SUPPLEMENTARY MATERIAL

Clinical Impact, Costs, and Cost-Effectiveness of Expanded SARS-CoV-2 Testing in Massachusetts

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INTRODUCTION

This appendix provides methodologic details to supplement the description of methods in the manuscript text, including summary of CEACOV model structure, model inputs, calibration and results.

SUPPLEMENTARY METHODS

Natural history

COVID-19 disease

The following health states are modeled: (1) susceptible, (2) people who acquire SARS-CoV-2, and (3) COVID-19-related death (Supplementary Figure 1). Susceptible people experience a daily probability of acquiring SARS-CoV-2 from people with COVID-19 in health states which transmit infection. People who acquire SARS-CoV-2 may progress through the following health states: (2a) latent, (2b) asymptomatic, (2c) mild/moderate illness, (2d) severe illness, (2e) critical illness, (2f) recuperation, and (2g) recovered (Supplementary Table 1). In health state 2a, people with latent infection experience daily probabilities of progressing to asymptomatic infection (all those with latent infection eventually progress). In health state 2b, people who are asymptomatic experience daily probabilities of progressing to mild/moderate illness or recovering. In health state 2c, people with mild/moderate illness experience daily probabilities of progressing to severe illness or recovering. In health state 2d, people with severe illness experience daily probabilities of progressing to critical illness or recovering. In health state 2e, people with critical illness experience daily probabilities of dying from COVID-19 or recuperating. In health state 2f, people previously critical experience daily probabilities of recovering. While recuperating, they are assumed to stay in the hospital or other non-long-term care facility with improved/resolving symptoms. People in health states 2b-2f can transmit SARS-CoV-2 to others. In the recovered health state, people remain in this absorbing health state and are assumed to have immunity to SARS-CoV-2 over the time horizon of model run.

Derivation of COVID-19-like illness inputs

Individuals with symptoms due to conditions other than COVID-19 ("COVID-19-like-illness"), may present for symptom screening or PCR testing. Estimates of the number of people presenting for testing with "COVID-19-like illness" are uncertain at the time this analysis is being conducted; therefore, we made assumptions informed by available literature from influenza-like illness. Data from the National Ambulatory Medical Care Survey (NAMCS) were used to estimate the age-stratified per-person daily rate of presenting to one's primary care physician [1]. Of these visits 15% were assumed to be related to COVID-19, based on estimates from New Jersey depicting approximately 15% of people presenting with influenza-like symptoms that were not actually due to influenza; among these, 75% were assumed to have symptoms due to conditions other than COVID-19 [2]. We additionally considered a second set of COVID-19-like illness inputs ("summer" COVID-19-like illness) to reflect the possibility that fewer people present for testing outside of influenza season. These were derived from NAMCS and the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) [1,3].

Summer COVID-19-like illness probabilities

Age, years	Mild	Severe	Critical
<19	0.00010058	0.00000519	0.00000011
19-65	0.00012243	0.00000632	0.00000013
>65	0.00015029	0.00000775	0.00000016

Transmissions

The basic reproduction number (R_0) is defined as the daily rate at which an infected individual contacts susceptible individuals and infects them in a fully susceptible cohort, multiplied by the duration of infectivity:

$$\mathbf{R_0 = K * b * D}$$

- K: number of contacts per day an infected individual has with susceptible people in a fully susceptible cohort
- b: the probability of infecting the susceptible person per contact
- D: the average duration of infectivity

Subsequently, in the model,

Effective Transmission Rate = Nominal Transmission Rate * Transmission multiplier

where

$$\textit{Nominal Transmission Rate} = R_0/D.$$

The Nominal Transmission Rate is a function of the average number of contacts per day an infected individual has with susceptible people in a fully susceptible cohort (K) multiplied by the probability of infecting the susceptible person per contact (b). Equivalently, it can be defined as R_0 in a fully susceptible cohort divided by the average duration of infectivity (D). This Nominal Transmission Rate captures the ratio of daily infectivity stratified by disease states. Infected individuals do not transmit while they are in the latent state (2a) or in the recovered state (2g).

Patients in other infected states (2b-2f) can transmit SARS-CoV-2 to susceptible individuals. The effective magnitude of the transmission rate changes over time as social interventions alter number of contacts (K) and infectivity (b), and subsequently, the effective reproduction number (R_e); thus, the magnitude is adjusted using the transmission multiplier.

Transmission multipliers are setting-specific, time-dependent adjusting factors, roughly accounting for population density and interventions that can alter the number of contacts (K) and infectivity (b) in the setting being modeled. In this analysis, these transmission multipliers are calibrated to the COVID-19 epidemic in Massachusetts, US. The transmission multiplier is used to model the effect of reducing contacts (K) resulting from social distancing measures, such as the stay-at-home advisory issued on March 21, 2020 in Massachusetts, as well as masking strategies that can decrease infectivity (b).

We assume that all susceptible people have an equal probability of contacting infected individuals and acquiring the virus (*i.e.*, homogenous mixing). As the epidemic grows, the number of susceptible people declines. Thus, not all of the daily contacts of infected individuals will be with susceptible people. The daily infection rate for a susceptible person is equal to the sum of transmission rates from all infected people across all infection states divided by the cohort size. This leads to an expected daily number of infections equal to the number of susceptible people multiplied by the infection rate on that day.

Derivation of reduction in transmission associated with test results

We associate each testing strategy with a reduction in transmission (Manuscript Table 1) based on two parameters: (1) likelihood of adherence to isolation directives and (2) the reduction in the average number of close contacts that results from isolation. At the time of this analysis there were no data specific to the COVID-19 pandemic reporting these parameters of interest. Therefore, we made assumptions informed by the available literature on public response to isolation directives with and without direct counseling and test results.

First, for people with mild/moderate symptoms, we assume that approximately 20% of the Massachusetts population (excluding those residing in long-term care facilities) would not be capable of or willing to be screened under the PCR-severe-only or Self-screen strategy and follow the subsequent recommendations for self-isolation when either strategy returns a positive result. For the remaining 80%, we estimate the maximal adherence to directives for isolation would be 85-94% [4]. For those with maximal adherence, we estimate that isolation would decrease the number of close contacts for all age groups by 75-80% [5,6]. We assume that isolation directives would be more effective when directly delivered by a medical or public health provider with counseling following a positive PCR test compared to the instructions received following a positive self-screen on an electronic device. This difference is partly based on the ability of the general public to engage in and implement public health messaging about COVID-19 outside of the context of specific provider-director counseling [7]. Therefore, we assign the transmission reduction associated with a positive self-screen in people with mild/moderate symptoms to be 20% and the transmission reduction associated with a positive PCR test to be 65%.

We assume that people who receive a negative PCR test, regardless of the presence of symptoms, would be reassured that they do not have COVID-19 and would not engage in self-isolation. Therefore, the transmission reduction for people with a negative PCR test, regardless of symptoms, is 0%. This means that in our model, individuals with COVID-19 who receive a false negative PCR test result will have no reduction in the transmission probability because they are behaving under the assumption that they do not have COVID-19.

Individuals with severe/critical illness in all strategies are assumed to be hospitalized, which results in 90% reduction in transmission. Hospitalization eliminates the number of susceptible social contacts exposed to an index patient but introduces contacts with healthcare workers and other patients. Transmission risk associated with any one of these contacts would be greatly reduced due to hospital-based infection control and isolation practices [8,9].

Validation and calibration

We initiated the model with a cohort of 1 million simulated people who are meant to represent the 6.9 million population of Massachusetts in 2020. Each person's age category was drawn at model start based on Massachusetts age distribution data [10]. We started the simulation in mid-March and set the prevalence of COVID-19 at model start to 0.14% [11]. We tracked the number of people in each health state over a 45-day horizon (30 days for calibration; 15 days for validation).

We calibrated the transmission multiplier (see Transmissions above) to the COVID-19 epidemic in Massachusetts from mid-March to mid-April (30 days). The remaining 15 days were used for validation. We assumed the reported number of COVID-19-related deaths would be close to the actual number of deaths. Hence, the number of reported COVID-19-related deaths was the primary calibration target. We adjusted cumulative mortality (3,716 deaths by May 1, 2020) by removing the 59% of COVID-19-related deaths that occurred in long-term care facilities and not in the community [12,13]. This led to a series of time dependent R_e estimates (Supplementary Table 1).

We assumed 80% of patients with severe and critical symptoms would present to care and be tested and detected. To ensure a good model fit, we used the mean absolute percentage error (MAPE) and the median absolute percentage error (MEDAPE) for modeled and observed number of deaths over the validation horizon.

Costs and cost-effectiveness

Daily hospital ward and intensive care unit (ICU) costs

To estimate the total costs for a hospitalization (ward or ICU) due to COVID-19, we first assumed each patient would be billed for the average Medicare-allowed inpatient coverage, including pneumonia-related diagnoses, ventilator use, and professional costs. This included Medicare-allowed coverage of diagnosis-related group (DRG) 193, “simple pneumonia and pleurisy with major complications,” DRG 194, “pneumonia with complications or comorbidity,” and DRG 195, “pneumonia without complications.” We assumed COVID-19 patients requiring hospital ward beds would be distributed evenly among these three diagnoses. For patients

requiring ICU-level care, we additionally included the diagnoses DRG 207, "respiratory system diagnosis with ventilator support required for 96 hours or more," and DRG 208, "respiratory system diagnosis with ventilator support required for less than 96 hours." We divided the total cost for a hospital stay and a hospital stay requiring ICU-level care by the average number of days spent in the hospital by a pneumonia patient and an ICU patient, respectively. This yielded the cost of a day spent in a hospital bed and an ICU bed. We lastly added a professional cost of $395, as allowed by Medicare, to the daily hospital and ICU bed costs to yield the final total constant daily costs of hospitalization ($1,640) and ICU care ($2,680) [14–16].

Cost-effectiveness

We calculated the incremental cost-effectiveness ratio (ICER) for each strategy from the healthcare sector perspective, the societal perspective, and again from the societal perspective while additionally accounting for the added healthcare costs associated with saving a life-year due to averted COVID-19-related mortality. All three sets of calculations relied on quantifying the number of quality-adjusted life-years lost per death related to COVID-19. First, we used data from the Massachusetts Department of Health to estimate the average age of deaths related to COVID-19 [12]. Because the available data included total age-stratified deaths and this model was calibrated to exclude deaths from those in long-term care facilities (LTCF), we first estimated the proportion of deaths in each age bracket that occurred in LTCF. We assumed that deaths in LTCF among people ages ≥60 years occur in the same proportions as total COVID-19-related deaths. This yielded age-stratified estimates for the number of deaths occurring among people in LTCF. We then subtracted these estimates from the total number of COVID-19-related deaths in the corresponding age group and used the resulting distribution to estimate the mean

age of death from COVID-19 in the non-institutionalized population of Massachusetts (76.3 years). Given the average life expectancy for a Massachusetts resident (80.6 years), we estimated that a death due to COVID-19 resulted in a loss of 4.3 life-years.

