COVID-19 Resources for Educators
Teaching Toolkit
2021

Overview
This "Teaching Toolkit" includes 9 individually curated collections to support teaching and learning about the COVID-19 pandemic.

This toolkit is intended to be "educator-facing" and has been assembled by the Global Health Education and Learning Incubator at Harvard University, with a specific goal to provide educators with accessible, evidence-based information for the design and development of curricula, teaching materials, student assignments and learning experiences. The toolkit, and individual collections, will be updated as new resources become available.

The Global Health Education and Learning Incubator at Harvard University supports interdisciplinary education about world health through the production, curation, and dissemination of educational public goods.

This teaching toolkit includes:

- Resource Pack: COVID-19 Data Visualizations
- Teaching Pack: COVID-19 Middle/High-School Resources
- Teaching Pack: COVID-19 Relevant Teaching Cases
- Resource Pack: COVID-19 and Racism
- Resource Pack: COVID-19 Scientific Portals
- Resource Pack: Ethics, Human Rights, Pandemics
- Teaching Pack: COVID-19 College/Graduate Resources
- Resource Pack: Diagnostic Tests, Bayes, and COVID-19
COVID-19 Data Visualizations
Resource Pack
2021

Overview

This digital collection includes data visualizations relevant to COVID-19, tracking trends in cases and deaths, over time and by location, as well as projected changes with population-level interventions, such as social distancing. Some of the sites leverage global data and display world-wide trends, while others focus on the United States and subnational patterns.

The sites included in this collection were selected based on the quality of the data sources used in their visualizations, as well as the design and effectiveness of the visualization itself. We specifically selected some data-intensive visualizations that capture detailed temporal patterns of infection across the world, simpler visualizations that expose viewers to specific concepts such as transmission properties of COVID-19, and stand-alone visualizations that depict interesting nuances of the epidemic relevant to other sectors, such as finance, employment, population movement and travel. All are accessible for free and updated regularly.

Explore these visualizations to identify the format most useful for your needs. Educators may find these data visualization portals and examples useful for online course development - adding information-rich visual components to multimedia, building short lessons around specific data interactives, and integrating data visualization into student assignments.

This collection of data visualization portals is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New data visualization portals will be added as they become available.

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Selected Resources

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* Data Interactive. Our World in Data: Coronavirus Disease (COVID-19) - Statistics and Research

* Data Visualization. COVID-19 Coronavirus Infographic Datapack

* Data Interactive. Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering

* Data Interactive. COVID-19 Data Hub

* Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count

* Data Interactive. COVID-19 Global Gender Response Tracker

* Data Interactive. COVID-19 and Human Development: Exploring Global Preparedness and Vulnerability

* Data Interactive. Why Outbreaks Like Coronavirus Spread Exponentially, and How to “Flatten the Curve”

* Infographic. Visualizing the History of Pandemics

* Data Interactive. Tracking the Spread of Coronavirus Cases in the US and Worldwide

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Data Interactive. COVID-19 Vaccine Hesitancy
This data interactive from the Institute for Health Metrics and Evaluation (IHME) displayed changes in vaccine hesitancy over time from January 2021 to the present and highlights the areas of the United States that would benefit most from greater vaccination acceptance. The portal demonstrates the percentage of respondents who answered "Yes, probably" or "No, probably not" when posed the question "If a vaccine to prevent COVID-19 were offered to you today, would you choose to get vaccinated?" As of July 2021, the largest percentage of those who answered "No, probably not" are located in the South and mid-West, with some counties exhibiting hesitancy above 20%. The data, presented in a map format, is collected from The Delphi Group at Carnegie Mellon University. Data can also be presented by county or by zip code.
GHELI repository link: https://repository.gheli.harvard.edu/repository/13763

Data Interactive. Coronavirus Disease (COVID-19) – Statistics and Research
GHELI repository link: https://repository.gheli.harvard.edu/repository/13207
This data interactive from Our World in Data contains more than 40 data visualization on all aspects of the Coronavirus Disease 2019 (COVID-19) pandemic, from total confirmed deaths to daily new confirmed cases. The data visualizations are based on data from the European Center for Disease Prevention and Control (ECDC), which publishes daily statistics on COVID-19 for the entire world. Many of the interactives allow the user to choose specific countries or regions for data comparison and much of the raw data can be downloaded directly from the visualization.

Data Visualization. COVID-19 Coronavirus Infographic Datapack
GHELI repository link: https://repository.gheli.harvard.edu/repository/13264
This data visualization produced by Information is Beautiful is an open-source, interactive portal with graphs, figures, tables, and other visuals about various indicators and health outcomes for Coronavirus Disease 2019 (COVID-19). The portal is updated daily and provides graphics on COVID-19 infection trajectories, infection and fatality rates by country, weekly trends of cases and deaths, and several measures for specific indicators such as risk for people over 60 years old, outcomes for people with preexisting conditions, comparable incubation periods, media mentions, and other trajectories that indicate the progression of the disease. The portal includes a list of news articles and external relevant data sources related to COVID-19 and provides an up-to-date log that details all of the changes made to the data as it is regularly updated. Users can also explore a comprehensive spreadsheet that tracks all of the raw data for the indicators and outcomes used in the visualization over time. Data is derived from Johns Hopkins University's Center for Systems Science and Engineering, Centers for Disease Control, World Health Organization, Statista, China Center for Disease Control and Prevention, Google News, the New York Times, and The Guardian.

