Planning Parameters for COVID-19 Outbreak Scenarios

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How to Use this Document

This document provides parameter values for four outbreak scenarios. These scenarios are to inform planning for potential widespread transmission of COVID-19.

These scenarios are not predictions, nor are they meant to inform forecasts or estimates of the likely impact of COVID-19. Instead, the parameter values detailed below for the outbreak scenarios represent the professional and scientific judgments as values that would be appropriate to use for **planning**. Substantial scientific uncertainty remains around nearly all of these parameters.

These values have expiration dates. Given the rapidly-changing state of the science surrounding the epidemiology of COVID-19, we expect to regularly update these estimates over time. If you need updated values, please request them through one of the POCs above.

COVID-19 Outbreak Scenarios

Below are parameter values for four outbreak scenarios to model for public health response, planning and preparation for the novel coronavirus (COVID-19) outbreak. Each scenario has parameter values for the basic reproduction number (R_0), symptomatic case fatality ratio (CFR), proportion of infections that are asymptomatic, relative infectiousness of asymptomatic individuals (i.e., asymptomatic cases are 50% as infectious as symptomatic cases) and the proportion of transmission that occurs prior to symptom onset.

At this time, there is little information on the effects of age on transmission and severity. As more data become available, these scenarios can be revised to reflect age effects.

Table 1. Parameters values for 4 COVID-19 outbreak scenarios. Scenarios are not predictions, can't inform estimates of likely impact, and are only appropriate to use for planning.

Parameter	Scenario 1: Moderate/high severity, low asymptomatic contribution	Scenario 2: Moderate/high severity, high asymptomatic contribution	Scenario 3: High/very high severity, low asymptomatic contribution	Scenario 4: High/very high severity, high asymptomatic contribution
Basic Reproduction Number (R_0) Source:COVID-19 estimates	2	2	3	3
Symptomatic Case Fatality Ratio (%) Source:COVID-19 estimates for overall; age-specific assumed to follow U.S. seasonal flu distribution	0–4: 0.01 5–17: 0.0075 18–49: 0.045 50–64:0.1 65+: 1.75 Overall: 0.25	0–4: 0.01 5–17: 0.0075 18–49: 0.045 50–64:0.1 65+: 1.75 Overall: 0.25	0–4: 0.04 5–17: 0.03 18–49: 0.18 50–64:0.5 65+: 7.0 Overall: 1.0	0–4: 0.04 5–17: 0.03 18–49: 0.18 50–64:0.5 65+: 7.0 Overall: 1.0
Symptomatic Case Hospitalization Ratio (CHR) Source: Estimated from the sCFR (above) using the U.S. age-specific seasonal flu death-to-hospitalization ratio	0–4: 1.25 5–17: 0.50 18–49: 1.25 50–64: 1.75 65+: 16.0 Overall: 3.0	0–4: 1.25 5–17: 0.50 18–49: 1.25 50–64: 1.75 65+: 16.0 Overall: 3.0	0–4: 5.0 5–17: 2.0 18–49: 5.0 50–64: 7.0 65+: 60.0 Overall: 12.0	0–4: 5.0 5–17: 2.0 18–49: 5.0 50–64: 7.0 65+: 60.0 Overall: 12.0
Proportion of infections that are asymptomatic Source: Assumption	20%	50%	20%	50%
Relative infectiousness of asymptomatic individuals (among asymptomatic infections) Source: Assumption	50%	100%	50%	100%
Proportion of transmission occurring prior to symptom onset (among symptomatic individuals) Source: Assumption	5%	35%	5%	35%
Pre-existing immunity Source: Assumption	None			
Time to Symptom Onset Source: COVID-19 estimates	~5 days (mean)			
Average time between primary and secondary infection Source: Assumption from SARS	~8 days (mean)			

Values expire 2020-02-28. Scenarios are not predictions.

Table 2. Assumptions to help anticipate resource needs for COVID-19 outbreak scenarios

Time to seek care (outpatient) Source: U.S. seasonal flu (among persons with ILI)	≤2 days: 35% 3–7 days: 50% ≥8 days: 25%
Mean time from onset to hospitalization (S.D.) Source: U.S. seasonal flu	0–4: 3.11 (2.82) 5–17: 3.33 (2.73) 18–49: 3.33 (2.73) 50–64: 3.57 (2.71) ≥65: 3.37 (2.74)
SHORT: Mean duration of hospitalization (S.D) Source: U.S. seasonal flu	0–4: 4.1 (6.7) 5–17: 3.9 (6.7) 18–49: 4.3 (6.3) 50–64: 5.1 (7.3) ≥65: 5.1 (5.1)
LONG: Mean duration of hospitalization (S.D) Source: Twice the length of U.S. seasonal flu hospitalizations	0–4: 8 (7) 5–17: 8 (7) 18–49: 9 (6.5) 50–64: 10 (7.5) ≥65: 10 (5.0)
ICU % among those hospitalized Source: U.S. seasonal flu	0–4: 15.0 5–17: 20.0 18–49: 15.0 50–64: 20.0 65+: 15.0 Overall: 15.0
% ventilated among those in ICU Source: U.S. seasonal flu	0–4: 35.0 5–17: 30.0 18–49: 45.0 50–64: 50.0 65+: 45.0 Overall: 45.0
Median time from symptom onset to death Source: U.S. seasonal flu	<18 years old: 6 days ≥18: 12 days

Values expire 2020-02-28. Scenarios are not predictions.

Table 3. Key transmissibility and severity parameters for seasonal influenza.

Parameter	Seasonal influenza
Basic Reproduction Number (R$_0$) Source: https://www.ncbi.nlm.nih.gov/pubmed/25186370	1.3
Approximate Symptomatic Case Fatality Ratio (%) Source: CDC seasonal influenza burden estimates	0–4: 0.006 5–17: 0.004 18–49: 0.025 50–64:0.075 65+: 1 Overall: 0.10–0.15
Approximate Symptomatic Case Hospitalization Ratio (CHR) (%) Source: CDC seasonal influenza burden estimates	0–4: 0.70 5–17: 0.25 18–49: 0.50 50–64: 1.00 65+: 9.0 Overall: 1.5

Values expire 2020-02-28. Scenarios are not predictions.