We applied preference-based utility weights in the form of age-dependent EQ-5D scores to estimate a quality adjustment for each life-year lost due to death from COVID-19 [17,18]. We additionally discounted each quality-adjusted life-year lost by 3%/year. This resulted in an average of 3.18 discounted quality-adjusted life-years lost due to a death from COVID-19. We multiplied the number of model-projected deaths for each strategy by 3.18 to yield the total quality-adjusted life-years lost per strategy.

To calculate ICERs, we sorted strategies by increasing cost and divided the difference in cost by the difference in total quality-adjusted life-years lost for each strategy compared to the next most expensive strategy. This results in a ratio that represents the value of a strategy relative to the next best option, in dollars per quality-adjusted life-year ($/QALY).

When calculating ICERs in the base case, we considered only direct medical costs borne either by the patient or a third party payer [17]. These include the costs of PCR testing ($51/test) [19] and hospitalizations for COVID-19, accounting for patient-time spent both on a general hospital ward ($1,640/day) and in the ICU ($2,680/day, see above).

Scenario analyses

We also considered three alternative approaches to estimating ICERS:

1. Direct medical costs (base case) and an alternative estimate of life-year lost

We applied an alternative estimate of life-years lost based on an approach employed by the Global Burden of Disease study of the Institute for Health Metrics and Evaluation as described in another CEACOV model-based analysis (5.61 discounted, quality-adjusted life-years lost per death averted vs. the base case estimate of 3.18 quality-adjusted life-years lost per death averted) (Supplementary Table 15) [20].

2. Direct medical costs (base case) and lost productivity (Indirect costs of hospitalization and self-isolation)

We accounted for the indirect costs of hospitalization and self-isolation (lost productivity) due to infection with SARS-CoV-2, in addition to the direct medical costs as described above (Supplementary Table 16). To determine the indirect costs associated with lost productivity for days spent hospitalized and in self-isolation, we first estimated the average hourly wage of a worker in the US using data from the Employer Costs for Employee Compensation, released quarterly by the US Bureau of Labor Statistics [21]. We calculated the average hourly wage for civilian workers across the four quarters of 2019 and assumed an eight-hour workday to estimate the average daily wages for a US worker ($295). To account for many COVID-19 patients being older and out of the workforce, we first used Massachusetts Department of Health data to determine the age distributions of COVID-19 patients in Massachusetts requiring hospitalization and those not requiring hospitalization [12]. We assumed patients aged 65 and older are not working, and thus accrue no lost productivity costs while either in the hospital or in self-isolation. For those under 65, we assumed all patients, including minors, accrue lost productivity

costs since parents of children sick with COVID-19 may have to miss work or make alternate childcare arrangements. We assumed a day spent in the hospital would result in a complete loss of productivity, thus patients under 65 incurred a cost equal to the full average daily wage of a US worker for each day spent in the hospital. We assumed a day spent in self-isolation would halve productivity, based on some patients' ability to work remotely at least part of the time while experiencing mild/moderate illness, or while caring for a sick child with mild/moderate illness. We calculated the weighted average of lost productivity costs due to hospitalization and self-isolation across the age distributions of hospitalized and non-hospitalized COVID-19 patients, respectively, to yield the lost productivity cost for a day spent hospitalized ($112) and in self-isolation ($115).

3. Direct medical costs (base case) and lost productivity and added healthcare costs due to averted morality

To estimate the costs that would be incurred for someone whose death was averted by one of our strategies. To do this, we first sorted strategies by increasing cost and calculated the number of incremental deaths averted for each strategy compared to the next most expensive strategy. For each incremental death averted, we applied a cost based on national data reporting mean annual healthcare expenses for people ages ≥65 years ($10,125) [22]. We multiplied this per-year cost by 4.33 based on the estimated life-years (discounting 3% yearly) lost due to a death from COVID-19 (see above). This resulted in a total discounted cost of $41,600, which represents the added healthcare costs required by the average person whose death from COVID-19 was averted by one of our strategies. We multiplied the number of incremental deaths averted for each strategy by $41,600 to obtain the total discounted cost of life-years-saved for each strategy and

added this to the original cost of the strategy. We re-ordered the strategies by this adjusted total cost and calculated ICERs as described above (Supplementary Table 16).

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Supplementary Table 1. Additional input parameters for a model of COVID-19 disease and testing in Massachusetts

Parameter	Value			
Distribution of clinical disease progression severity (%), [a], [23–26]	0-19 years	20-59 years		≥60 years
Asymptomatic infection	52.39	26.20		18.00
Mild/moderate illness	47.10	71.95		78.79
Severe illness	0.50	1.18		0.09
Critical illness	0.01	0.67		3.12
Time to health state transition, by ultimate stage of disease, mean, days	Asymptomatic	Mild/moderate	Severe	Critical
Latent to asymptomatic infection	2.6	2.6	2.6	2.6
Asymptomatic infection to mild/moderate illness [23,27]	–	2.0	2.0	2.0
Mild/moderate to severe illness [28]	–	–	6.5	3.0
Severe to critical illness [25]	–	–	–	7.1
Critical illness to recuperation	–	–	–	11.9
Recuperation to recovery	–	–	–	5.7
COVID-19-like illness				
Duration of COVID-19-like illness, mean, days				
Mild/moderate symptoms		5		
Severe symptoms		5		
Critical symptoms		5		
Transmissions				
R_e				
Model validation and calibration				
March 15, 2020–March 20, 2020		5.9		
March 21, 2020–March 31, 2020		2.6		
April 1, 2020–April 10, 2020		1.3		
April 11, 2020–May 1, 2020		0.9		

Abbreviations: R_e, Effective reproduction number

[a] Those who progress to mild/moderate illness, first pass through the susceptible, latent, and asymptomatic health states.
Those who progress to severe illness first pass through the susceptible, latent, and asymptomatic and mild/moderate health states.
Those who progress to critical illness first pass through the susceptible, latent, and asymptomatic and mild/moderate health states.

Supplementary Table 2. Clinical and resource utilization outcomes for a model of COVID-19 disease and testing in Massachusetts, results per million

Strategy	Incident infections, No.	Mortality, No.	PCR tests/simulation day, mean	PCR tests conducted, total	Hospital bed-days		ICU bed-days		Self-isolation days, total
					Cumulative	Peak	Cumulative	Peak	
Optimistic scenario (June 1, 2020 R_e 0.9)									
PCR-severe-only	246,000	1,400	1,300	226,900	60,500	1,200	38,500	600	-
Self-screen	183,800	1,100	1,300	226,700	53,400	1,200	32,500	500	1,605,900
PCR-any-symptom	137,700	1,000	2,100	382,100	45,700	1,200	28,500	500	799,200
PCR-all	122,300	900	15,300	2,758,300	43,600	1,200	26,800	500	876,000
PCR-all-repeat	91,500	800	83,800	15,077,600	38,500	1,200	24,100	500	1,035,200
Intermediate scenario (June 1, 2020 R_e 1.3)									
PCR-severe-only	640,200	2,800	1,300	230,600	107,800	1,200	64,600	600	-
Self-screen	424,400	1,900	1,300	228,500	80,900	1,200	49,400	500	2,735,500
PCR-any-symptom	263,200	1,500	2,500	449,200	60,300	1,200	36,700	500	1,182,500
PCR-all	236,700	1,300	15,800	2,838,800	56,800	1,200	35,600	500	1,237,700
PCR-all-repeat	129,800	900	84,200	15,150,900	42,900	1,200	26,500	500	1,260,000
Surging scenario (June 1, 2020 R_e 2.0)									
PCR-severe-only	1,825,200	7,500	1,300	239,800	266,500	2,700	158,500	1,600	-
Self-screen	1,595,900	6,400	1,300	237,700	234,600	2,200	136,300	1,300	8,491,500
PCR-any-symptom	1,272,700	5,200	5,500	986,700	177,700	1,600	103,000	900	4,178,500
PCR-all	1,218,400	4,900	19,600	3,522,800	172,800	1,500	98,500	900	4,227,600
PCR-all-repeat	536,400	2,300	88,500	15,925,300	89,000	1,200	51,800	500	3,339,900

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number

Model-projected outcomes are presented for the 180-days between simulated days May 1, 2020 and November 1, 2020. PCR tests, hospital bed-days, ICU bed-days, and self-isolation days are rounded to the nearest 100. Cumulative self-isolation days are estimated in addition to the PCR-severe-only strategy.

