COVID19 Update
August 5, 2020

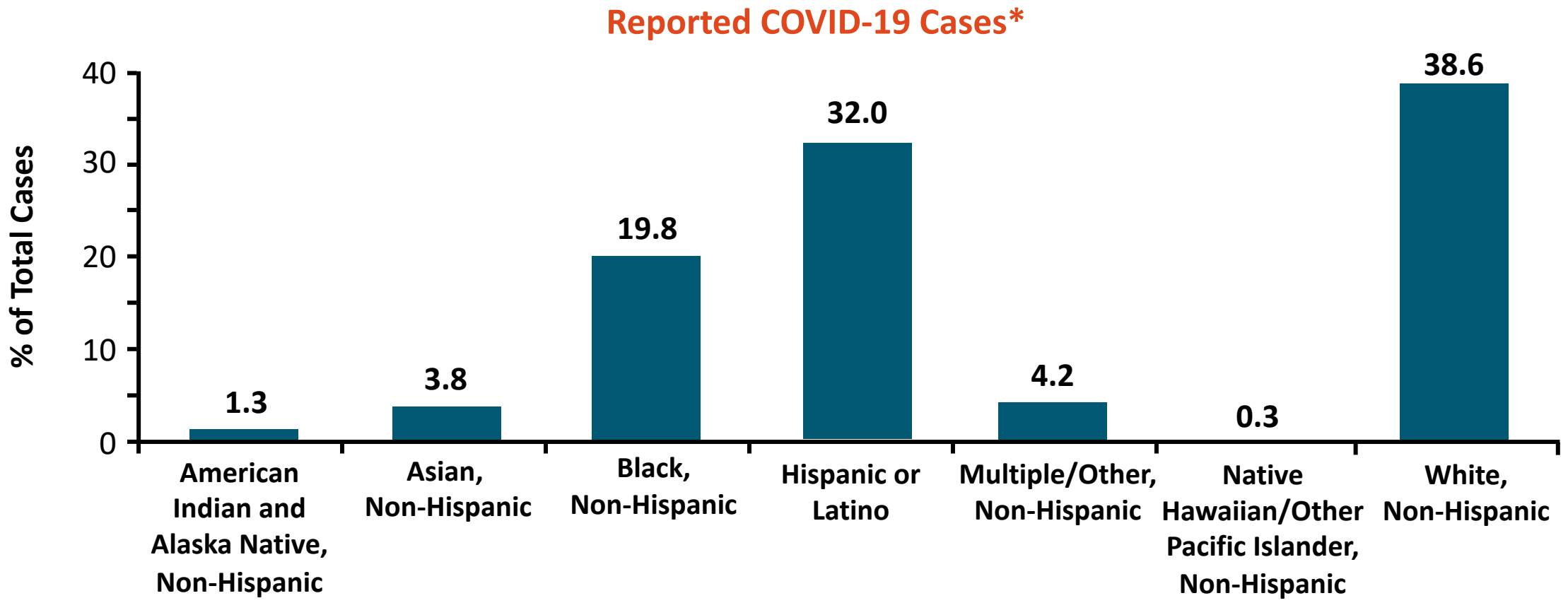
Jorge Mera, MD

Whitney Essex, APRN

Objectives

- Review new data on
  - SARS-COV-2 US cases, hospitalization and death by race and ethnicity
  - Pediatric nasal viral load of SARS-COV-2 compared to older individuals
  - Sensitivity of home collected nasal swabs for SARS-COV-2
  - Vertical transmission of SARS-COV-2
  - Predictive value of loss of smell and taste for the diagnosis of SARS-COV-2
  - Mask comparisons
  - Duration of symptoms after mild SARS-COV-2 infection
  - Duration of symptoms after severe SARS-COV-2 infection
  - Immune response to SARS-COV-2