Data Interactive. COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering
GHELI repository link: https://repository.gheli.harvard.edu/repository/13178
This data interactive by Johns Hopkins Center for Systems Science and Engineering can display numerous different data sets related to COVID-19 on an interactive map. Upon entering the interactive, the map shows global cumulative
confirmed cases of COVID-19. However, the user can also view active cases of Coronavirus Disease 2019, the incidence rate, the case-fatality ratio by country, global vaccinations, US vaccinations, and US testing rate. The user can zoom in and out along the map and select different outbreaks to see specific information related to that country. The global data, which is updated numerous times per day, can also be broken down by region, country, and state or province.

Data Interactive. COVID-19 Data Hub
The Tableau Foundation has partnered with multiple public health experts and data visualization communities to develop the Coronavirus (COVID-19) Global Data Tracker, which provides confirmed case and death totals over time, reflecting the spread of coronavirus and places most impacted.

A downloadable workbook, the COVID-19 Cases Starter Workbook, includes a starter dashboard as well as an embedded connection to data from the European Centre for Disease Prevention and Control as well as The New York Times (who is aggregating data from state and local governments and health departments for the United States). Anyone can blend their own data with this workbook to better understand the impact on their organization.

A variety of other visualizations capture specific regions and topics. For example, the ONE Africa COVID-19 Tracker combines data from multiple sources to depict the impact of COVID-19 on African countries. The tracker contains information for all 54 African countries, exploring key health, economic, demographic, social, and governance data.

The COVID-19 Data Platform ingests and aggregates data across public sources and curates them into standardized data models that can be reliably used to make data-driven decisions. The Tableau Foundation, working with Mulesoft and Salesforce, has built an open flow of public COVID-19 data, made available as open APIs and within Tableau Public to be used in applications and new visualizations by anyone.

Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count
This interactive in The New York Times provides the latest map and case count for Coronavirus Disease 2019 (COVID-19) and is updated regularly. Users can engage with the most recent data on location hot spots, total cases, deaths, cases per capita, and recent trends for COVID-19 in the United States on an interactive map of the entire country and on the individual state and county level.

The interactive article also includes data on the places hit hardest in the United States, such as in hot spots, the counties with the highest number of cases per resident, and clusters, which are places such as nursing homes, correctional facilities, and cruise ships with densely packed people. Readers can download county-level data for COVID-19 cases and read more about the methodology on GitHub.

Data Interactive. COVID-19 Global Gender Response Tracker
This data interactive from the United Nations Development Programme (UNDP) and UN-Women monitors global policies intended to curb the Coronavirus Disease 2019 (COVID-19) pandemic, placing a special focus on those with a gender lens. Policies are broken down in the interactive into numerous categories: all measures enacted, “gender-sensitive,” “unpaid care” related, “violence against women” related, and “women's economic security.” UNDP and UN-Women define gender-sensitive policies as those intended to limit the risks and challenges associated with gender during the COVID-19 pandemic. The interactive is broken into four sections, with each providing further insight into the policies enacted. Also included with the data interactive is a Q&A section, focused on providing further background, as well as fact sheets outlining global and regional policy changes.
Resource Pack: COVID-19 Data Visualizations

Data Interactive. UNDP: COVID-19 and Human Development: Exploring Global Preparedness and Vulnerability. COVID-19 and Human Development
GHELI repository link: https://repository.gheli.harvard.edu/repository/13240
This data interactive from the United Nations Development Programme measures individual countries vulnerability and preparedness for a Coronavirus Disease 2019 (COVID-19) outbreak. The data delves into health system functionality indicators, such as hospital beds and number of health care personnel, and availability of internet access and mobile phone capabilities, less common in lower ranked HDI countries – but necessary for economic recovery. Preparedness and vulnerability are measured by examining a country’s health system capacity, connectivity, population living below the poverty line, immediate economic vulnerability, and placement on the Human Development Index (HDI). The data interactive allows users to single out individual countries or select groups of countries for comparison. Users can also access the same information through a data publication.

Data Interactive. Why Outbreaks Like Coronavirus Spread Exponentially, and How to “Flatten the Curve”
GHELI repository link: https://repository.gheli.harvard.edu/repository/13305
This article in The Washington Post provides interactive data on Coronavirus Disease 2019 (COVID-19), illustrating the exponential growth of cases over time in the United States, transmission of the disease between health and infected people, the change in number of recovered people over time, and other outcomes through simulations.