Supplementary Table 3. One-way sensitivity analysis: PCR test sensitivity

PCR test sensitivity	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-any-symptom	10,000	411,525,000	-
	Self-screen	8,200	428,461,000	9,000
30%	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	9,500	682,393,000	dominated
	PCR-all-repeat	8,700	2,138,507,000	dominated
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
70% (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	5,600	364,723,000	-
	Self-screen	8,200	428,461,000	dominated
100%	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	5,300	620,470,000	796,000
	PCR-all-repeat	4,800	2,044,408,000	2,787,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-any-symptom	17,700	615,508,000	-
	Self-screen	14,100	636,392,000	6,000
30%	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all	16,700	907,022,000	dominated
	PCR-all-repeat	13,200	2,298,035,000	1,765,000
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
70% (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	7,200	434,448,000	-
	Self-screen	14,100	636,392,000	dominated
100%	PCR-all	6,700	684,401,000	482,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	5,100	2,058,743,000	844,000

Supplementary Table 3. One-way sensitivity analysis: PCR test sensitivity (continued)

PCR test sensitivity	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
	PCR-any-symptom	57,100	1,672,249,000	-
	Self-screen	46,500	1,753,092,000	8,000
30%	PCR-all	55,900	1,983,677,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	45,400	3,389,170,000	1,455,000
	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
70% (Base case)	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
	PCR-any-symptom	22,800	1,106,651,000	-
	PCR-all	21,600	1,283,524,000	dominated
100%	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	7,700	2,182,207,000	71,000

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 4. One-way sensitivity analysis: probability of test acceptance

Probability of test acceptance	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-any-symptom	9,900	436,988,000	-
	Self-screen	9,700	459,399,000	dominated
15%	PCR-all	9,100	491,224,000	69,000
	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all-repeat	8,900	753,288,000	1,056,000
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
80% (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	7,200	367,159,000	-
	Self-screen	8,200	401,933,000	dominated
100%	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	688,327,000	667,000
	PCR-all-repeat	5,800	2,498,184,000	1,952,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-any-symptom	17,800	724,979,000	-
	PCR-all	15,600	744,306,000	9,000
15%	Self-screen	19,100	759,127,000	dominated
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	15,100	975,257,000	433,000
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
80% (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	9,700	451,087,000	-
	Self-screen	13,700	590,578,000	dominated
100%	PCR-all	8,900	769,693,000	397,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,500	2,524,022,000	735,000

Supplementary Table 4. One-way sensitivity analysis: probability of test acceptance (continued)

Probability of test acceptance	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
15%	PCR-all	48,700	1,900,970,000	-
	PCR-any-symptom	52,600	1,954,317,000	dominated
	Self-screen	53,400	1,979,727,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	46,700	2,122,844,000	112,000
80% (Base case)	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
100%	PCR-any-symptom	31,800	1,202,513,000	-
	PCR-all	31,300	1,508,234,000	dominated
	Self-screen	44,500	1,636,131,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	13,100	2,813,003,000	86,000

Abbreviations: PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 5. One-way sensitivity analysis: transmission reduction after a positive PCR test result

Transmission reduction after a positive PCR test result	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-any-symptom	8,500	421,061,000	-
	PCR-severe-only	9,100	441,061,000	dominated
33%	Self-screen	10,300	470,241,000	dominated
	PCR-all	8,700	705,742,000	dominated
	PCR-all-repeat	7,600	2,152,299,000	1,944,000
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
65% (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	6,500	347,653,000	-
	Self-screen	7,200	373,539,000	dominated
100%	PCR-severe-only	9,100	441,061,000	dominated
	PCR-all	5,700	601,207,000	292,000
	PCR-all-repeat	5,000	2,025,288,000	2,168,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-any-symptom	14,700	643,452,000	-
	PCR-severe-only	16,200	695,062,000	dominated
33%	Self-screen	19,900	810,658,000	dominated
	PCR-all	14,700	911,003,000	dominated
	PCR-all-repeat	11,000	2,297,888,000	447,000
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
65% (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	8,000	404,249,000	-
	Self-screen	10,700	490,688,000	dominated
100%	PCR-all	6,700	645,776,000	188,000
	PCR-severe-only	16,200	695,062,000	dominated
	PCR-all-repeat	5,200	2,037,436,000	935,000

Supplementary Table 5. One-way sensitivity analysis: transmission reduction after a positive PCR test result (continued)

Transmission reduction after a positive PCR test result	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
33%	PCR-any-symptom	47,600	1,775,535,000	-
	PCR-severe-only	49,900	1,845,785,000	dominated
	Self-screen	53,900	1,999,246,000	dominated
	PCR-all	47,500	2,055,836,000	dominated
	PCR-all-repeat	37,400	3,386,787,000	158,000
65% (Base case)	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
100%	PCR-any-symptom	23,900	949,753,000	-
	PCR-all	20,000	1,105,802,000	40,000
	Self-screen	36,800	1,348,219,000	dominated
	PCR-severe-only	49,900	1,845,785,000	dominated
	PCR-all-repeat	6,500	2,093,001,000	73,000

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 6. One-way sensitivity analysis: percent of people with severe disease presenting to hospital

Number of severe disease presentations to hospital	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
50%	PCR-any-symptom	10,000	298,716,000	-
	Self-screen	12,900	299,028,000	dominated
	PCR-severe-only	15,700	332,235,000	dominated
	PCR-all	9,800	577,967,000	dominated
	PCR-all-repeat	8,700	1,991,091,000	1,317,000
80% (Base case)	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
100%	PCR-any-symptom	5,700	440,307,000	-
	Self-screen	5,800	498,864,000	dominated
	PCR-severe-only	6,700	559,875,000	dominated
	PCR-all	5,300	702,901,000	620,000
	PCR-all-repeat	4,400	2,124,859,000	1,584,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
50%	PCR-any-symptom	14,200	372,635,000	-
	Self-screen	21,700	433,489,000	dominated
	PCR-severe-only	30,000	537,170,000	dominated
	PCR-all	13,800	646,906,000	dominated
	PCR-all-repeat	9,900	2,026,449,000	387,000
80% (Base case)	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
100%	PCR-any-symptom	8,300	575,575,000	-
	Self-screen	9,400	756,588,000	dominated
	PCR-all	7,200	824,862,000	229,000
	PCR-severe-only	13,300	962,465,000	dominated
	PCR-all-repeat	4,900	2,173,536,000	581,000

Supplementary Table 6. One-way sensitivity analysis: percent of people with severe disease presenting to hospital (continued)

Number of severe disease presentations to hospital	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
50%	PCR-any-symptom	51,600	1,015,751,000	-
	Self-screen	72,100	1,119,555,000	dominated
	PCR-severe-only	82,400	1,285,021,000	dominated
	PCR-all	50,300	1,296,937,000	dominated
	PCR-all-repeat	23,900	2,324,640,000	47,000
80% (Base case)	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
100%	PCR-any-symptom	28,000	1,684,293,000	-
	PCR-all	26,100	1,877,432,000	dominated
	Self-screen	31,100	2,174,489,000	dominated
	PCR-severe-only	36,200	2,473,379,000	dominated
	PCR-all-repeat	11,500	2,643,654,000	58,000

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 7. One-way sensitivity analysis: probability of surviving an intensive care unit admission

Probability of ICU survival	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
20%	PCR-any-symptom	11,100	525,880,000	-
	Self-screen	13,900	558,077,000	dominated
	PCR-severe-only	15,800	639,645,000	dominated
	PCR-all	10,500	783,218,000	446,000
	PCR-all-repeat	9,300	2,204,169,000	1,145,000
40% (Base case)	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
80%	PCR-any-symptom	5,700	354,902,000	-
	Self-screen	6,200	387,986,000	dominated
	PCR-severe-only	7,500	422,140,000	dominated
	PCR-all	5,100	626,647,000	409,000
	PCR-all-repeat	4,300	2,034,145,000	1,928,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
20%	PCR-any-symptom	15,600	654,937,000	-
	Self-screen	22,400	790,654,000	dominated
	PCR-all	15,000	883,490,000	dominated
	PCR-severe-only	29,600	988,997,000	dominated
	PCR-all-repeat	11,200	2,263,925,000	367,000
40% (Base case)	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
80%	PCR-any-symptom	8,700	470,461,000	-
	Self-screen	10,800	579,369,000	dominated
	PCR-all	7,300	720,416,000	179,000
	PCR-severe-only	15,100	752,231,000	dominated
	PCR-all-repeat	5,300	2,074,658,000	670,000

Supplementary Table 7. One-way sensitivity analysis: probability of surviving an intensive care unit admission (continued)

Probability of ICU survival	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
20%	PCR-any-symptom	53,300	1,664,966,000	-
	PCR-all	50,900	1,839,231,000	dominated
	Self-screen	69,400	2,015,926,000	dominated
	PCR-severe-only	79,600	2,389,770,000	dominated
	PCR-all-repeat	24,600	2,694,990,000	36,000
40% (Base case)	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
80%	PCR-any-symptom	29,700	1,326,919,000	-
	PCR-all	27,700	1,572,729,000	dominated
	Self-screen	35,900	1,619,166,000	dominated
	PCR-severe-only	42,800	1,897,369,000	dominated
	PCR-all-repeat	12,900	2,474,891,000	68,000

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number; ICU, Intensive care unit; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 8. One-way sensitivity analysis: PCR test cost

PCR test cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-all	6,700	345,849,000	-
	PCR-any-symptom	7,300	350,249,000	dominated
$3	PCR-all-repeat	5,800	382,881,000	40,000
	Self-screen	8,200	403,075,000	dominated
	PCR-severe-only	10,100	467,144,000	dominated
	PCR-any-symptom	7,300	352,496,000	-
	PCR-all	6,700	362,073,000	14,000
$5	Self-screen	8,200	404,409,000	dominated
	PCR-severe-only	10,100	468,478,000	dominated
	PCR-all-repeat	5,800	471,568,000	119,000
	PCR-any-symptom	7,300	359,256,000	-
	Self-screen	8,200	408,419,000	dominated
$13	PCR-all	6,700	410,872,000	78,000
	PCR-severe-only	10,100	472,492,000	dominated
	PCR-all-repeat	5,800	738,323,000	356,000
	PCR-any-symptom	7,300	370,519,000	-
	Self-screen	8,200	415,101,000	dominated
$26	PCR-severe-only	10,100	479,180,000	dominated
	PCR-all	6,700	492,183,000	183,000
	PCR-all-repeat	5,800	1,182,797,000	751,000
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
$51 (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	7,300	438,081,000	-
	Self-screen	8,200	455,185,000	dominated
$103	PCR-severe-only	10,100	519,299,000	dominated
	PCR-all	6,700	979,920,000	816,000
	PCR-all-repeat	5,800	3,848,953,000	3,119,000

Supplementary Table 8. One-way sensitivity analysis: PCR test cost (continued)

PCR test cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-all-repeat	6,800	414,669,000	-
	PCR-all	9,700	450,441,000	dominated
$3	PCR-any-symptom	11,100	456,183,000	dominated
	Self-screen	14,100	610,806,000	dominated
	PCR-severe-only	20,100	806,205,000	dominated
	PCR-any-symptom	11,100	458,825,000	-
	PCR-all	9,700	467,139,000	6,000
$5	PCR-all-repeat	6,800	503,786,000	13,000
	Self-screen	14,100	612,149,000	dominated
	PCR-severe-only	20,100	807,562,000	dominated
	PCR-any-symptom	11,100	466,773,000	-
	PCR-all	9,700	517,364,000	35,000
$13	Self-screen	14,100	616,192,000	dominated
	PCR-all-repeat	6,800	771,836,000	89,000
	PCR-severe-only	20,100	811,641,000	dominated
	PCR-any-symptom	11,100	480,015,000	-
	PCR-all	9,700	601,050,000	84,000
$26	Self-screen	14,100	622,927,000	dominated
	PCR-severe-only	20,100	818,439,000	dominated
	PCR-all-repeat	6,800	1,218,469,000	215,000
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
$51 (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	11,100	559,449,000	-
	Self-screen	14,100	663,327,000	dominated
$103	PCR-severe-only	20,100	859,213,000	dominated
	PCR-all	9,700	1,103,038,000	376,000
	PCR-all-repeat	6,800	3,897,571,000	974,000