CDC COVID Data Tracker: Reported COVID-19 Cases by Race/Ethnicity

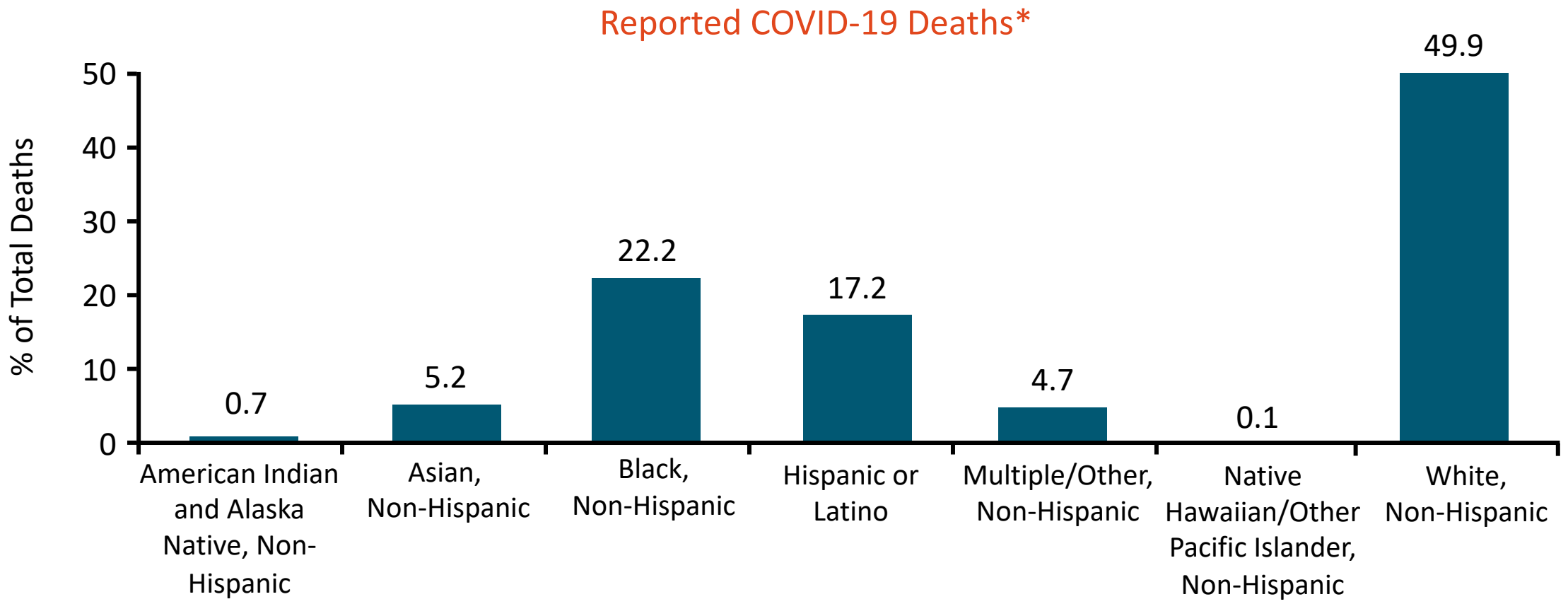


*Last updated July 29, 2020, 5:45 PM EDT. Includes race/ethnicity data available for 1,578,696 cases.