The interactive provides six simulations for educators and learners to explore, to understand how many people in a population would be healthy, sick, and recovered based on four different sample populations and different levels of severity of social distancing measures. The series of simulations highlights that extensive social distancing measures predict the most effective outcomes for “flattening the curve” of new cases and deaths. Data for this interactive was collected by the Johns Hopkins University Center for Systems Science and Engineering, and users can download it on GitHub.

Infographic. Visualizing the History of Pandemics
GHELI repository link: https://repository.gheli.harvard.edu/repository/13291
This infographic from the Visual Capitalist depicts a visual history of pandemics, from the Antonine Plague to the current COVID-19 pandemic. It illustrates the impact of the marked shift to agrarian communities, widespread trade, and urbanization on infectious disease spread - both scale and scope.

In addition to providing historical context to the COVID-19 epidemic, educators can use this visualization to have students explore the impact of quarantine which began in the 14th century (aimed at protecting coastal cities from epidemics) and improved health care, which lowered case fatality rates associated with epidemics.

There is also a visualization depicting R_0, pronounced “R naught”, which represents the number of susceptible people, on average, each infected person will in turn infect.

Data Interactive. Tracking the Spread of Coronavirus Cases in the US and Worldwide
GHELI repository link: https://repository.gheli.harvard.edu/repository/13307
This data visualization in USA Today provides daily updates on the spread of Coronavirus Disease 2019 (COVID-19) in the United States and around the world. It compiles interactive data with maps and charts from the World Health Organization, the Centers for Disease Control and Prevention, and other sources compiled by Johns Hopkins University.

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gheli@harvard.edu
617-495-8222
Readers can engage with data visualizations detailing the total confirmed cases, number of deaths, and number of recovered people at varying geographic resolutions including on the global, country, or state level. The maps illustrate the cumulative spread of the virus and are accompanied by supporting information about the disease.

**Infographic. Decoding COVID-19**
GHeli repository link: [https://repository.gheli.harvard.edu/repository/13290](https://repository.gheli.harvard.edu/repository/13290)
This educational infographic is hosted on the infographics pages of the South China Morning Post and is a relatively simple scrolling visualization of how coronaviruses, in particular COVID-19, spreads and interfaces with the human body.

**Infographic. Coronavirus Tracked: The Latest Figures as Countries Fight to Contain the Pandemic**
GHeli repository link: [https://repository.gheli.harvard.edu/repository/13293](https://repository.gheli.harvard.edu/repository/13293)
This infographic-style dashboard presents a visual narrative of the global consequences of COVID-19. It is hosted by the *Financial Times* and is freely available. It features a range of visual charts, tables, and interactives using country-specific data to depict the scale of outbreaks, number of deaths, and impact of public health interventions and the government response. Most recently, interactive epidemic trajectory charts and a government response tracker have been added. In addition to reflecting the epidemiological profiles of countries, it presents information on the economic dimension of the pandemic as well. It is updated on a daily basis.

**Data Interactive. Location Data Says It All: Staying at Home During Coronavirus is a Luxury**
GHeli repository link: [https://repository.gheli.harvard.edu/repository/13306](https://repository.gheli.harvard.edu/repository/13306)
This interactive article in *The New York Times* explains that smartphone location data has shown that lower-income workers are continuing to leave their homes and move around, while wealthier populations are able to stay home and limit their exposure to Coronavirus Disease 2019 (COVID-19). The article presents results from analyses of cellphone data by the company Cuebiq, which tracks about 15 million cellphone users around the United States each day. The article shows changes in movement of people over time, beginning in early March, and shows both general trends and movement trends specific to major cities’ transportation systems. It shows the differences in movement between those in the top 10 percent of income and the bottom 10 percent of income, as well as a real-time analysis of people’s movement responses to government orders. The data focuses on metro areas in cities with high income disparity – Washington, Boston, Baltimore, San Francisco – and in areas with low income disparity – El Paso, Chattanooga, Little Rock, and Deltona-Daytona. The article reports more broadly on economic impacts of COVID-19 such as stimulus checks, small businesses, unemployment, and health insurance in the United States.

**Data Portal. COVID-19 Projections**
GHeli repository link: [https://repository.gheli.harvard.edu/repository/13194](https://repository.gheli.harvard.edu/repository/13194)
This data portal from the Institute for Health Metrics and Evaluation (IHME) includes several data interactives on key findings and projections related to Coronavirus Disease 2019 (COVID-19). It now provides predictions for nearly all locations at the national and subnational level for indicators such as hospital resource use, estimating the total number of beds and the need for intensive care unit (ICU) beds. The portal also estimates deaths per day, total deaths due to COVID-19, and “excess deaths” – an IHME approximation of recorded and unrecorded deaths from COVID-19. Daily infection and testing indicators including estimated infections, confirmed infections, and projected tests, are also included. For countries where data is available, it provides measures of social distancing policies and mask use. The portal is updated daily, allowing viewers to track the progress of COVID-19 and examine the changing resource needs in select countries as the disease progresses.
COVID-19 Middle/High-School Resources
Teaching Pack

2021

Overview

How can educators leverage the COVID-19 pandemic to engage students in active learning? This collection of resources was curated to support high-school and middle-school teachers in bringing timely, high-quality material on the current COVID-19 pandemic into the "classroom" whether it be online, hybrid or physical.

