HARVARD GLOBAL HEALTH INSTITUTE

EDMOND J. SAFRA Center for Ethics

Key Metrics for COVID Suppression

A Framework for policy makers and the public

July 1, 2020

The Harvard Global Health Institute and Harvard's Edmond J. Safra Center for Ethics have been working with a network of research and policy organizations to achieve convergence around recommendations for **core metrics** to be used to evaluate the status of COVID response and **key performance indicators** to evaluate how well particular tools of response are being deployed. Convergence metrics and indicators have been sought for the following areas:

1. **Epidemiology**
2. **Response capacity**
    - **a. TTSI- testing, tracing, and supported isolation**
    - **b. Use of other non-pharmaceutical interventions (e.g. social distancing, masking)**
    - **c. Therapeutic capacity**
    - **d. Protection capacity (capacity to identify and meet the needs of vulnerable populations)**
    - **e. Infection control**
    - **f. Disease surveillance capacity**

Participants in these convergence conversations have included TTSI Collaborative members (Harvard Global Health Institute; Harvard's Edmond J. Safra Center for Ethics, Partners in Health); CovidActNow.org; Covid-local.org; Resolve to Save Lives; the Nuclear Threat Initiative; Georgetown Center for Global Health Science and Security; Rockefeller Foundation; Bloomberg Philanthropies; and faculty and researchers at the University of Pennsylvania, University of Washington, University of Minnesota, University of Louisville, Center for Communicable Disease at the Harvard Chan School of Public Health, Microsoft Research, Microsoft AI for Health, and Apple University. CovidActNow.org provided foundational analytic work.

This memo focuses only on key epidemiological metrics and key performance indicators for TTSI response capacity. No COVID response is complete without attention to the other areas of capacity and performance. Implementers may find resources for metrics in the other areas at www.cdc.gov, https://www.who.int/, and non-profit organizations such as those supporting https://covid-local.org/, which provides tools for local decision-makers to link metrics with decisions and policies for expanding and contracting social distancing.

Epidemiology

Case incidence can be best measured and communicated with three measures: new confirmed case trend, case trend as an estimate from the new deaths trend, and new COVID hospitalizations, in each case with a seven day rolling average. All three should be used, and they should be used and communicated to the public together.

Metric 1: New confirmed case trend: New daily cases per 100k pop (seven day rolling average); + trend direction and rate

*Metric 2: Case trend as an estimate from new deaths trend: New daily deaths per 100k pop * 100 (assuming 1% IFR) (seven day rolling average); + trend direction and rate*

Metric 3: New daily hospitalizations per 100k pop (seven day rolling average); + trend direction and rate

Because case incidence numbers are affected by testing levels and deaths are a lagging indicator, it is important to track and compare both numbers and the information about cases that each provides. Whichever of metric 1 or metric 2 results in a higher estimate for the number of new cases per 100,000 people, should be used to determine the incidence level on the green, yellow, orange, red scale.

The daily case incidence number will determine whether a jurisdiction is green, yellow, orange, or red with the following cut-offs:

Covid Risk Level	Case Incidence	
Red	**>25**	daily new cases per 100,000 people
Orange	**10<25**	daily new cases per 100,000 people
Yellow	**1<10**	daily new cases per 100,000 people
Green	**<1**	daily new case per 100,000 people

The incidence numbers can be used both at county or MSA level, or other local health district jurisdiction level, and at the state level. Policy decisions about which strategies of disease response are best for a jurisdiction should be made by looking at both the local level and the state picture and considering the dynamic relationship between them.

These COVID levels provide a map that helps decision-makers and community members know where they are. The green level aligns with the CDC's low incidence plateau threshold. The levels do not in themselves provide information about how to respond, given where a community is. The levels do, however, communicate the intensity of effort needed for control of COVID at varying levels of community spread. In addition to paying attention to the levels, decision-makers should pay close attention to direction of trend and rate of change. While jurisdictions may plateau in yellow, in the orange level spread tends to have more velocity.

At the green level, jurisdictions are on track for containment so long as they maintain maintenance levels of viral testing (i.e. this is not a reference to antibody testing) and contact tracing, sufficient to control spikes and outbreaks. Viral testing should be used both for symptomatic and asymptomatic individuals, with the latter need for testing flowing from exposure, role in a congregate setting or other critical context (e.g. elective surgery), or requirements of disease surveillance programs. It is not enough to get to green; one also has to plan to stay green.

At the red level, jurisdictions have reached a tipping point for uncontrolled spread and will require the use of stay-at-home orders and/or advisories to mitigate the disease.

At yellow levels, there may be some initial community spread. At orange levels, community spread has accelerated and is at dangerous levels. At both yellow and orange levels, jurisdictions can make strategic choices about which package of non-pharmaceutical interventions to use to suppress the disease. One jurisdiction may choose stay-at-home orders; another may choose more intensive use of viral testing and tracing programs. All jurisdictions will want some combination of social distancing strategies and infection control.