Supplementary Table 8. One-way sensitivity analysis: PCR test cost (continued)

PCR test cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
	PCR-all-repeat	16,600	748,987,000	-
	PCR-all	36,000	1,279,395,000	dominated
$3	PCR-any-symptom	37,600	1,310,926,000	dominated
	Self-screen	46,500	1,726,475,000	dominated
	PCR-severe-only	55,000	1,983,651,000	dominated
	PCR-all-repeat	16,600	842,660,000	-
	PCR-all	36,000	1,300,116,000	dominated
$5	PCR-any-symptom	37,600	1,316,730,000	dominated
	Self-screen	46,500	1,727,873,000	dominated
	PCR-severe-only	55,000	1,985,062,000	dominated
	PCR-all-repeat	16,600	1,124,411,000	-
	PCR-any-symptom	37,600	1,334,187,000	dominated
$13	PCR-all	36,000	1,362,442,000	dominated
	Self-screen	46,500	1,732,078,000	dominated
	PCR-severe-only	55,000	1,989,304,000	dominated
	PCR-any-symptom	37,600	1,363,275,000	-
	PCR-all	36,000	1,466,292,000	dominated
$26	PCR-all-repeat	16,600	1,593,873,000	11,000
	Self-screen	46,500	1,739,084,000	dominated
	PCR-severe-only	55,000	1,996,374,000	dominated
	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
$51 (Base case)	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
	PCR-any-symptom	37,600	1,537,754,000	-
	Self-screen	46,500	1,781,111,000	dominated
$103	PCR-severe-only	55,000	2,038,780,000	dominated
	PCR-all	36,000	2,089,231,000	dominated
	PCR-all-repeat	16,600	4,409,916,000	137,000

Supplementary Table 9. One-way sensitivity analysis: varying the costs of PCR Test (continued)

Abbreviations: No. Number; PCR, Polymerase chain reaction; Re, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.
[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 9. One-way sensitivity analysis: additional cost of offering a PCR test

Added cost of offering PCR test	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
$0 (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	7,300	393,607,000	-
	Self-screen	8,200	428,800,000	dominated
$3	PCR-severe-only	10,100	492,890,000	dominated
	PCR-all	6,700	658,860,000	399,000
	PCR-all-repeat	5,800	2,093,919,000	1,560,000
	PCR-any-symptom	7,300	394,463,000	-
	Self-screen	8,200	429,307,000	dominated
$7	PCR-severe-only	10,100	493,399,000	dominated
	PCR-all	6,700	665,039,000	407,000
	PCR-all-repeat	5,800	2,127,696,000	1,590,000
	PCR-any-symptom	7,300	398,743,000	-
	Self-screen	8,200	431,846,000	dominated
$26	PCR-severe-only	10,100	495,940,000	dominated
	PCR-all	6,700	695,935,000	447,000
	PCR-all-repeat	5,800	2,296,583,000	1,740,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
$0 (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	11,100	507,160,000	-
	Self-screen	14,100	636,733,000	dominated
$3	PCR-all	9,700	772,598,000	184,000
	PCR-severe-only	20,100	832,373,000	dominated
	PCR-all-repeat	6,800	2,134,015,000	475,000

Supplementary Table 9. One-way sensitivity analysis: additional cost of offering a PCR test (continued)

Added cost of offering PCR test	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Intermediate scenario (June 1, 2020 R_e 1.3) (continued)				
	PCR-any-symptom	11,100	508,167,000	-
	Self-screen	14,100	637,245,000	dominated
$7	PCR-all	9,700	778,957,000	187,000
	PCR-severe-only	20,100	832,889,000	dominated
	PCR-all-repeat	6,800	2,167,956,000	484,000
	PCR-any-symptom	11,100	513,198,000	-
	Self-screen	14,100	639,804,000	dominated
$26	PCR-all	9,700	810,756,000	206,000
	PCR-severe-only	20,100	835,472,000	dominated
	PCR-all-repeat	6,800	2,337,662,000	532,000
Surging scenario (June 1, 2020 R_e 2.0)				
	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
$0 (Base case)	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
	PCR-any-symptom	37,600	1,422,901,000	-
	PCR-all	36,000	1,679,173,000	dominated
$3	Self-screen	46,500	1,753,446,000	dominated
	PCR-severe-only	55,000	2,010,865,000	dominated
	PCR-all-repeat	16,600	2,556,216,000	54,000
	PCR-any-symptom	37,600	1,425,111,000	-
	PCR-all	36,000	1,687,065,000	dominated
$7	Self-screen	46,500	1,753,979,000	dominated
	PCR-severe-only	55,000	2,011,403,000	dominated
	PCR-all-repeat	16,600	2,591,893,000	56,000
	PCR-any-symptom	37,600	1,436,164,000	-
	PCR-all	36,000	1,726,524,000	dominated
$26	Self-screen	46,500	1,756,641,000	dominated
	PCR-severe-only	55,000	2,014,089,000	dominated
	PCR-all-repeat	16,600	2,770,274,000	64,000

Supplementary Table 9. One-way sensitivity analysis: additional cost of offering a PCR test (continued)

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 10. One-way sensitivity analysis: hospital bed-day cost

Hospital bed-day cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-any-symptom	7,300	306,859,000	-
	Self-screen	8,200	327,799,000	dominated
$820	PCR-severe-only	10,100	378,417,000	dominated
	PCR-all	6,700	572,495,000	400,000
	PCR-all-repeat	5,800	1,998,760,000	1,551,000
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
$1,640 (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	7,300	565,392,000	-
	Self-screen	8,200	629,785,000	dominated
$3,280	PCR-severe-only	10,100	720,820,000	dominated
	PCR-all	6,700	819,231,000	382,000
	PCR-all-repeat	5,800	2,216,680,000	1,519,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-any-symptom	11,100	392,812,000	-
	Self-screen	14,100	483,859,000	dominated
$820	PCR-severe-only	20,100	628,715,000	dominated
	PCR-all	9,700	661,333,000	186,000
	PCR-all-repeat	6,800	2,030,467,000	477,000
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
$1,640 (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	11,100	733,845,000	-
	Self-screen	14,100	941,457,000	dominated
$3,280	PCR-all	9,700	982,408,000	172,000
	PCR-severe-only	20,100	1,238,655,000	dominated
	PCR-all-repeat	6,800	2,273,227,000	450,000

Supplementary Table 10. One-way sensitivity analysis: hospital bed-day cost (continued)

Hospital bed-day cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
	PCR-any-symptom	37,600	1,086,430,000	-
	Self-screen	46,500	1,310,778,000	dominated
$820	PCR-all	36,000	1,348,190,000	dominated
	PCR-severe-only	55,000	1,508,073,000	dominated
	PCR-all-repeat	16,600	2,364,582,000	61,000
	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
$1,640 (Base case)	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
	PCR-any-symptom	37,600	2,091,421,000	-
	PCR-all	36,000	2,325,355,000	dominated
$3,280	Self-screen	46,500	2,637,719,000	dominated
	PCR-all-repeat	16,600	2,868,132,000	dominated
	PCR-severe-only	55,000	3,015,376,000	37,000

Abbreviations: No., Number; PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 11. One-way sensitivity analysis: intensive care unit bed-day cost

ICU bed-day cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
	PCR-any-symptom	7,300	305,251,000	-
	Self-screen	8,200	328,292,000	dominated
$1,340	PCR-severe-only	10,100	373,828,000	dominated
	PCR-all	6,700	572,236,000	402,000
	PCR-all-repeat	5,800	1,997,144,000	1,549,000
	PCR-any-symptom	7,300	393,037,000	-
	Self-screen	8,200	428,461,000	dominated
$2,680 (Base case)	PCR-severe-only	10,100	492,552,000	dominated
	PCR-all	6,700	654,741,000	394,000
	PCR-all-repeat	5,800	2,071,400,000	1,540,000
	PCR-any-symptom	7,300	568,673,000	-
	Self-screen	8,200	628,873,000	dominated
$5,370	PCR-severe-only	10,100	730,087,000	dominated
	PCR-all	6,700	819,811,000	378,000
	PCR-all-repeat	5,800	2,219,968,000	1,522,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
	PCR-any-symptom	11,100	393,444,000	-
	Self-screen	14,100	484,253,000	dominated
$1,340	PCR-severe-only	20,100	632,994,000	dominated
	PCR-all	9,700	658,585,000	183,000
	PCR-all-repeat	6,800	2,029,736,000	478,000
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
$2,680 (Base case)	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	11,100	732,664,000	-
	Self-screen	14,100	940,783,000	dominated
$5,370	PCR-all	9,700	987,985,000	177,000
	PCR-severe-only	20,100	1,230,246,000	dominated
	PCR-all-repeat	6,800	2,274,750,000	449,000

Supplementary Table 11. One-way sensitivity analysis: intensive care unit bed-day cost (continued)

ICU bed-day cost	Strategy	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)				
	PCR-any-symptom	37,600	1,103,992,000	-
	Self-screen	46,500	1,333,026,000	dominated
$1,340	PCR-all	36,000	1,370,450,000	dominated
	PCR-severe-only	55,000	1,522,006,000	dominated
	PCR-all-repeat	16,600	2,372,868,000	61,000
	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
$2,680 (Base case)	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000
	PCR-any-symptom	37,600	2,056,533,000	-
	PCR-all	36,000	2,281,061,000	dominated
$5,370	Self-screen	46,500	2,593,535,000	dominated
	PCR-all-repeat	16,600	2,851,680,000	38,000
	PCR-severe-only	55,000	2,987,874,000	dominated

Abbreviations: No., Number; ICU, Intensive care unit; PCR, Polymerase chain reaction; R_e, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 12. Scenario analysis: R_e threshold for cost-effectiveness of PCR-all-repeat testing strategy