Each tile within the collection brings together a key resource on the topic and some sample activities, discussion prompts, or tools to generate ideas for teaching and learning. This teaching pack is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New resources will be added as they become available.

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Selected Resources

CONTENTS AT-A-GLANCE

* Resource Portal. COVID-19 Dashboard

* Resource Portal. COVID-19 Classroom

* Activity. United Nations Global Call Out to Creatives - Help Stop the Spread of COVID-19

* Resource Portal. Coronavirus Resources: Teaching, Learning and Thinking Critically

* LESSON. Making Sense of Coronavirus through Storytelling and Media Making

* Activity. Above The Noise: Social Distancing
https://learn.kqed.org/discussions/60.

* Online Learning. Coronavirus Lessons

* Online Learning. Learning Toolbox: COVID-19 Science
https://www.exploratorium.edu/learn.

Teaching Our World: The Coronavirus. Scholastic Classroom Magazines.

* Activity. COVID-19: How Can We Make Choices That Promote the Common Good?

* Resource Portal. Infectious Diseases
Infectious Diseases. National Geographic.

* Teaching Case. Social Distancing in the Midst of COVID-19

* Lesson. Influenza 1918

* Lesson Material. How Can We Help Stop the COVID-19 Pandemic?
Annotated Bibliography

ANNOTATED CONTENTS OF TEACHING PACK

Resource Portal. COVID-19 Dashboard
GHELI repository link: https://repository.gheli.harvard.edu/repository/13762
This web portal from the Viswanath Lab at the Harvard T.H. Chan School of Public Health brings together a wide variety of credible Coronavirus Disease 2019 (COVID-19) related information that is easy to access, digest, and act upon. The rapid spread of COVID-19 has simultaneously led to a rapid spread of information, misinformation, and disinformation related to the pandemic. This portal seeks to aid journalists, non-governmental organizations, and community members in navigating this deluge of COVID-19 information. The COVID-19 dashboard provides answers to frequently asked questions (FAQs) and resources on COVID-19 vaccines; answers to FAQs about COVID-19; a Mythbusters section aiming to debunk common COVID-19 misconceptions; infographics and reliable resources; mental health tips for managing stress and promoting wellbeing during the pandemic; a data spotlight providing up-to-date information on current cases; social media tips for using the platforms responsibly; and tips for tobacco users during the pandemic. All of this information is free, updated frequently, and is readily available in Portuguese, Spanish, and Hindi.

Resource Portal. COVID-19 Classroom
GHELI repository link: https://repository.gheli.harvard.edu/repository/13515
This online curriculum produced by the COVID-19 Student Response Team at Harvard Medical School (HMS) is a resource portal containing information about Coronavirus in three formats tailored to elementary school students, middle school students, and high school and college age students. Modules for elementary students include a guided series of printable coloring pages. Middle school students can learn the science behind viruses and the timeline of COVID-19 via a series of videos, readings, and interactive worksheets. High school and college age students can participate in a virtual case simulation and learn the basics of clinical medicine in the context of a COVID-19 patient. The curriculum portal includes a Caregiver and Teacher Guide with materials and practices to support kids and adolescents throughout the pandemic, also tailored to several age groups. The portal also provides related resources that are freely accessible and have been curated by the team at HMS to offer additional information for families, caregivers, and children. These resources cover topics including temporary homeschooling, building resilience, ensuring child wellbeing, supporting children with anxiety or ADD/ADHD, and expressing emotions throughout the pandemic.

Activity. United Nations Global Call Out to Creatives - Help Stop the Spread of COVID-19
GHELI repository link: https://repository.gheli.harvard.edu/repository/13212
The purpose of this protocol is to design an art assignment that communicates public health information. This is inspired by the United Nations Global Call Out to Creatives, a campaign to marshal creative efforts in translating critical public health message to different communities. A provocative or eye-catching piece of art, video, or audio can transform evidence into a format that is both attractive and memorable.

Resources
Students may want to refer to the following resources for a better understanding of the UN's key messages on personal hygiene, physical distancing, knowing the symptoms, the "kindness contagion", mythbusting, and donations.