In order to understand optionality at yellow and orange levels, decision-makers should review the different "phasing plans" that policy-makers have developed as guidance. They should be equipped to evaluate whether the "phasing plans" will help them meet their goals, having clearly in mind whether their goals are mitigation or suppression.

Covid Risk Level	Case Incidence		Intensity of Control Effort Needed
Red	**>25**	**daily new cases per 100,000 people**	Stay-at-home orders necessary
Orange	**10<25**	**daily new cases per 100,000 people**	Strategic choices must be made about which package of non-pharmaceutical interventions to use for control. Stay-at-home orders are advised, unless viral testing and contact tracing capacity are implementable at levels meeting surge indicator standards (see KPIs below).
Yellow	**1<10**	**daily new cases per 100,000 people**	Strategic choices must be made about which package of non-pharmaceutical interventions to use for control.
Green	**<1**	**daily new case per 100,000 people**	On track for containment, conditional on continuing use of viral testing and contact tracing for surveillance and to contain spikes and outbreaks.

TTSI Key Performance Indicators

Step 1: Make a strategic choice: Mitigation or Suppression

The goal of a TTSI program used for purposes of suppression is to get to green (<1 new daily case/100,000) and stay green.

To achieve this epidemiologically defined goal, the relevant jurisdiction will need capabilities for (1) testing, tracing, and supporting isolation; (2) protecting the vulnerable; and (3) treating the ill.

While the green, yellow, orange, red color levels help us keep our eye on the target of where we want to be with regard to epidemiologically defined goals, these three categories of capability are best measured via key performance indicators that support grading the jurisdiction along each of these three dimensions.

If you are at the green level, you can operate a steady-state TTSI infrastructure that delivers **maintenance** by being prepared to handle and suppress outbreaks fast, should they arise. You should also expect to deliver **disease surveillance**.

If your jurisdictions are yellow, orange, or red, you will need to **surge TTSI infrastructure** and you have to make a strategic choice about whether to pursue mitigation or suppression.

Mitigation = some reduction in the rate of R (the reproduction number of the virus) through diagnostic testing and contact tracing.

Suppression = an effort to get to zero or near zero case incidence.

Both mitigation and suppression require a suite of activities ranging from stay-at-home advisories to 6-foot social distancing to mask wearing to TTSI implementation. TTSI is a tool that can be deployed at either mitigation or suppression levels. However, **we strongly recommend jurisdictions that have the capacity to deliver suppression-level surge resources for TTSI to pursue a suppression strategy as they will be on the most efficient path toward a restored economy without future lockdowns.**

Maintenance levels of TTSI resources are used in jurisdictions that are green to contain spikes and outbreaks. For jurisdictions at the green level, the goal is to have adequate TTSI resources to stop community spread. It continues to be important to measure communities along all capability measures: TTSI capability, other NPI capability, protection capability, treatment capability, and surveillance capability.

Surge levels of TTSI resources are needed once there is community spread. Jurisdictions at the yellow level have spikes that may also indicate community spread. Jurisdictions at Orange and Red levels are contexts with dangerous community spread. These jurisdictions at orange or red need "surge" levels of TTSI resources to drive the disease back close to near zero case incidence. Once a community has progressed along the path to zero and returned to green level status, the levels of testing capacity and contact tracing it needed should dramatically decline. Jurisdictions at the red level also need stay-at-home orders.

A **mitigation surge** targets broad and accessible testing, a test positivity rate of 10%, and for 60% of positives not coming from critical context testing to have come from contact tracing.

A **suppression surge** targets broad and accessible testing, a test positivity rate of <3%, and for 80% of positives not coming from critical context testing to have come from contact tracing.

Successful suppression efforts can work relatively fast to restore jurisdictions to near-zero case incidence in a matter of 1-2 months. In other words, a surge of testing and tracing resources is a **temporary** need; only **maintenance** levels are permanent until vaccines become widely available, presuming effective and durable immunity.

