled students come to campus at least weekly

(50% visit $\geq 3\times$, 0% visit 1-2$\times$)

50% of tenure-stream faculty come to campus at least weekly

(40% visit $\geq 3\times$, 10% visit 1-2$\times$)

50% of usual campus staff workforce comes to campus at least weekly

(40% visit $\geq 3\times$, 10% visit 1-2$\times$)

and an additional 50 contract staff come to campus $\geq 3\times$/week

(no occasional contract staff)