Coronavirus Disease 2019 (COVID-19)

- COVID-19 is the disease caused by the novel coronavirus SARS-CoV-2

COVID-19 Globally

- 39.9 million cases
- 1,113,464 deaths

COVID-19 in the United States

- 8.0 million cases
- 217,918 deaths

United States vs. Europe

New COVID-19 Cases: US vs. EU

- 7-day rolling average of new COVID-19 cases, January 1 to October 17, 2020

Change in Mobility Over Time: Parks and Outdoor Spaces

- Italy
- United States
- Spain
Virology

SARS-CoV-2 Virology
- Beta-CoV: same subgenus as SARS CoV-1 and some bat CoVs
- RNA virus: enveloped, positive-sense, single-stranded
- Large genome: ~30,000 Kb
- 4 structural proteins: S, E, M, N
  - S allows virus to attach to and fuse with cell membrane
- ACE2 receptor: cell receptor

Transmission
- Mainly through exposure to respiratory droplets when close (≤6 ft) to an infected person
- Sometimes through droplets or particles that remain in the air (aerosols) over time and various distances (> or ≤6 ft)
- Less commonly through contact with contaminated surfaces
- Virus found in stool, blood, semen and ocular secretions; role in transmission unknown
Risk of Transmission

- Varies by type and duration of exposure, prevention measures used, and individual factors (e.g., viral load)
- Transmissions most common among household contacts, in congregate or health care settings when PPE not used, and in closed settings (e.g., cruise ships, nursing homes, prisons)
- Factors that may increase the risk of airborne transmission include:
  - Crowded, enclosed spaces with poor ventilation
  - Singing, speaking loudly, or breathing heavily

CDC Morbidity and Mortality Weekly Report (MMWR)

Morbidity and Mortality Weekly Report (MMWR)
Community Transmission of SARS-CoV-2 at Two Family Gatherings — Chicago, Illinois, February–March 2020
I Ghani, JE Laydon et al.

Morbidity and Mortality Weekly Report (MMWR)
High COVID-19 Attack Rate Among Attendees at Events at a Church — Arkansas, March 2020
A James, H Kikking et al.

Prevalence of Asymptomatic SARS-CoV-2 Infection
A Narrative Review
DP Drake and EJ Topol

Data from 16 cohorts, total n=45,000+
Asymptomatic persons account for -40-45% of SARS-CoV-2 infections

Fundamentals to Prevent Acquiring and Transmitting SARS-CoV-2

- Universal wearing of masks/cloth face coverings
- Maintain physical distance – at least 6 feet
- Avoid crowds and congregate settings
- Outdoors better than indoors
- Frequent washing of hands
Clinical Manifestations

COVID-19 Clinical Presentation
- Fever 83–99%
- Cough 59–82
- Fatigue 44–70
- Anorexia 40–84
- Shortness of breath 31–40
- Myalgias 11–35

Other non-specific symptoms reported
- Sore throat, nasal congestion, headache, diarrhea, nausea, vomiting. Loss of smell/taste preceding the onset of respiratory symptoms.

Spectrum of Disease Among 44,672 Individuals with Confirmed COVID-19, China

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Mild/Mod</th>
<th>Severe</th>
<th>Critical</th>
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</thead>
<tbody>
<tr>
<td>Case-fatality rate</td>
<td>81%</td>
<td>14%</td>
<td>9%</td>
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</tbody>
</table>

Manifestations of Severe COVID-19
- Neurological disorders
- Hyperinflammation
- Acute respiratory distress syndrome (ARDS)
- Cardiac dysfunction
- Hypercoagulability
- Acute kidney injury
- Multisystem inflammatory syndrome in children (MIS-C)

Post-COVID-19 Syndrome

People at Increased Risk for Severe COVID-19 Illness
- Older adults
- People of any age with certain underlying medical conditions
People at Increased Risk for Severe COVID-19 Illness

- Older adults
- People of any age with certain underlying medical conditions

Cumulative Rates of Laboratory-Confirmed COVID-19-Associated Hospitalizations by Age, United States, March 1 – October 10, 2020

Underlying Medical Conditions Associated with Increased Risk for Severe COVID-19 Illness

- Cancer
- Chronic kidney disease
- Acute respiratory distress syndrome (ARDS)
- Chronic obstructive pulmonary disease (COPD)
- Diabetes, type 2
- Heart conditions (e.g. heart failure, coronary artery disease, cardiomyopathies)
- Immunocompromised state from solid organ transplant
- Obesity (BMI ≥ 30)
- Sickle cell disease
- Smoking