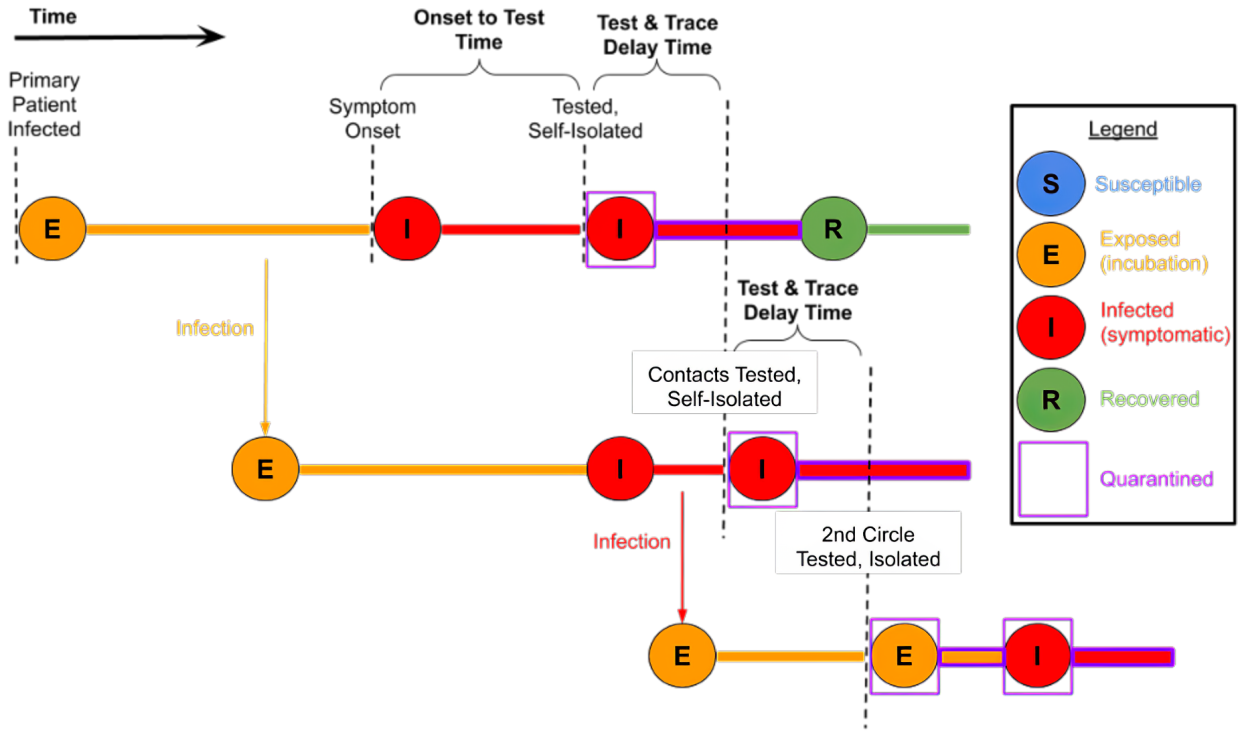
Key Performance Indicators for Contact Tracing are as follows:

	Maintenance/ Green Level	Suppression/ Yellow, Orange, or Red Levels	Mitigation/ Yellow, Orange, Red Levels
Contact Tracing			
Capacity			
Number of Tracers	30 tracers per 100k population (or 1 per 4000 in sparsely populated areas)	**Planning:** 30 tracers per 100k (or 1 per 4000 in sparsely populated areas) **Activation:** Whichever is higher, 30 per 100k or 5 tracers per every confirmed new daily case	30 tracers per 100k population
Performance			
Percent of Positives from Tracing vs. Symptomatics	>80%	>80%	>50%
Percent of Index Cases Who Give Contacts	>75%	>75%	>75%
Percent of Identified Contacts Traced	>90%	>90%	>80%
Trace Time	24 hours	24 hours	24 hours
Percent of Identified Contacts Traced	>90%	>90%	>80%
Percentage of Contacts with Symptoms at Time of Trace	close to zero	close to zero	close to zero
% traced contacts in quarantine, isolation, or active monitoring	90%	90%	90%
% traced contacts receiving supports	varies with context; locales should set targets	varies with context; locales should set targets	varies with context; locales should set targets
% traced contacts assigned to quarantine, isolation, or active monitoring who are fully compliant with program	90%	90%	90%
% of traced contacts tested	90%	90%	0%
Time from Contact Tracing Program to Test of Contact	24 hours	24 hours	24 hours

Key Performance Indicators for Viral Testing are as follows:

	Maintenance/ Green Level	Suppression/ Yellow, Orange, or Red Levels	Mitigation/ Yellow, Orange, Red Levels
Viral Testing			
Capacity			
Access	Anyone should be able to access a test regardless of symptoms	Anyone should be able to access a test regardless of symptoms	Anyone should be able to access a test regardless of symptoms
Supply	Sufficient to test for therapeutic purposes; hot spot testing purposes; contact tracing purposes for several links of the chain following from an index case to further positives to their contacts, and so on; surveillance purposes; and critical context purposes.	Sufficient to test for therapeutic purposes, hot spot testing purposes, contact tracing purposes for several links of the chain, surveillance purposes, and critical context purposes.	Sufficient to test for therapeutic purposes, hot spot testing purposes, surveillance purposes, and critical context purposes.
Performance			
Time from Symptom Onset to Test Positivity	24 hours	24 hours	24 hours
Turnaround Time	24 hours	24 hours	24 hours
Positive Test Ratio	<1%	<3%	Less than 10%

Breaking the Chain: The Temporal Dynamics of Testing and Contact Tracing



Endorsement List

Endorsement: Institutional or Personal	Institution	Name & Title
Institutional		
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	COVID-local.org	**Beth Cameron** and **Jessica Bell** (Nuclear Threat Initiative) **Ellie Graeden** (Talus Analytics) **Rebecca Katz** (Georgetown Center for Global Health Science & Security) **Jeremy Konyndyk** (Center for Global Development)
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