- Key Messages for Creatives (United Nations 2020)
- Q&A on Coronaviruses (World Health Organization 2020)
Sample Activities

Before selecting a medium, students may want to spend some time identifying which of the UN "key messages" they would like to tackle through their work. Some projects we would recommend thereafter:

- **Illustrate or design a graphic (e.g., Instagram post, GIF, meme):** During this time, people are on their phones more than ever. What are short format pieces that people of all ages can share quickly to their friends and family?
- **Film or animate a short video:** This is a great opportunity to practice storyboarding and narrative storytelling that is grounded in evidence. Ideally, video projects should be no more than 3 minutes.
- **Record audio (e.g., music, PSA):** Music, podcasts, and public service announcements are all different mediums for making change through audio. Music in particular—like [Vietnam's catchy and viral handwashing video](https)—can stick with listeners.

For fun, consider sharing through social media using hashtags like #FlattenTheCurve #SafeHands #AloneTogether #ViralKindness #StopTheSpread #Covid19.

**Resource Portal. Coronavirus Resources: Teaching, Learning and Thinking Critically**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13247](https://repository.gheli.harvard.edu/repository/13247)

This collection of resources from The New York Times is designed to help students and educators stay updated on the COVID-19 outbreak, think critically about information, consider the “essential” questions the pandemic raises about our world today. Popular resources include a lesson on how coronavirus hijacks cell function, weekly data literacy activities, short Film Club documentaries on COVID-related stories, and daily writing prompts for students. The page is regularly updated with new student-centered content from The Times or other reliable resources. Most content is aimed at students ages 13 and up.

**Lesson. Making Sense of Coronavirus through Storytelling and Media Making**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13244](https://repository.gheli.harvard.edu/repository/13244)

This unit from the Student Reporting Labs at PBS News Hour covers the basics of community journalism, storytelling, scripting, and video editing. It covers three different angles or types of stories students can develop: quick takes, community stories, and confronting misinformation. In addition to step-by-step guidance for telling stories through media, the unit includes a webinar walking through the curriculum and a glossary of common terms related to COVID-19.

**Activity. Above The Noise: Social Distancing**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13245](https://repository.gheli.harvard.edu/repository/13245)

This video and facilitator guide from KQED, aimed at students, talks about the importance of social distancing, even for young people. The facilitator guide includes prompts for students to practice their writing, specifically about their personal experiences social distancing and their tips for survival. Educators have the option to integrate the resource directly to Google Classroom.

**Online Learning. Coronavirus Lessons**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13246](https://repository.gheli.harvard.edu/repository/13246)

These resources from BrainPOP offer multiple ways to teach about coronavirus that are most appropriate for younger students. After watching the anchor video, students can take quizzes or make a visual map of their learning through BrainPOP’s web-based tool. It also includes a worksheet about prevention, graphic organizer on fact vs. fear, and vocabulary flash cards.
Online Learning. Learning Toolbox: COVID-19 Science
GHELI repository link: https://repository.gheliharvard.edu/repository/13243
These videos and activities from the Exploratorium help students understand the science underlying viruses, like COVID-19. Students can learn about exponential decay using pennies to model how long coronavirus can last on different surfaces, or learn how soap inactivates coronaviruses. Many of the activities are hands-on and can be replicated at home with common household materials.

Resource Portal. Teaching Our World: The Coronavirus
GHELI repository link: https://repository.gheliharvard.edu/repository/13248
This resource collection from Scholastic Classroom Magazines brings together age-appropriate information for teaching about the coronavirus. Among the resources for middle school and high school students is an interview with a physicist who explains how sneezes (and mucus droplets) spread the disease, as well as an accessible article on pandemic preparedness.

Activity. COVID-19: How Can We Make Choices That Promote the Common Good?
GHELI repository link: https://repository.gheliharvard.edu/repository/13242
These activities from Facing History and Ourselves encourage students to grapple with the ethics around social distancing, a new social norm with the spread of COVID-19. In particular, the activities in this resource help students explore the meaning of “common good” and consider its implications for collective action. Each activity includes reflection questions, which students can respond to through text, virtual discussion, or multimedia. This resource also includes student-facing Google Slides that can be integrated into Google Classroom.

Resource Portal. Infectious Diseases
GHELI repository link: https://repository.gheliharvard.edu/repository/13249
This resource library from National Geographic includes photos, videos, maps, and activities related to infectious diseases. The resources within the collection focus on bacteria, viruses, fungi, and parasites. The resources within the collection would be useful to educators seeking to contextualize COVID-19 within the context of other infectious disease prevention and treatment efforts. Educators can filter by content type (e.g., video, infographic, activity) or by subject (e.g., biology, social studies, geography). Most resources are suitable for middle school and high school classrooms.

Teaching Case. Social Distancing in the Midst of COVID-19
GHELI repository link: https://repository.gheliharvard.edu/repository/13275
This case vignette will be most useful to high-school educators looking to introduce COVID-19 to their classroom. The case focuses on understanding why local and federal governments need to "implement guidelines for social distancing".