https://www.cdc.gov/covid-data-tracker/index.html#demographics

Slide credit: clinicaloptions.com

CDC COVID Data Tracker: Reported COVID-19 Deaths by Race/Ethnicity

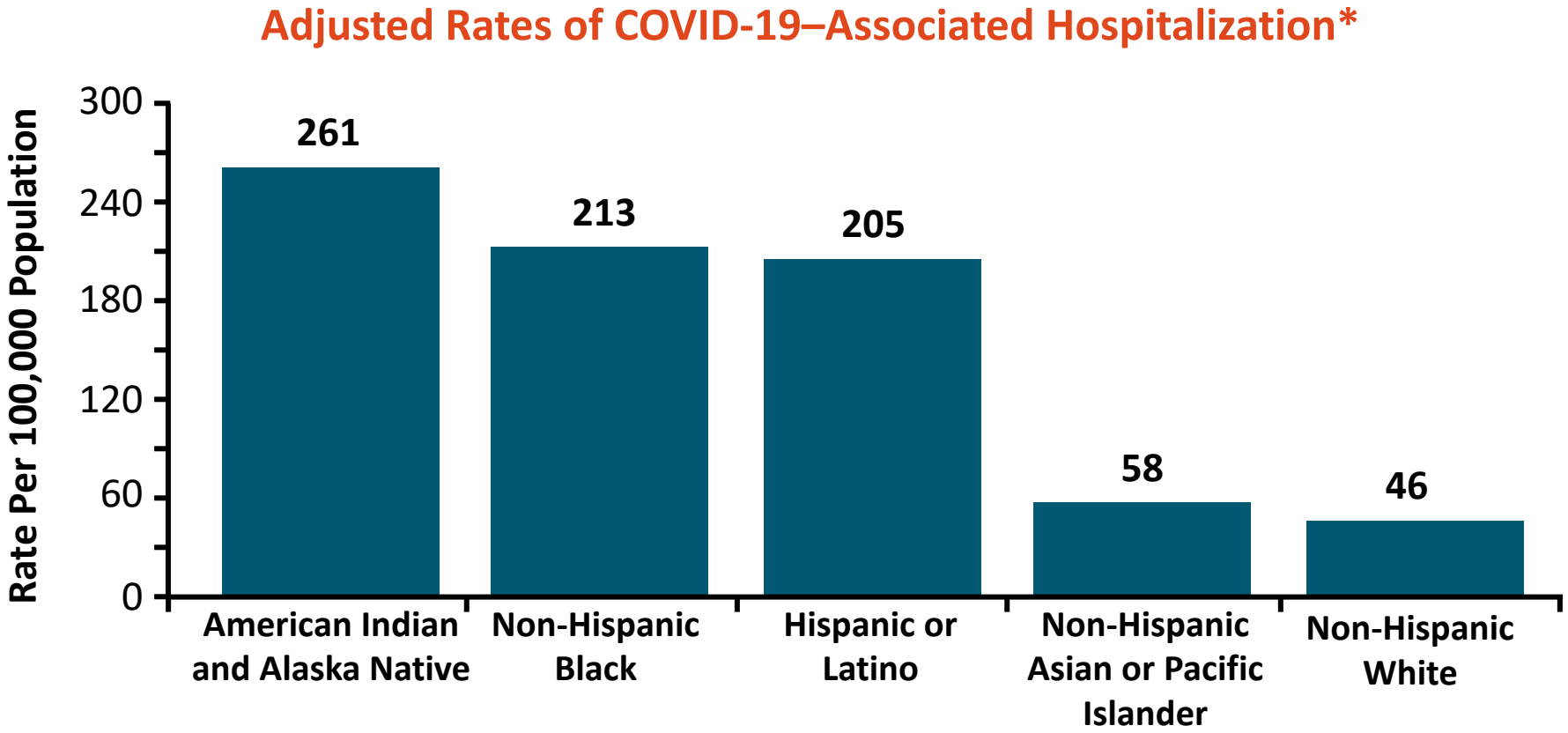


*Last updated July 29, 2020, 5:45 PM EDT. Includes race/ethnicity data available for 96,678 deaths.

https://www.cdc.gov/covid-data-tracker/index.html#demographics

Slide credit: clinicaloptions.com

COVID-NET: COVID-19–Associated Hospitalization by Race and Ethnicity



*Data from March 1, 2020 – June 27, 2020 covers ~ 10% of US population: 99 counties in 14 states (CA, CO, CT, GA, IA, MD, MI, MN, NM, NY, OH, OR, TN, UT). Adjusted to account for differences in age distribution within race and ethnicity groups.

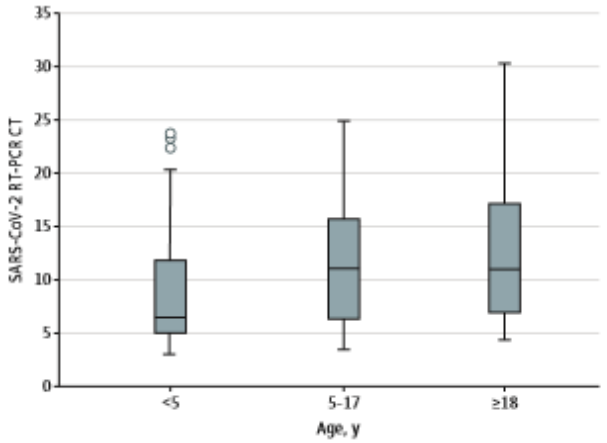
https://www.cdc.gov/coronavirus/2019-ncov/covid-data/images/age-adjusted-hospitalization-rates.jpg

Slide credit: clinicaloptions.com

COVID-19: YOUNG KIDS AS CARRIERS

- NP swabs collected in in patient, outpatient, ED and drive through testing sites at a pediatric tertiary medical center in Chicago from March 23 through April 27, 2020
  - Patients with symptoms or high exposure included
  - Patients with symptoms for more than one week were excluded
- Out of 145 patients with with mild-to-moderate symptoms who tested positive, children under age 5 years (n= 46) had a higher viral load did older children and adults
- 10- to 100-fold greater amount of SARS-CoV-2 RNA in young children's respiratory tracts than in adults

Figure. Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Reverse Transcriptase–Polymerase Chain Reaction (RT-PCR) Amplification Cycle Threshold (CT) Values From Nasopharyngeal Swabs Collected From Patients With Coronavirus Disease 2019



Children younger than 5 years had significantly lower CT values compared with children aged 5 to 17 years ($P = .02$) and adults 18 years and older ($P = .001$). CT values were similar between children aged 5 to 17 years and adults 18 years and older ($P = .34$). Midlines indicate the median, boxes indicate interquartile ranges, whiskers indicate the upper and lower adjacent values (within 1.5-fold the interquartile range), and isolated data points indicate outliers.

Heald-Sargent T, Muller WJ, Zheng X, Rippe J, Patel AB, Kociolek LK. Age-Related Differences in Nasopharyngeal Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Levels in Patients With Mild to Moderate Coronavirus Disease 2019 (COVID-19). *JAMA Pediatr.* Published online July 30, 2020