R_e	Strategy	Total quality-adjusted life-years lost [a]	Healthcare cost, $ [a]	ICER, $/QALY [b]
	PCR-any-symptom	11,100	506,489,000	-
	Self-screen	14,100	636,392,000	dominated
1.3	PCR-all	9,700	768,358,000	181,000
	PCR-severe-only	20,100	832,028,000	dominated
	PCR-all-repeat	6,800	2,111,387,000	468,000
	PCR-any-symptom	12,900	563,940,000	-
	Self-screen	17,600	751,489,000	dominated
1.4	PCR-all	11,500	822,263,000	186,000
	PCR-severe-only	24,700	997,869,000	dominated
	PCR-all-repeat	7,500	2,135,526,000	327,000
	PCR-any-symptom	14,800	641,247,000	-
	Self-screen	20,800	864,182,000	dominated
1.5	PCR-all	13,300	885,507,000	163,000
	PCR-severe-only	29,100	1,150,596,000	dominated
	PCR-all-repeat	7,900	2,164,444,000	238,000
	PCR-any-symptom	17,900	776,738,000	-
	PCR-all	16,300	992,658,000	136,000
1.6	Self-screen	27,100	1,054,899,000	dominated
	PCR-severe-only	35,300	1,359,162,000	dominated
	PCR-all-repeat	8,800	2,187,983,000	159,000
	PCR-any-symptom	21,400	867,633,000	-
	PCR-all	19,800	1,094,131,000	dominated
1.7	Self-screen	30,100	1,162,715,000	dominated
	PCR-severe-only	39,700	1,507,097,000	dominated
	PCR-all-repeat	9,700	2,237,080,000	117,000
	PCR-any-symptom	26,900	1,037,823,000	-
	PCR-all	24,200	1,261,625,000	83,000
1.8	Self-screen	36,700	1,382,196,000	dominated
	PCR-severe-only	45,500	1,690,743,000	dominated
	PCR-all-repeat	12,100	2,327,317,000	88,000

Supplementary Table 12. Scenario analysis: R_e threshold for cost-effectiveness of PCR-all-repeat testing strategy (continued)

R_e	Strategy	Total quality-adjusted life-years lost [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
1.9	PCR-any-symptom	31,000	1,210,192,000	-
	PCR-all	29,200	1,430,673,000	dominated
	Self-screen	41,600	1,578,223,000	dominated
	PCR-severe-only	50,400	1,864,492,000	dominated
	PCR-all-repeat	13,200	2,398,244,000	67,000
2.0	PCR-any-symptom	37,600	1,421,427,000	-
	PCR-all	36,000	1,673,911,000	dominated
	Self-screen	46,500	1,753,092,000	dominated
	PCR-severe-only	55,000	2,010,507,000	dominated
	PCR-all-repeat	16,600	2,532,432,000	53,000

Abbreviations: PCR, Polymerase chain reaction; Re, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Quality-adjusted life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 13. Sensitivity analysis for PCR-all-repeat testing: Frequency of retesting those with no observed symptoms (surging scenario: R_e 2.0)

Frequency	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Surging scenario (June 1, 2020 R_e 2.0)			
PCR-any-symptom	37,600	1,421,427,000	-
30 Days (Base case) PCR-all-repeat	16,600	2,532,432,000	53,000
14 days PCR-all-repeat	15,600	4,406,890,000	1,783,000
7 days PCR-all-repeat	13,500	7,922,086,000	1,702,000

Abbreviations: No., Number; PCR, Polymerase chain reaction; Re, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 14. Scenario analysis: varying COVID-19-like illness probability

COVID-19-like illness rate	Strategy	PCR tests/simulation day, mean [a]	PCR tests, total [a,b]	Cumulative duration of self-isolation days	Total life-years lost, n [a,b,c]	Healthcare costs, $ [a]	ICER, $/QALY [d]
Slowing scenario (June 1, 2020 R_e 0.9)							
Summer COVID-19-like illness probability	PCR-any-symptom	2,400	440,800	0.3	7,400	360,717,000	-
	Self-screen	100	18,800	0.6	8,100	396,450,000	dominated
	PCR-severe-only	100	21,000	-	10,400	454,504,000	dominated
	PCR-all	32,800	5,905,900	0.3	6,600	626,561,000	347,000
	PCR-all-repeat	188,400	33,919,800	0.3	6,100	2,045,806,000	2,946,000
0.5x	PCR-any-symptom	3,300	599,300	0.3	7,400	362,303,000	-
	Self-screen	1,500	267,100	0.5	8,500	407,442,000	dominated
	PCR-severe-only	1,500	270,000	-	10,000	461,160,000	dominated
	PCR-all	33,700	6,057,600	0.3	7,100	628,832,000	830,000
	PCR-all-repeat	189,900	34,176,400	0.3	5,900	2,048,797,000	1,255,000
1x (Base case)	PCR-any-symptom	4,900	877,900	0.3	7,300	393,037,000	-
	Self-screen	2,900	520,800	0.5	8,200	428,461,000	dominated
	PCR-severe-only	2,900	521,300	-	10,100	492,552,000	dominated
	PCR-all	35,200	6,337,500	0.3	6,700	654,741,000	394,000
	PCR-all-repeat	192,500	34,643,400	0.3	5,800	2,071,400,000	1,540,000
2x	PCR-any-symptom	8,000	1,435,300	0.3	7,300	411,805,000	-
	Self-screen	5,700	1,028,000	0.6	8,700	443,900,000	dominated
	PCR-severe-only	5,700	1,027,200	-	10,400	495,648,000	dominated
	PCR-all	38,300	6,890,400	0.3	6,600	673,087,000	407,000
	PCR-all-repeat	197,400	35,525,200	0.3	5,900	2,120,089,000	1,963,000
Intermediate scenario (June 1, 2020 R_e 1.3)							
Summer COVID-19-like illness probability	PCR-any-symptom	3,300	589,500	0.4	11,000	463,649,000	-
	Self-screen	100	25,900	0.9	14,100	596,568,000	dominated
	PCR-all	33,800	6,080,200	0.4	9,700	733,170,000	204,000
	PCR-severe-only	200	32,800	-	20,400	797,849,000	dominated
	PCR-all-repeat	189,400	34,091,400	0.4	6,900	2,088,947,000	490,000
0.5x	PCR-any-symptom	4,200	751,600	0.4	11,000	482,510,000	-
	Self-screen	1,500	273,000	0.9	15,200	633,509,000	dominated
	PCR-all	34,600	6,235,400	0.4	10,100	737,667,000	269,000
	PCR-severe-only	1,500	278,200	-	19,800	808,458,000	dominated
	PCR-all-repeat	190,800	34,346,800	0.4	7,000	2,092,276,000	443,000

Supplementary Table 14. Scenario analysis: varying COVID-19-like illness rates (continued)

COVID-19-like illness rate	Strategy	PCR tests/simulation day, mean [a]	PCR tests, total [a,b]	Cumulative duration of self-isolation days	Total life-years lost, n [a,b,c]	Healthcare costs, $ [a,b]	ICER, $/QALY [d]
Intermediate scenario (June 1, 2020 R_e 1.3) (continued)							
1x (Base case)	PCR-any-symptom	5,700	1,032,100	0.4	11,100	506,489,000	-
	Self-screen	2,900	524,900	0.9	14,100	636,392,000	dominated
	PCR-all	36,200	6,522,700	0.4	9,700	768,358,000	181,000
	PCR-severe-only	2,900	529,800	-	20,100	832,028,000	dominated
	PCR-all-repeat	193,400	34,811,600	0.4	6,800	2,111,387,000	468,000
2x	PCR-any-symptom	8,800	1,588,700	0.4	10,900	531,735,000	-
	Self-screen	5,700	1,028,200	1	14,800	658,703,000	dominated
	PCR-all	39,200	7,059,800	0.4	9,900	779,216,000	259,000
	PCR-severe-only	5,700	1,026,700	-	20,000	841,120,000	dominated
	PCR-all-repeat	198,200	35,684,600	0.4	6,900	2,155,479,000	461,000
Surging scenario (June 1, 2020 R_e 2.0)							
Summer COVID-19-like illness rate	PCR-any-symptom	10,200	1,828,900	1.4	37,600	1,386,897,000	-
	PCR-all	42,700	7,680,500	1.4	35,300	1,631,017,000	dominated
	Self-screen	300	62,800	2.9	45,900	1,716,795,000	dominated
	PCR-severe-only	400	71,100	-	56,000	1,994,972,000	dominated
	PCR-all-repeat	198,900	35,796,200	1.1	16,300	2,475,968,000	51,000
0.5x	PCR-any-symptom	11,000	1,983,700	1.4	38,200	1,384,809,000	-
	PCR-all	43,400	7,810,500	1.4	35,000	1,609,425,000	dominated
	Self-screen	1,700	301,200	2.8	47,200	1,712,068,000	dominated
	PCR-severe-only	1,700	309,400	-	55,300	1,992,291,000	dominated
	PCR-all-repeat	200,500	36,091,500	1.1	16,500	2,488,751,000	51,000
1x Base case	PCR-any-symptom	12,600	2,267,100	1.4	37,600	1,421,427,000	-
	PCR-all	45,000	8,094,300	1.4	36,000	1,673,911,000	dominated
	Self-screen	3,000	546,100	2.8	46,500	1,753,092,000	dominated
	PCR-severe-only	3,100	551,000	-	55,000	2,010,507,000	dominated
	PCR-all-repeat	203,300	36,591,000	1.1	16,600	2,532,432,000	53,000

Supplementary Table 14. Scenario analysis: varying COVID-19-like illness rates (continued)

COVID-19-like illness rate	Strategy	PCR tests/simulation day, mean [a]	PCR tests, total [a,b]	Cumulative duration of self-isolation days	Total life-years lost, n [a,b,c]	Healthcare costs, $ [a,b]	ICER, $/QALY [d]
Surging scenario (June 1, 2020 R_e 2.0) (continued)							
	PCR-any-symptom	15,600	2,804,700	1.4	37,900	1,444,124,000	-
	PCR-all	47,800	8,597,500	1.4	34,600	1,653,707,000	dominated
2x	Self-screen	5,700	1,030,900	2.9	46,900	1,757,094,000	dominated
	PCR-severe-only	5,700	1,031,100	-	55,100	2,021,166,000	dominated
	PCR-all-repeat	207,400	37,337,300	1.1	15,500	2,561,095,000	50,000

Abbreviations: PCR, Polymerase chain reaction; $, US Dollar; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-year; R_e, Effective reproduction number