Students will learn what "social distancing" means, and how it can involve population-based measures such as canceling group events and closing public spaces as well as individual-level behavior change such as staying home, working remotely, and avoiding of crowds. Students will become familiar with the phrase and meaning of 'flattening the curve,' which refers to the potential effectiveness of using social distancing measures to prevent surges of sick patients requiring intensive care that could overwhelm the capacity of the health care system.
Lesson. Influenza 1918
GHELI repository link: http://repository.gheli.harvard.edu/repository/12197
This documentary uncovers the history of the 1918 flu epidemic—the worst epidemic in American history, which killed over 600,000 people. Since 2018 represents the centenary of this deadly epidemic, many are drawing parallels to the current, deadly flu season. The film is accompanied by a teacher’s guide, a timeline tracking the disease’s spread, and a photo gallery of the medical investigation of influenza.

Lesson. How Can We Help Stop the COVID-19 Pandemic?
GHELI repository link: https://repository.gheli.harvard.edu/repository/13374
This article in the Biomedical Science Journal for Teens compares two non-pharmaceutical approaches for addressing COVID-19: mitigation approaches, which emphasize protecting the most vulnerable in the population, and suppression approaches, which minimize the spread of the disease until treatment is available. This article, written in plain language accessible to middle school and high school audiences, bases this comparison on a computer model for flu pandemic simulations, modified for COVID-19. The authors find that suppression strategies -- which include social distancing for the entire population -- are a far better technique in the present moment.

This resource includes a glossary of key terms, as well as a worksheet for checking student understanding. Also included is a teacher's key, which summarizes answers to the worksheet. Educators may wish to incorporate this article as primary source material in a lesson, specifically lessons that focus on data comprehension, scientific writing, and basic epidemiology.
COVID-19 Relevant Teaching Cases
Teaching Pack
2020

Overview

This curated collection includes teaching cases that could serve as useful resources for educators teaching about topics that are relevant to COVID-19, including but not limited to: pandemic risk preparedness, mitigation and response; policy coordination between federal, state and local government; drugs, vaccines and supply chains; international collective action and global governance.

Cases include both domestic and international experiences with SARS, H1N1, H5N1, Ebola and COVID-19. While some cases are older, they represent the challenges, opportunities and lessons learned from past events surrounding complex epidemics and pandemics. This teaching pack is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New cases will be added as they become available.

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Selected Resources

*indicates resource listed in GHELI's online Repository

TEACHING CASES

* Teaching Case. Roche and Tamiflu: Doing Business in the Shadow of Pandemic

* Teaching Case. When Supply Is of Public Interest: Roche & Tamiflu

* Teaching Case. COVID-19: The Global Shutdown

* Teaching Case. Protecting the Population from the 2009 Pandemic H1N1 Virus

* Teaching Case. Gavi and COVID-19: Pandemic of the Century

* Teaching Case. Hong Kong Copes With SARS, 2003: The Amoy Gardens

* Teaching Case. Emergency Response System Under Duress: The Public Health Fight to Contain SARS in Toronto (A)

* Teaching Case. Keeping an Open Mind in an Emergency: CDC Experiments With 'Team B'

* Teaching Resource. Technological Innovation for Global Health: Vaxess' Long Road to Heat-Stable Vaccines

* Teaching Case. Caught in a Storm: The World Health Organization and the 2014 Ebola Outbreak

* Teaching Case. Social Distancing in the Midst of COVID-19
* **Teaching Case. Coping with Crisis: Hong Kong Public Health Officials and the "Bird Flu"**

* **Teaching Case. Swine Flu Scare in America (B)**

* **Teaching Case. Swine Flu Scare in America (A)**

* **Teaching Case. On the Frontlines of a Pandemic: Texas Responds to 2009 Novel H1N1 Influenza**

* **Teaching Case. Tennessee Responds to the 2009 Novel H1N1 Influenza A Pandemic**

* **Teaching Case. Confronting a Pandemic in a Home Rule State: The Indiana State Department of Health Responds to H1N1**

* **Teaching Case. The Meningitis Vaccine Project**

* **Teaching Case. Ensuring Vaccine Supply for the Next Pandemic Flu**
Moon S, Gordon R. Ensuring Vaccine Supply for the Next Pandemic Flu: Will the World Be Ready? Global Health Education and Learning Incubator at Harvard University, Connors Center for Women's Health at Brigham and Women's Hospital, FXB Center for Health and Human Rights, Harvard University 2014. [http://repository.gheli.harvard.edu/repository/10686](http://repository.gheli.harvard.edu/repository/10686).