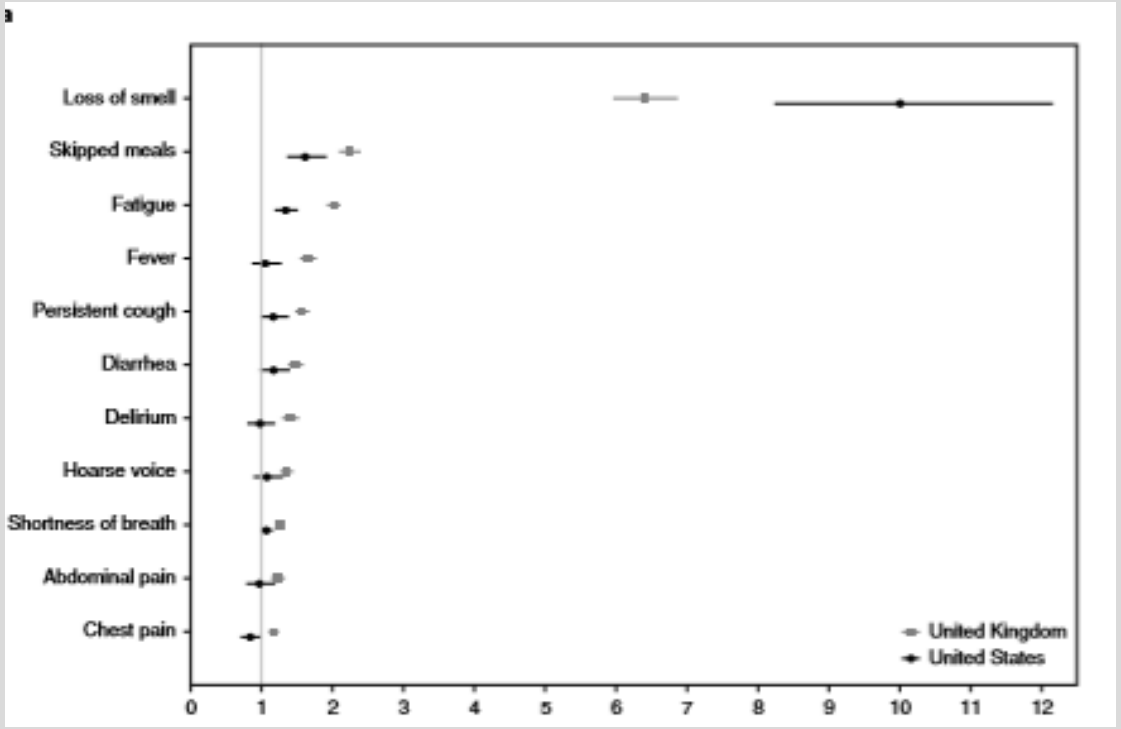
COVID-19: Self-Collected Midnasal Swabs

- Midnasal swab specimens self-collected at home may be comparable to clinician-collected nasopharyngeal swab specimens for detecting SARS-CoV-2 in symptomatic patients
- 200 symptomatic patients - 85% HCWs - contributed both types of specimens for analysis
- About one-fifth positive on at least one specimen
- With clinician-collected swabs as reference, home swabs had sensitivity of 80% and specificity of 98%
- Among 28 true positives detected at home, specimen self-collected at median of 4 days after symptom onset
- Among the 7 false-negatives at home, specimen collected at median of 6 days
- This approach is safe and scalable in the pandemic setting, permitting widespread testing of symptomatic participants early in illness and the potential for prompt self-isolation and contact tracing

McCulloch DJ, Kim AE, Wilcox NC, et al. Comparison of Unsupervised Home Self-collected Midnasal Swabs With Clinician-Collected Nasopharyngeal Swabs for Detection of SARS-CoV-2 Infection. *JAMA Netw Open.*July 22, 2020

Loss of Smell and Taste: Solid Indicators of COVID-19

- Mobile device app that allows users to report repeatedly on symptoms thought to be relevant for COVID-19 and to self-report results of reverse transcription polymerase chain reaction (RT-PCR) testing for SARS-CoV-2
- App has been used by more than 2.6 million people in the U.K. and U.S. (168,293 in the US) who believed they had symptoms of COVID-19
  - 18,500 participants who underwent RT-PCR testing, about 7000 tested positive
- Loss of smell and taste much more common in participants who were RT-PCR positive than in those who were RT-PCR negative (65% vs. 22%; odds ratio, 6.74)
- These 2 symptoms best discriminated test-positive from test-negative participants, although several other symptoms - particularly fatigue and skipped meals – were significantly
- Results similar regardless of country of domicile, age, or sex



Predictive model based on symptoms found to have sensitivity of 65% and specificity of 78% for detecting SARS-CoV-2-positive patients

Menni C et al. Real-time tracking of self-reported symptoms to predict potential COVID-19. *Nat Med* 2020 Jul; 26

COVID-19: Vertical Transmission

- 1481 deliveries
- 116 (8%) mothers tested positive for SARS-COV-2
- All neonates were tested at 24 h, day 5-7 and day 14
- 82/120 neonates completed follow-up
  - 68 (83%) roomed with their mothers
    - All mothers wore surgical mask when near their infant and practiced hand and breast hygiene when handling or breast-feeding the child
  - None of the neonates tested positive through 14 days of follow-up and all were asymptomatic

- Women positive for SARS-CoV-2 when they give birth are at low risk for transmitting the virus to their newborns when proper precautions are taken