[a] Tests, deaths, and life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.
[b] Includes six-month time horizon between simulated days May 1, 2020 and November 1, 2020.
[c] Changes in COVID-19 -like illness do not vary with mortality; small variations may be seen in individual model runs.
[d] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 15. Scenario analysis: estimates of life-years lost per death due to COVID-19

Quality-adjusted life-years lost per death	Strategy	Incident infections, No. [a]	Deaths, No. [a]	Total life-years lost, No. [a]	Healthcare costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)						
3.18 (Base case)	PCR-any-symptom	316,300	2,300	7,300	393,037,000	-
	Self-screen	422,200	2,600	8,200	428,461,000	dominated
	PCR-severe-only	565,300	3,200	10,100	492,552,000	dominated
	PCR-all	281,000	2,100	6,700	654,741,000	394,000
	PCR-all-repeat	210,200	1,800	5,800	2,071,400,000	1,540,000
5.61	PCR-any-symptom	316,300	2,300	13,000	393,037,000	-
	Self-screen	422,200	2,600	14,400	428,461,000	dominated
	PCR-severe-only	565,300	3,200	17,800	492,552,000	dominated
	PCR-all	281,000	2,100	11,800	654,741,000	223,000
	PCR-all-repeat	210,200	1,800	10,200	2,071,400,000	872,000
Intermediate scenario (June 1, 2020 R_e 1.3)						
3.18 (Base case)	PCR-any-symptom	604,600	3,500	11,100	506,489,000	-
	Self-screen	975,200	4,400	14,100	636,392,000	dominated
	PCR-all	543,900	3,000	9,700	768,358,000	181,000
	PCR-severe-only	1,471,100	6,300	20,100	832,028,000	dominated
	PCR-all-repeat	298,300	2,100	6,800	2,111,387,000	468,000
5.61	PCR-any-symptom	604,600	3,500	19,600	506,489,000	-
	Self-screen	975,200	4,400	24,900	636,392,000	dominated
	PCR-all	543,900	3,000	17,000	768,358,000	103,000
	PCR-severe-only	1,471,100	6,300	35,600	832,028,000	dominated
	PCR-all-repeat	298,300	2,100	12,000	2,111,387,000	265,000
Surging scenario (June 1, 2020 R_e 2.0)						
3.18 (Base case)	PCR-any-symptom	2,924,200	11,800	37,600	1,421,427,000	-
	PCR-all	2,799,400	11,300	36,000	1,673,911,000	dominated
	Self-screen	3,666,900	14,700	46,500	1,753,092,000	dominated
	PCR-severe-only	4,193,800	17,300	55,000	2,010,507,000	dominated
	PCR-all-repeat	1,232,500	5,200	16,600	2,532,432,000	53,000
5.61	PCR-any-symptom	2,924,200	11,800	66,400	1,421,427,000	-
	PCR-all	2,799,400	11,300	63,600	1,673,911,000	dominated
	Self-screen	3,666,900	14,700	82,200	1,753,092,000	dominated
	PCR-severe-only	4,193,800	17,300	97,100	2,010,507,000	dominated
	PCR-all-repeat	1,232,500	5,200	29,400	2,532,432,000	30,000

Supplementary Table 15. Scenario analysis: estimates of life-years lost per death due to COVID-19 (continued)

Abbreviations: No., Number; PCR, Polymerase chain reaction; Re, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Incident infection, deaths, and life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.
[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

Supplementary Table 16. Scenario analysis: incremental cost-effectiveness ratios incorporating costs related to productivity losses and averted COVID-19-related mortality

Strategy	Deaths, No. [a]	Total life-years lost, No. [a]	Total costs, $ [a]	ICER, $/QALY [b]
Slowing scenario (June 1, 2020 R_e 0.9)				
Healthcare sector costs (Base case)				
PCR-any-symptom	2,300	7,300	393,037,000	-
Self-screen	2,600	8,200	428,461,000	dominated
PCR-severe-only	3,200	10,100	492,552,000	dominated
PCR-all	2,100	6,700	654,741,000	394,000
PCR-all-repeat	1,800	5,800	2,071,400,000	1,540,000
Healthcare sector + lost productivity costs				
PCR-severe-only	3,200	10,100	508,086,000	-
PCR-any-symptom	2,300	7,300	616,454,000	40,000
Self-screen	2,600	8,200	867,490,000	dominated
PCR-all	2,100	6,700	897,965,000	424,000
PCR-all-repeat	1,800	5,800	2,355,467,000	1,585,000
Healthcare sector + lost productivity + averted mortality costs				
PCR-severe-only	3,200	10,100	508,086,000	-
PCR-any-symptom	2,300	7,300	651,956,000	53,000
Self-screen	2,600	8,200	856,868,000	dominated
PCR-all	2,100	6,700	917,295,000	399,000
PCR-all-repeat	1,800	5,800	2,367,524,000	1,577,000
Intermediate scenario (June 1, 2020 R_e 1.3)				
Healthcare sector costs (Base case)				
PCR-any-symptom	3,500	11,100	506,489,000	-
Self-screen	4,400	14,100	636,392,000	dominated
PCR-all	3,000	9,700	768,358,000	181,000
PCR-severe-only	6,300	20,100	832,028,000	dominated
PCR-all-repeat	2,100	6,800	2,111,387,000	468,000
Healthcare sector + lost productivity costs				
PCR-any-symptom	3,500	11,100	835,157,000	-
PCR-severe-only	6,300	20,100	859,701,000	dominated
PCR-all	3,000	9,700	1,110,737,000	191,000
Self-screen	4,400	14,100	1,381,688,000	dominated
PCR-all-repeat	2,100	6,800	2,456,131,000	469,000

Supplementary Table 16. Scenario analysis: incremental cost-effectiveness ratios incorporating costs related to lost productivity and averted COVID-19-related mortality (continued)

Strategy	Deaths, No. [a]	Total life-years lost, No. [a]	Total costs, $ [a]	ICER, $/QALY [b]
Intermediate scenario (June 1, 2020 R_e 1.3) (continued)				
Healthcare sector + lost productivity + averted mortality costs				
PCR-severe-only	6,300	20,100	741,045,000	-
PCR-any-symptom	3,500	11,100	835,157,000	10,000
PCR-all	3,000	9,700	1,248,341,000	286,000
Self-screen	4,400	14,100	1,323,221,000	dominated
PCR-all-repeat	2,100	6,800	2,552,204,000	455,000
Surging scenario (June 1, 2020 Re 2.0)				
Healthcare sector costs (Base case)				
PCR-any-symptom	11,800	37,600	1,421,427,000	
Universal PCR	11,300	36,000	1,673,911,000	dominated
Self-screen	14,700	46,500	1,753,092,000	dominated
PCR-severe-only	17,300	55,000	2,010,507,000	dominated
PCR-all-repeat	5,200	16,600	2,532,432,000	53,000
Healthcare sector + lost productivity costs				
PCR-severe-only	17,300	55,000	2,078,894,000	-
PCR-any-symptom	14,700	46,500	2,573,740,000	dominated
PCR-all	11,800	37,600	2,837,965,000	30,000
PCR-all-repeat	11,300	36,000	3,439,898,000	dominated
Self-screen	5,200	16,600	4,062,357,000	63,000
Healthcare sector + lost productivity + averted mortality costs				
PCR-severe-only	17,300	55,000	2,799,638,000	-
PCR-any-symptom	11,800	37,600	3,066,548,000	15,000
PCR-all	11,300	36,000	3,309,817,000	dominated
PCR-all-repeat	5,200	16,600	3,657,882,000	dominated
Self-screen	14,700	46,500	4,672,483,000	dominated

Abbreviations: No., Number; PCR, Polymerase chain reaction; Re, Effective reproduction number; $, US dollars; ICER, Incremental cost-effectiveness ratio; QALY, Quality-adjusted life-years

[a] Deaths and life-years lost are rounded to the nearest 100. Costs are rounded to the nearest 1,000.

Supplementary Table 16. Scenario analysis: incremental cost-effectiveness ratios incorporating costs related to productivity losses and averted COVID-19-related mortality (continued)

[b] Incremental cost effectiveness ratios are calculated by dividing the difference in total life-years lost by the difference in total healthcare-related costs compared to the next most expensive strategy. Dominated strategies are either more expensive and less effective (strong dominance) or more expensive and more effective but a less efficient than a subsequent strategy (weak dominance). Strategies are listed in order of increasing cost as per cost-effectiveness analysis convention.

SUPPLEMENTARY FIGURE LEGENDS

Supplementary Figure 1. Flow diagrams: Modeled SARS-CoV-2 testing strategies

Five population-based testing strategies: 1) PCR-severe-only: PCR testing only patients with severe/critical symptoms (*i.e.*, warranting hospital care); 2)Self-screen: PCR-severe-only and individuals self-assess the presence of COVID-19-consistent symptoms, using available smartphone applications or websites and self-isolate if positive; 3) PCR-any-symptom: PCR-severe-only and PCR for people with any COVID-19-consistent symptoms who self-isolate if positive; 4) PCR-all: PCR-any-symptom and a one-time PCR for the entire population n; 5) PCR-all-repeat: PCR-all and re-testing every 30 days of those who test negative and remain asymptomatic. We assumed that a positive test leads to self-isolation (more effective than symptom-based self-isolation). For all strategies, those with severe or critical illness are sent to the hospital for evaluation and management.

Abbreviations: R_e, Effective reproduction number; PCR, polymerase chain reaction; Sx, symptom

Supplementary Figure 2. Health state transitions for a model of COVID-19 disease and testing

When infected, individuals face daily age-stratified probabilities of disease progression through seven health states, including latent infection, asymptomatic illness, mild/moderate illness, severe illness (warranting hospitalization), critical illness (warranting intensive care), recuperation, and recovery. While in the critical state, individuals face daily age-stratified probabilities of COVID-19-related death. Individuals transition to "recovered" when they no longer experience symptoms and pose no risk of transmitting to others. We assume recovered individuals are immune from repeat infection for the 180-day modeled horizon.