* **Teaching Case. Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (B): Business Model Innovation in Vaccine Delivery**

* **Teaching Case. Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (A): The Challenges of Vaccine Launches in Emerging Markets**

* **Teaching Case. H1N1 in Texas, PART A**
* Teaching Case. H1N1 in Tennessee

* Teaching Case. H1N1 in Indiana
Teaching Pack: COVID-19 Relevant Teaching Cases

Annotated Bibliography

TEACHING CASES

Teaching Case. Roche and Tamiflu: Doing Business in the Shadow of Pandemic
GHELI repository link: https://repository.gheli.harvard.edu/repository/13285
This case focuses on the accessibility of a drug, Tamiflu, produced by Roche, which could provide a treatment for pandemic flu caused by a lethal avian flu strain. As of July 2006, 232 cases had been reported, mainly in individuals with direct contact with poultry. However, there was still fear that the development of human to human transmission could start a global pandemic. In that situation, Tamiflu would represent the only therapeutic agent that could protect healthcare workers and help to contain the virus while research was conducted to develop other medications and vaccines.

As described in the abstract, "Due to patent protection and a complicated production process with scarce raw ingredients, Roche had been the only producer of the drug. Partly in response to U.S. political pressure, in November 2005 Roche allowed Gilead to produce Tamiflu as well. Even so, it would take at least until late 2007 for Roche and Gilead to meet the orders of governments worldwide. The issue was a difficult one for Roche: What were the risks; what were the opportunities? If a pandemic occurred before sufficient stockpiles of Tamiflu had been built up, would Roche be held responsible? What steps, if any, should Roche take with respect to patent protection and production licensing in the shadow of a potential pandemic?"

This case study is offered for a small fee by Harvard Business School Publishing, which serves as a bridge between academia and enterprises around the world through its myriad publications—including cases, articles, simulations, books and chapters, online courses, and “core curriculum” modules on foundational topics—and content-delivery platforms. Any registered user can create personalized libraries with shareable folders of resources, and individuals with “Premium Educator access” may access publications for free as well as unlock supplemental materials, including teaching notes.

Teaching Case. When Supply Is of Public Interest: Roche & Tamiflu
GHELI repository link: https://repository.gheli.harvard.edu/repository/13284
This case presents the challenges faced by Roche to establish and maintain a functional supply network and stockpile for the antiviral drug Tamiflu, in order to prepare for the needs of a global influenza pandemic. While Tamiflu was the main available drug for seasonal influenza (Type A or B), it was likely to also be a valuable therapeutic tool against an influenza pandemic caused by influenza virus A, especially since there would be no immediate vaccine.

As described in the abstract, "Managing supply is particularly challenging for three reasons. First, demand for stockpile quantities is spiky and uncertain, and governments placing orders expect lead times to be short. Second, lead times for increasing capacity are long, as are lead times for drug production and encapsulation. Last, media coverage and press releases made by governments and other stakeholders increase the stakes, as negative media coverage may damage Roche's reputation with consumers, leading to lower sales levels for its products."

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Teaching Case. COVID-19: The Global Shutdown
https://hbsp.harvard.edu/product/320108-PDF-ENG.
GHELI repository link: https://repository.gheli.harvard.edu/repository/13283
This teaching case focuses on the COVID-19 pandemic from a global perspective. In addition to describing the public health emergency, the case focuses on the enormous impact on global economics as world trade, tourism, capital flows, remittances, and commodity prices have all been affected by efforts to contain the virus.

Key questions posed in the abstract included, "What policy options existed to mitigate the financial and economic distress of containment, and what factors did different countries weigh in deciding which paths to choose? Was there a terrible choice - either damage livelihoods through extended lockdowns, or sacrifice thousands or even millions of lives to the virus - or were policies reinforcing? What was the role of government, businesses, communities and individuals? After the worst of the health crisis was mitigated, what kind of shape would world economies take?"

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Teaching Case. Protecting the Population from the 2009 Pandemic H1N1 Virus
GHELI repository link: https://repository.gheli.harvard.edu/repository/13282
This case takes place in the summer of 2009 as the Centers for Disease Control (CDC) and various stakeholders faced difficult decisions regarding how to manage a potential H1N1 pandemic in the fall. It begins with the concerns of the chair of the special meeting of the Advisory Committee on Immunization Practices (ACIP) that would make recommendations to the Centers for Disease Control (CDC) on how to prioritize vaccine distribution to protect the population. A primary concern was that in the middle of a pandemic, state and local public health officials could face vaccine shortages and unclear protocols.

The case reviews the differences between pandemic flu and seasonal flu, provides background information about H1N1, and illustrates the range of multi-disciplinary perspectives required to address public health issues. While acknowledging the global dimensions of pandemic flu, it focuses predominantly on the domestic decision making processes. It allows for a discussion of basic concepts of epidemiology, vaccine development, production and distribution, construction of policies in uncertainty, and communication with the public.