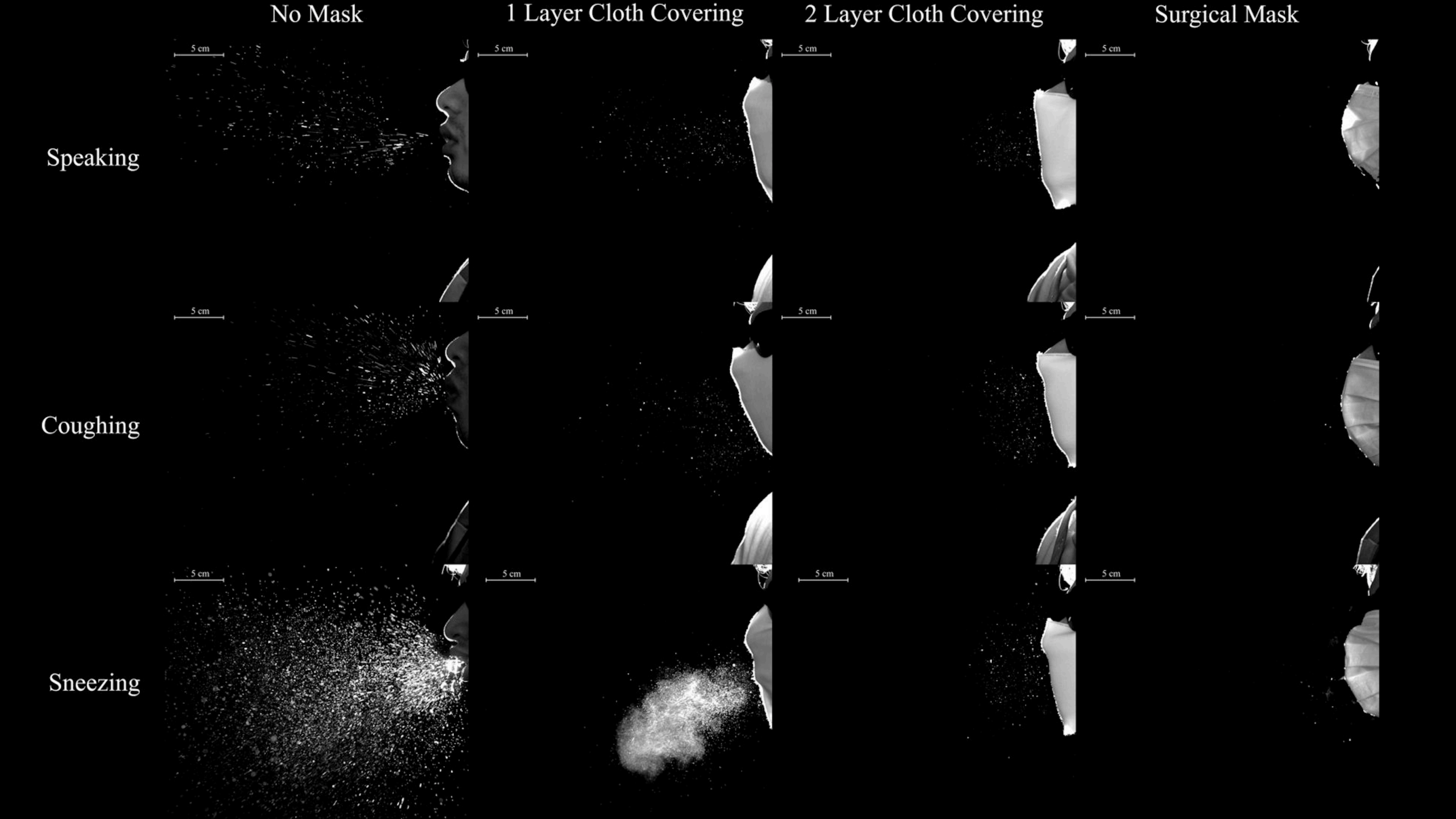
- In view of the benefits of early mother-neonate bonding and breastfeeding, rooming in with the mother and direct breastfeeding are safe and should be promoted, but these procedures need to be paired with effective parental education of infant protective strategies

Salvatore CM et al. Neonatal management and outcomes during the COVID-19 pandemic: an observation cohort study. *The Lancet Child Adolescent Health* 2020 Published Online July 23, 2020

COVID-19: Mask Comparisons

- Use of high-speed cameras to photograph light scattered by aerosols and respiratory droplets expelled during speaking, coughing, and sneezing when a volunteer wore different masks
- 3-layer surgical mask most effective at limiting droplet spread
- 2-layer cloth cotton mask more effective during coughing and sneezing than one made from a single layer
- Even single-layer mask better than no mask
- Guidelines on home-made cloth masks should stipulate multiple layers (at least 3)

- Bahl P, Bhattacharjee S, de Silva C*, et al* Face coverings and mask to minimise droplet dispersion and aerosolisation: a video case study *Thorax* Published Online First: 24 July 2020


No Mask
1 Layer Cloth Covering
2 Layer Cloth Covering
Surgical Mask
Speaking
Coughing
Sneezing
5 cm

N95 vs. KN95 Comparison Chart

Based on this comparison, it is reasonable to consider China KN95, AS/NZ P2, Korea 1st Class, and Japan DS FFRs as "equivalent" to US NIOSH N95 and European FFP2 respirators, for filtering non-oil-based particles such as those resulting from wildfires, PM 2.5 air pollution, volcanic eruptions, or bioaerosols (e.g. viruses). However, prior to selecting a respirator, users should consult their local respiratory protection regulations and requirements or check with their local public health authorities for selection guidance.