Abbreviations: Asympt., Asymptomatic; Mild/Mod., Mild/moderate

Supplementary Figure 3. One-way sensitivity analyses: Incident SARS-CoV-2 infections (2A-C) and mortality (2D-F) over 180 days in Massachusetts

The thick gray bars represent base case projections of incident infections (panels A-C) or mortality (panels D-F) for the PCR-severe-only and the 5 testing strategies. Each colored bar represents a one-way sensitivity analysis in which a key parameter was varied. The width of each bar indicates the relative sensitivity of model results to that parameter. The figure key lists the parameters that were varied, as well as the range through which each was varied in parentheses. Panels A and D represent slowing scenario in which the effective reproduction number (R_e) on June 1 is 0.9. Panels B and E represent an intermediate scenario in which R_e on June 1 is 1.3, and panels C and F represent a surging scenario in which R_e on June 1 is 2.0.

Abbreviations: R_e, Effective reproduction number

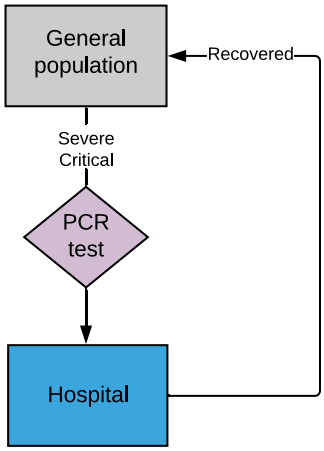
Supplementary Figure 4. Two-way sensitivity analyses: PCR test cost and additional cost of offering a PCR test

In this two-way sensitivity analysis, PCR test cost and cost of offering the PCR test were varied. Incremental cost-effectiveness ratios (ICERs) are reported in $/QALY for PCR-all testing versus the next least costly strategy at R_e 0.9 and PCR-all-repeat testing versus the next least costly strategy at R_e 2.0. The "X" represents the base case.

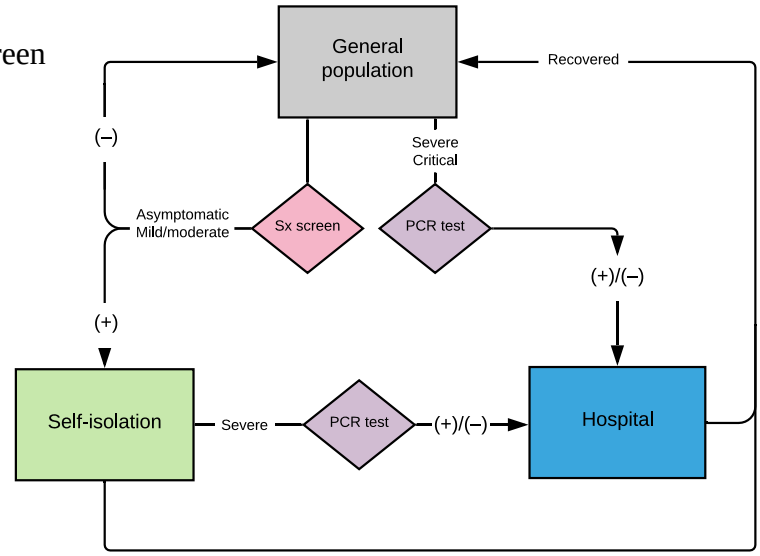
Abbreviations: R_e, Effective reproduction number; PCR: Polymerase chain reaction

Supplementary Figure 1. Flow diagrams: Modeled SARS-CoV-2 testing strategies

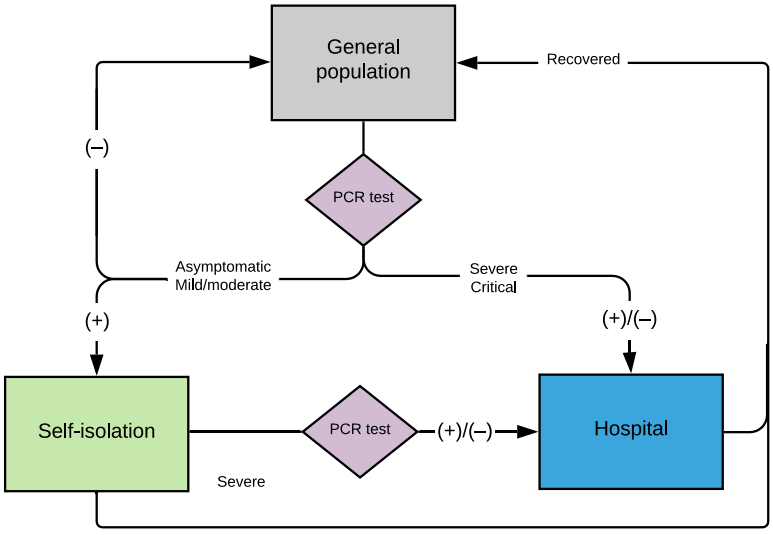
A. PCR-severe-only



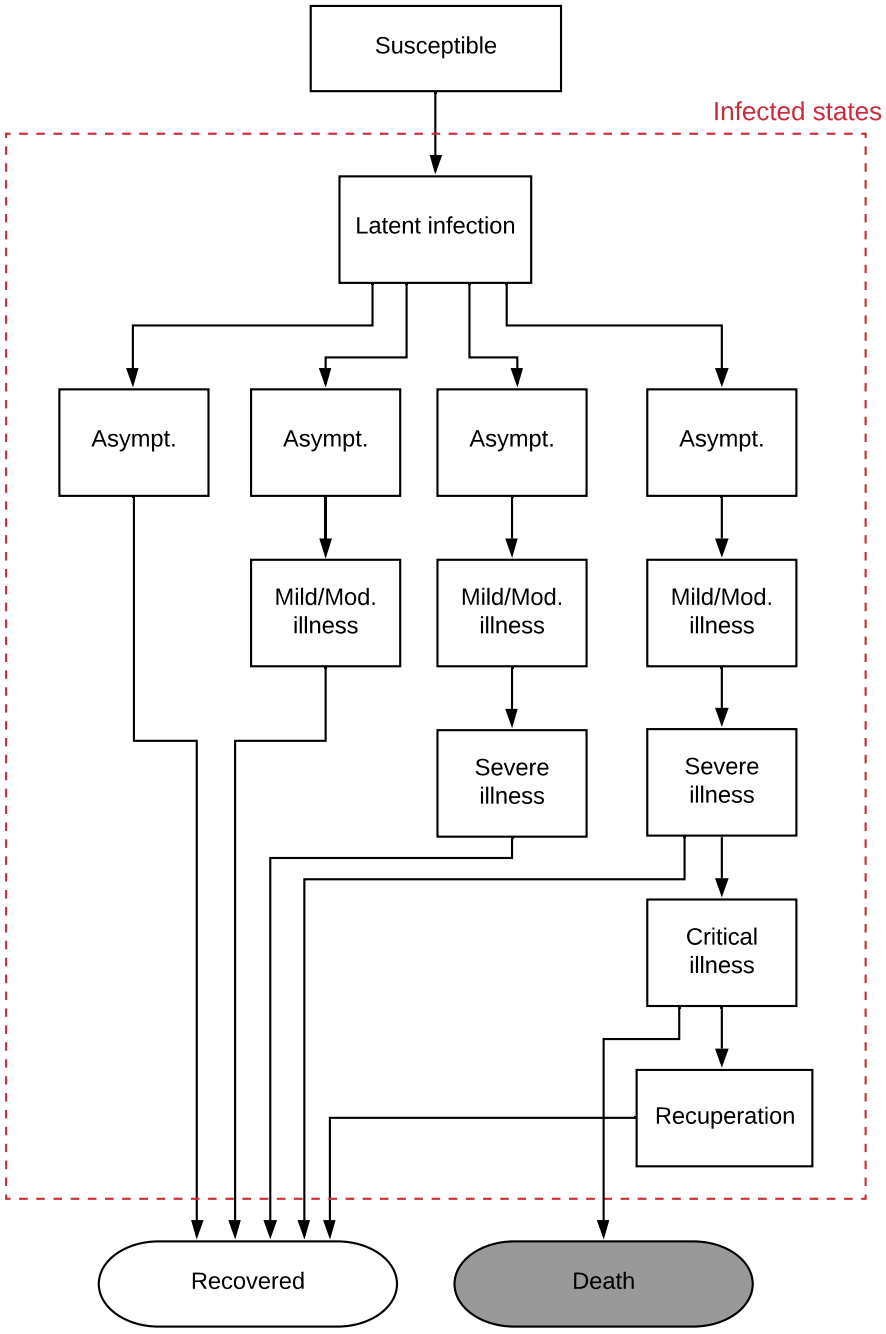
B. Self-screen



C. PCR-any-symptom, PCR-all, PCR-all-repeat

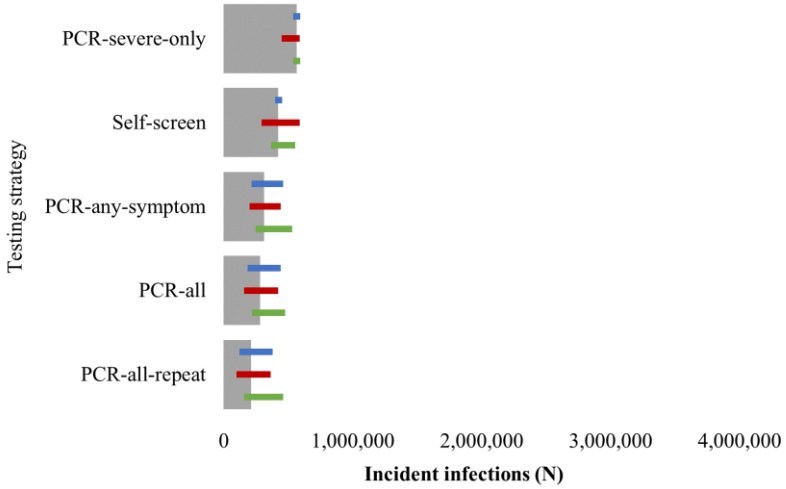


Supplementary Figure 2. Health state transitions for a model of COVID-19 disease and testing

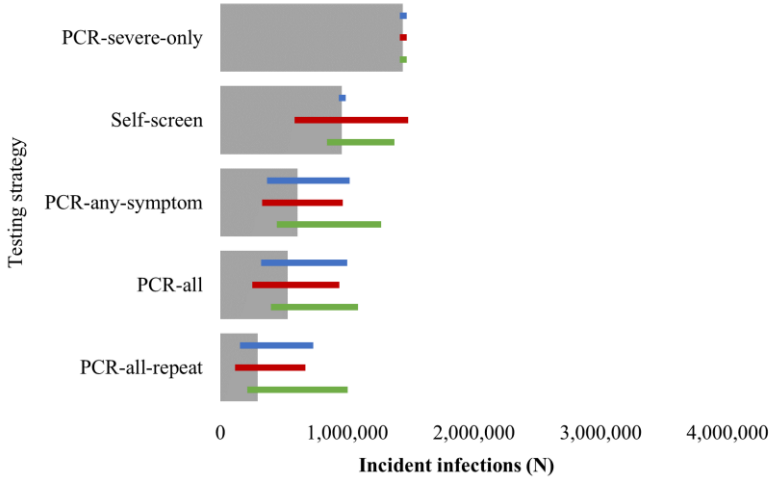


Supplementary Figure 3. One-way sensitivity analyses: Incident SARS-CoV-2 infections (2A-C) and mortality (2D-F) over 180 days in Massachusetts