Underlying Medical Conditions That May Confer Increased Risk for Severe COVID-19 Illness

- Asthma (moderate-to-severe)
- Cerebrovascular disease
- Cystic fibrosis
- Diabetes, type 1
- Hypertension
- Immunosuppressed state from blood or bone marrow transplant, immune deficiencies, 1% use of corticosteroids or other immune-weakening medicines
- Neurologic conditions (e.g. dementia)
- Liver disease
- Overweight (BMI > 25 but < 30)
- Pregnancy
- Pulmonary fibrosis
- Thalassemia

More Than 40% Of U.S. Adults Are Susceptible To Severe COVID-19

Prevalence of underlying conditions in U.S. adults in 2018

- Any underlying condition 40.7%
- Obesity* 30.9%
- Diabetes mellitus 11.4%
- COPD 6.9%
- Heart disease 6.8%
- Chronic kidney disease 3.1%

*Obese and overweight are considered together as a single "obesity" category.
COVID-19 and Racial/Ethnic Disparities

MW Hooper, AM Nápoles and EJ Pérez-Stable

“The most pervasive disparities are observed among African American and Latino individuals, and where data exist, American Indian, Alaska Native, and Pacific Islander populations.”

Therapeutics

Therapeutics for COVID-19

Recommended by the NIH COVID-19 Treatment Guidelines Panel for Certain Patients

- Remdesivir (investigational antiviral)
- Dexamethasone (corticosteroid)

Examples of Other Investigational Therapies

- Antivirals
- Blood-derived products, e.g., convalescent plasma, hyperimmune globulin
- Monoclonal antibodies against SARS-CoV-2
- Immunomodulators, e.g., cytokine inhibitors, interferons
- Adjunct therapies, e.g., anticoagulants

Age-Adjusted COVID-19-Associated Hospitalization Rates by Race and Ethnicity, United States, March 1 – October 10, 2020

- Hispanic/Latino: 387
- American Indian/Alaska Native: 377
- Black, Non-Hispanic: 376
- Asian: 114
- Native Hawaiian or Other Pacific Islander: 96

Rate per 100,000 population

News Release

Expert U.S. Panel Develops NIH Treatment Guidelines for COVID-19

“Living document” expected to be updated often as new clinical data accrue

Covid19treatmentguidelines.nih.gov


JH Bogel, HC Lane et al. for the ACTT-1 Study Group Members

- Hospitalized patients on remdesivir recovered more quickly than those on placebo (median 10 days vs 15 days, P<0.001)
- A trend toward decreased mortality: hazard ratio = 0.73 (95% CI: 0.52–1.03)
- 1,062 patients from 10 countries: U.S., Europe and Asia
Effect of Dexamethasone in Hospitalized Patients with COVID-19: Preliminary Report

The RECOVERY Collaborative Group

- RECOVERY trial in UK -- 6,425 patients randomized to receive dexamethasone 6 mg once per day (oral or IV) for up to ten days or usual care alone
- Dexamethasone reduced 28-day mortality by 36% in ventilated patients and by 18% in other patients receiving oxygen
- No benefit for patients not receiving respiratory support

Vaccines

Selected COVID-19 Vaccine Candidates

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<tr>
<th>Platform</th>
<th>Developer</th>
<th>Phase 1/2</th>
<th>Phase 2/3</th>
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<tbody>
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<td>moderna</td>
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Just 50% of Americans Plan to Get a COVID-19 Vaccine. Here’s How to Win Over the Rest

W Cornwall

Do you plan to get a coronavirus vaccine when one is available?

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<th>Not sure</th>
<th>No</th>
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<td>Overall</td>
<td>49%</td>
<td>31%</td>
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<td>Under age 60</td>
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<td>30%</td>
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<td>Age 60 and older</td>
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<td>White</td>
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<td>32%</td>
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<tr>
<td>Hispanic</td>
<td>37%</td>
<td>37%</td>
<td>22%</td>
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Emerging Pandemic Diseases: How We Got To COVID-19

DM Morens and AS Fauci

“Disease emergence reflects dynamic balances and imbalances, within complex globally distributed ecosystems comprising humans, animals, pathogens, and the environment. Understanding these variables is a necessary step in controlling future devastating disease emergences.”