Certification/ Class (Standard)	N95 (NIOSH-42C FR84)	FFP2 (EN 149-2001)	KN95 (GB2626-2006)	P2 (AS/NZ 1716:2012)	Korea 1st Class (KMOEL - 2017-64)	DS (Japan JMHLW-Notification 214, 2018)
Filter performance – (must be ≥ X% efficient)	≥ 95%	≥ 94%	≥ 95%	≥ 94%	≥ 94%	≥ 95%
Test agent	NaCl	NaCl and paraffin oil	NaCl	NaCl	NaCl and paraffin oil	NaCl
Flow rate	85 L/min	95 L/min	85 L/min	95 L/min	95 L/min	85 L/min
Total inward leakage (TIL)* – tested on human subjects each performing exercises	N/A	≤ 8% leakage (arithmetic mean)	≤ 8% leakage (arithmetic mean)	≤ 8% leakage (individual and arithmetic mean)	≤ 8% leakage (arithmetic mean)	Inward Leakage measured and included in User Instructions
Inhalation resistance – max pressure drop	≤ 343 Pa	≤ 70 Pa (at 30 L/min) ≤ 240 Pa (at 95 L/min) ≤ 500 Pa (clogging)	≤ 350 Pa	≤ 70 Pa (at 30 L/min) ≤ 240 Pa (at 95 L/min)	≤ 70 Pa (at 30 L/min) ≤ 240 Pa (at 95 L/min)	≤ 70 Pa (w/valve) ≤ 50 Pa (no valve)
Flow rate	85 L/min	Varied – see above	85 L/min	Varied – see above	Varied – see above	40 L/min
Exhalation resistance - max pressure drop	≤ 245 Pa	≤ 300 Pa	≤ 250 Pa	≤ 120 Pa	≤ 300 Pa	≤ 70 Pa (w/valve) ≤ 50 Pa (no valve)
Flow rate	85 L/min	160 L/min	85 L/min	85 L/min	160 L/min	40 L/min
Exhalation valve leakage requirement	Leak rate ≤ 30 mL/min	N/A	Depressurization to 0 Pa ≥ 20 sec	Leak rate ≤ 30 mL/min	visual inspection after 300 L /min for 30 sec	Depressurization to 0 Pa ≥ 15 sec
Force applied	-245 Pa	N/A	-1180 Pa	-250 Pa	N/A	-1,470 Pa
CO_2 clearance requirement	N/A	≤ 1%	≤ 1%	≤ 1%	≤ 1%	≤ 1%

*Japan JMHLW-Notification 214 requires an Inward Leakage test rather than a TIL test.

COVID-19: PROLONGED MILD ILLNESS

- An *MMWR* study
- Outpatients with mild COVID-19 can still have symptoms lasting weeks
- 275 adults with symptoms at the time of testing but not hospitalized
- Interviews 2 to 3 weeks later, 35% had persistent symptoms, most commonly cough and fatigue

Tenforde MW, Kim SS, Lindsell CJ, et al. Symptom Duration and Risk Factors for Delayed Return to Usual Health Among Outpatients with COVID-19 in a Multistate Health Care Systems Network — United States, March–June 2020. *MMWR Morb Mortal Wkly Rep.* ePub: 24 July 2020

COVID-19: PROLONGED MILD ILLNESS

- Even among those aged 18 to 35 without chronic medical conditions, 19% not returned to their normal state of health

- Public health messaging should target populations that might not perceive COVID-19 illness as being severe or prolonged, including young adults and those without chronic underlying medical conditions

Tenforde MW, Kim SS, Lindsell CJ, et al. Symptom Duration and Risk Factors for Delayed Return to Usual Health Among Outpatients with COVID-19 in a Multistate Health Care Systems Network — United States, March–June 2020. *MMWR Morb Mortal Wkly Rep.* ePub: 24 July 2020

Persistent Symptoms in Patients After Acute COVID-19

Carfì A, Bernabei R, Landi F, et al *JAMA.* Published online July 9, 2020. doi:10.1001/jama.2020.12603

- Outcomes of 143 patients previously hospitalized for COVID-19, evaluated a mean of
  - 60 days after symptom onset
  - 36 days after hospital discharge

- Cohort had a mean age of 56.5 years, 37% were women, and mean length of hospitalization 13.5 days

- During hospitalization
  - 73% had evidence of interstitial pneumonia
  - 15% required noninvasive ventilation
  - 5% received mechanical ventilation

Persistent Symptoms in Patients After Acute COVID-19

Carfì A, Bernabei R, Landi F, et al *JAMA.* Published online July 9, 2020. doi:10.1001/jama.2020.12603