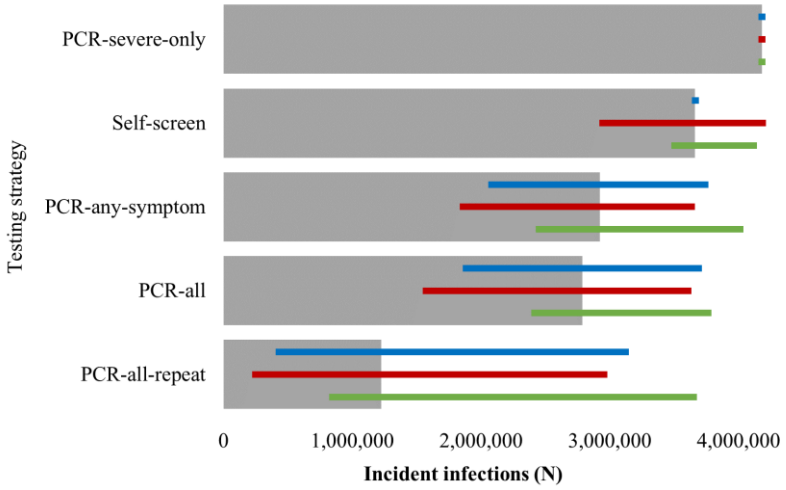
A. Incident infections: slowing scenario (June 1, 2020 R_e 0.9)

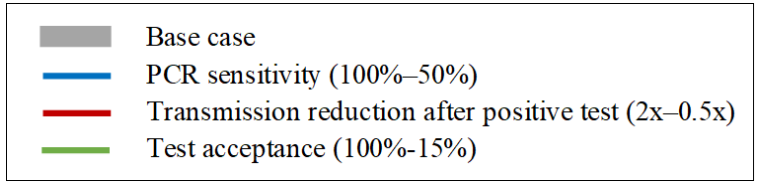


B. Incident infections: intermediate scenario (June 1, 2020 R_e 1.3)



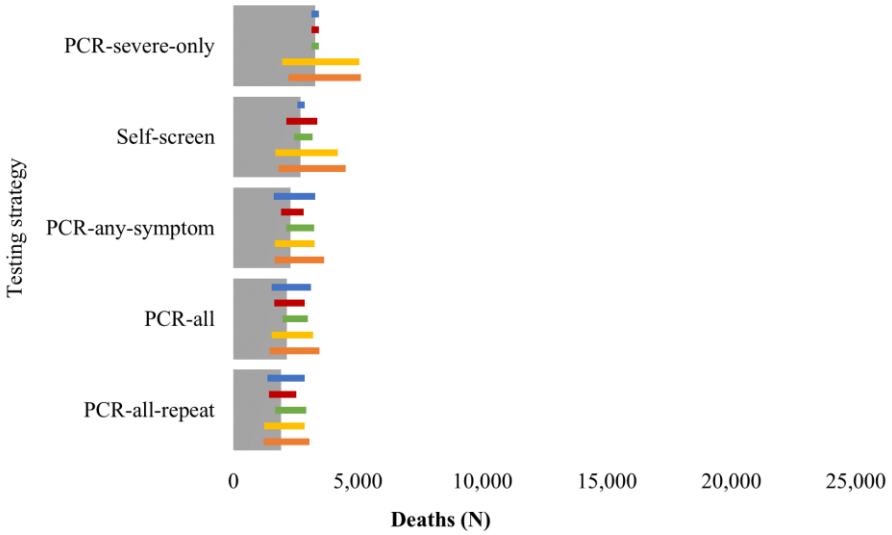
C. Incident infections: surging scenario (June 1, 2020 R_e 2.0)



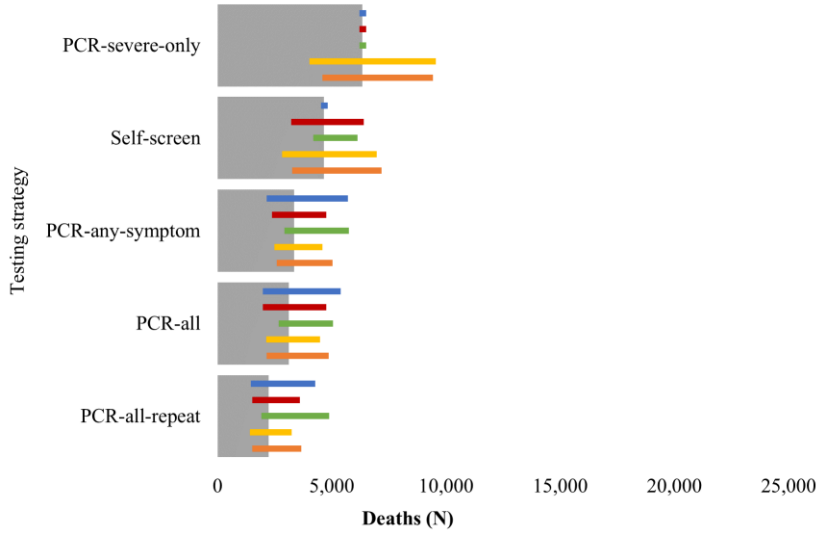


Supplementary Figure 3. One-way sensitivity analyses: Incident SARS-CoV-2 infections (2A-C) and mortality (2D-F) over 180 days in Massachusetts (continued)

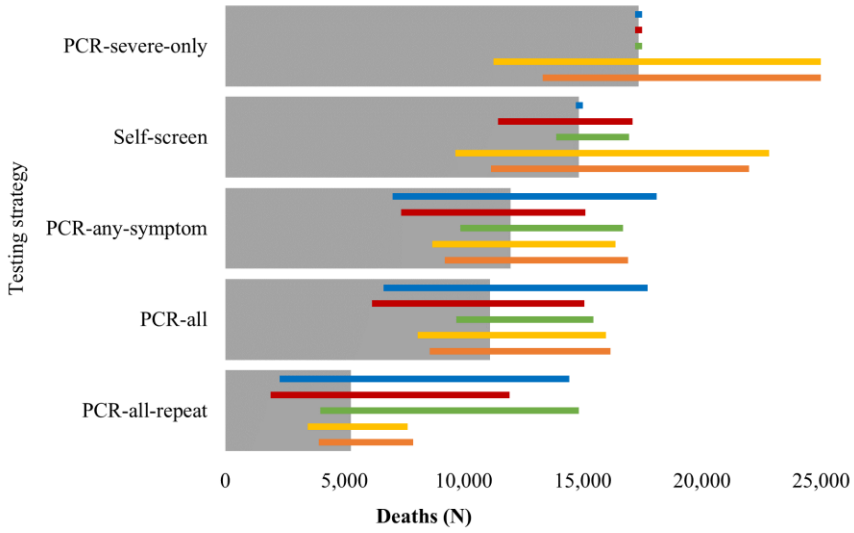
D. Mortality: slowing scenario (June 1, 2020 R_e 0.9)

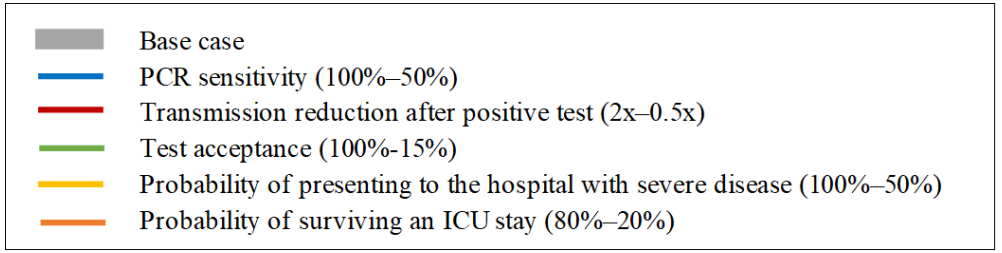


E. Mortality: intermediate scenario (June 1, 2020 R_e 1.3)



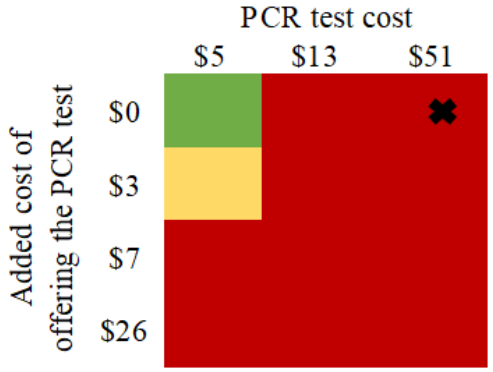
F. Mortality: surging scenario (June 1, 2020 R_e 2.0)



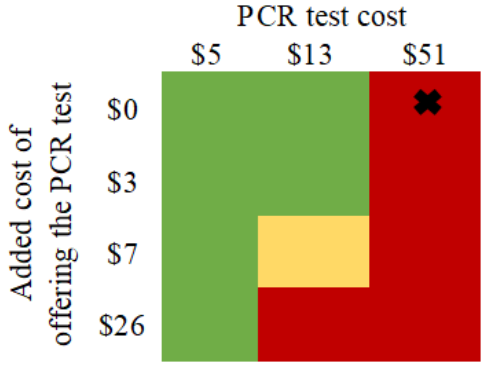


Supplementary Figure 4. Two-way sensitivity analyses: PCR test cost and additional cost of offering a PCR test

A. ICER for PCR-all-repeat strategy compared to the next less costly strategy in slowing scenario (June 1, 2020 R_e 0.9)



B. ICER for PCR-all-repeat strategy compared to the next less costly strategy in intermediate scenario (June 1, 2020 R_e 1.3)



C. ICER for PCR-all-repeat strategy compared to the next less costly strategy in surging scenario (June 1, 2020 R_e 2.0)