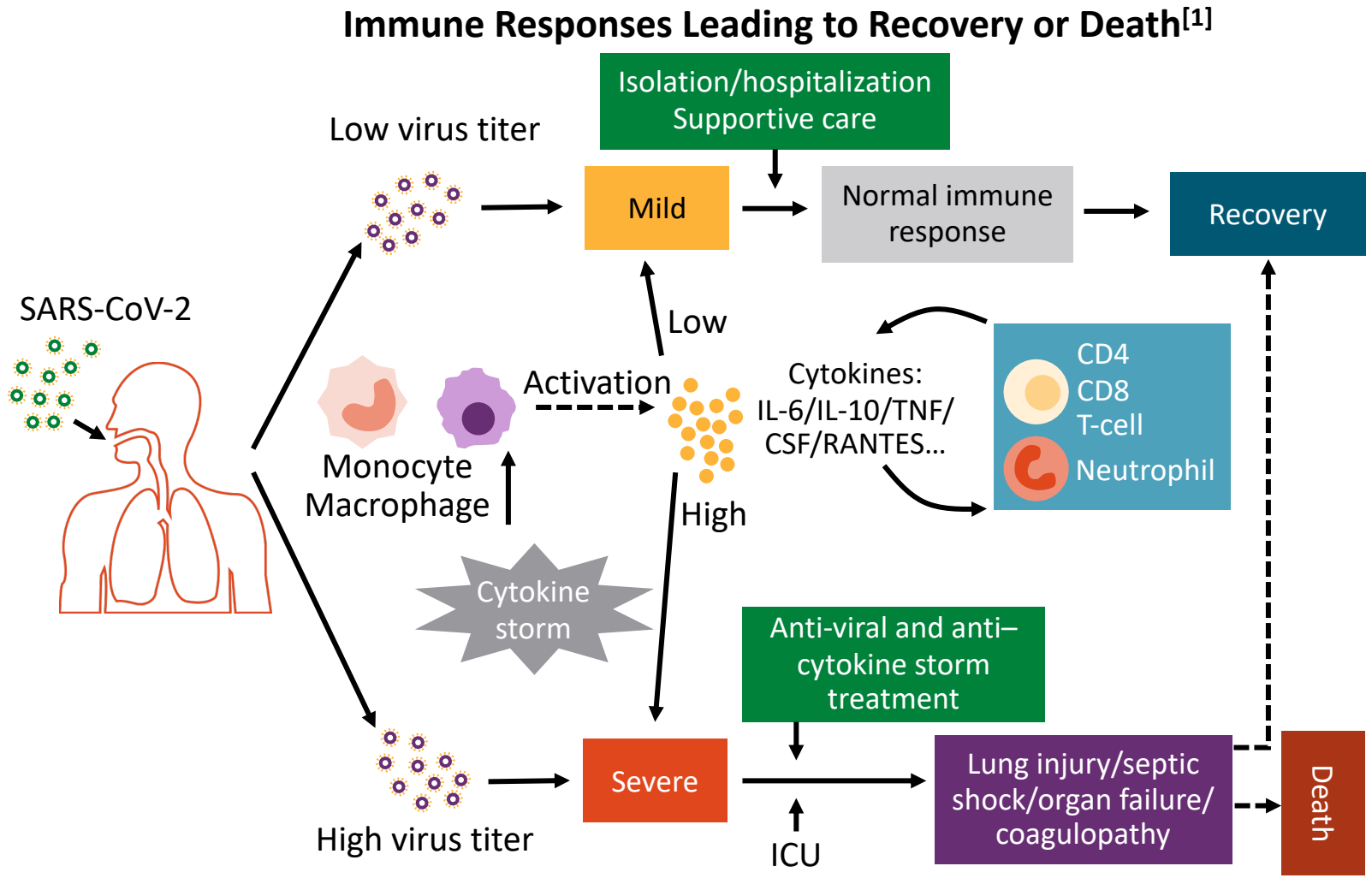
- For this study, participants were virus-free by rt-PCR and met WHO criteria for ending quarantine

- On physical examination and history taking
  - 13% of participants reported being symptom-free
  - 55% 3 or more symptoms
  - 32% 1 or 2 symptoms

- Most common symptoms
  - Fatigue in 53%
  - Dyspnea in 43%
  - Joint pain in 27%
- Chest pain in 22%

Compared with their pre-COVID-19 quality of life,
44% reported that their quality of life ≥10 points lower on a scale of 0 (worst health) to 100 (best health)

Immune Response to SARS-CoV-2



Adequate immune responses[2]

- Timely innate/adaptive responses
- Quick type 1 IFN response
- Activation of efficient antiviral response (clearance by macrophages)
- Activation of Th1 cells and B-cells for production of neutralizing antibodies

Inadequate immune responses[2]

- Delayed/limited type 1 IFN
- Endothelial cell death
- Epithelial/endothelial leakage
- Overactivation/exhaustion T-cells and NK cells
- Accumulation of activated macrophages → cytokine storm

1. Wang. 2020; J Leukoc Biol. 2020;[Epub]. 2. Sokolowska. EAACI. 2020[Epub].

Slide credit: clinicaloptions.com

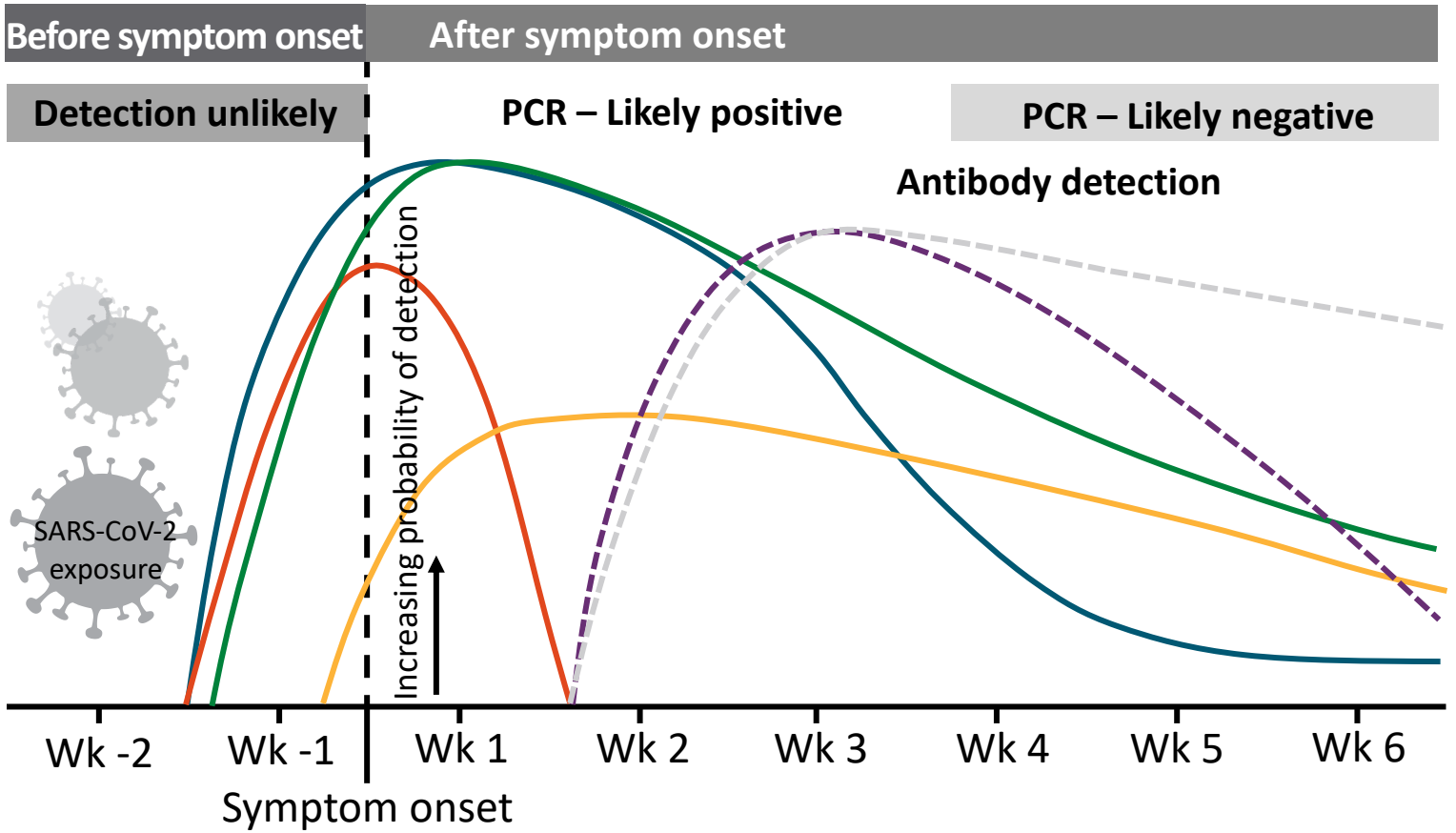
Nonpharmacologic Preventative Interventions

Recommended Prevention Strategies[1,2]
Identify and quickly test suspect cases with subsequent isolation of infected individuals
Quarantine close contacts of infected individuals
Wash hands often with soap and water
Maintain social distance (~ 6 feet)
Wear cloth face cover in public[3,4]
Practice respiratory etiquette
Disinfect frequent-touch surfaces regularly
Avoid crowds, close-contact settings, and poorly ventilated spaces

- Inactivation of SARS-CoV, MERS-CoV, and other endemic human coronaviruses readily accomplished with 62% to 71% ethanol, 0.5% hydrogen peroxide, or 0.1% sodium hypochlorite (in 1 min)[5]
  - 0.05% to 0.2% benzalkonium chloride, 0.02% chlorhexidine digluconate less effective

1. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html 2. WHO. Scientific Brief. July 9, 2020.
3. Leung. Nat Med. 2020;26:676. 4. Chu. Lancet. 2020;395:1973. 5. Kampf. J Hosp Infect. 2020;104:246.

Temporal Considerations for Diagnosis



- Nasopharyngeal swab PCR
- Virus isolation from respiratory tract
- Bronchoalveolar lavage/sputum PCR
- Stool PCR
- IgM antibody
- IgG antibody

Slide credit: clinicaloptions.com