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Teaching Case. Gavi and COVID-19: Pandemic of the Century
GHELI repository link: https://repository.gheli.harvard.edu/repository/13281
Gavi, launched in 2000 with the mission to increase access to immunization in low-income countries, is an alliance of donor countries, philanthropies, and multilateral agencies such as the WHO and UNICEF. The alliance coordinates immunization programs by pooling resources, using advance market commitments and financial instruments such as vaccine bonds. This case asks the question "How should Gavi respond to the need for a vaccine for the worldwide COVID-19 pandemic?"
As stated in the abstract, the learning objectives are to "understand how a global alliance structure is used to preemptively structure the market so as to solve a pressing public_goods problem, that of inadequate vaccinations for many of the world's hotspots; and understand why solutions to grand entrepreneurial challenges - the kinds that affect vast swathes of humanity - can be solved by creativity on multiple fronts of science, finance, and business model elaboration."

This case study is offered for a small fee by Harvard Business School Publishing, which serves as a bridge between academia and enterprises around the world through its myriad publications—including cases, articles, simulations, books and chapters, online courses, and “core curriculum” modules on foundational topics—and content-delivery platforms. Any registered user can create personalized libraries with shareable folders of resources, and individuals with “Premium Educator access” may access publications for free as well as unlock supplemental materials, including teaching notes.

Teaching Case. Hong Kong Copes With SARS, 2003: The Amoy Gardens
GHELI repository link: https://repository.gheli.harvard.edu/repository/13280
This case tracks events beginning in late March 2003 when SARS (Severe Acute Respiratory Syndrome) spread to Hong Kong, one of the world's most densely populated cities, and explores the responses by the government, the health sector, and civil society.

As described in the abstract, "After weeks of effort to control the spread of the illness finally appeared to have made progress, SARS cases suddenly erupted unexpectedly and in large numbers in a large apartment complex—raising questions about how residents, not seemingly exposed to the illness, might have contracted it, and, even more worrisome, whether it might spread far more easily than previously thought. The SARS outbreak at Amoy Gardens became an exercise in crisis management for public health officials in Hong Kong—with their counterparts around the world either observing or actively advising. Should the complex be evacuated? Should it be quarantined? How might residents respond to either approach? What would be the best way to aid residents of Amoy Gardens, at the same time ensuring, as much as possible, that they would not spread SARS further?"

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. This case may be purchased for a nominal fee; registered educators may obtain a free review copy.

Teaching Case. Emergency Response System Under Duress: The Public Health Fight to Contain SARS in Toronto (A)
GHELI repository link: https://repository.gheli.harvard.edu/repository/13279
This two-part case explores how the Toronto and Ontario public health and hospital systems responded to the outbreak of SARS in 2003. SARS was introduced to Toronto when an airplane passenger from Hong Kong—who had been in contact with an infected individual at a Hong Kong hotel—arrived in Toronto.

As described in the abstract, "It describes both the public health system in place at the time SARS came to Toronto and the stress and adaptations which resulted. This crisis management case makes it clear that Toronto had great difficulty in coping with the respiratory virus. The case raises the questions of whether Toronto’s problems were the result of long-term under-funding of the public health system and highlights systemic communications problems which came to play a dramatic role in the SARS story. It focuses, as well, on the question of whether quarantine is a useful weapon in the modern struggle against disease and, if so, what form such action should take."

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. The funding source was the Centers for Disease Control, US Department of Health and Human Services, Robert Wood Johnson Foundation. This case may be purchased for a nominal fee; registered educators may obtain a free review copy.

The teaching case on the public health fight to contain SARS in Toronto is divided into two parts. The second part of the case is accessible on a separate web page.
Teaching Case. Keeping an Open Mind in an Emergency: CDC Experiments With 'Team B'
GHELI repository link: https://repository.gheli.harvard.edu/repository/13278
This case and epilogue focus on the efforts at the US Centers for Disease Control and Prevention (CDC) in the early 2000s to come up with new strategies for addressing the growing complexity of public health emergencies. At that time, the 2001 anthrax attacks illustrated the threats posed by weaponized pathogens, while resurgent infectious diseases and drug-resistant pathogens rose.

As described in the abstract, the case describes how "top level CDC strategists began to consider adding a feature called "Team B," to emergency investigations. Team B would be made up of people with expertise in the topic at hand, but with no significant responsibilities in the investigation itself. This group would convene regularly, over the course of the emergency investigation, to review the latest developments in the outbreak, and to ask themselves whether there were alternative interpretations of the data, or concurrent developments, that the principal investigating team had either missed or too readily dismissed."

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. The funding source was Harvard’s National Preparedness Leadership Initiative. This case is available for free.

Teaching Resource. Technological Innovation for Global Health: Vaxess’ Long Road to Heat-Stable Vaccines
GHELI repository link: https://repository.gheli.harvard.edu/repository/13277
This case describes the launch of a start-up company, Vaxess, which develops a silk-based technology for the heat-stabilization of vaccines, bypassing the need for refrigeration. Vaxess aims to increase vaccine access for children living in low-income countries, particularly in rural areas. This case examines the complex global system that shapes the process of technological innovation for public health and the barriers that arise with implementation.

As the abstract describes, "Developing a biomedical technology from its early stages into a final product was already a lengthy and risky endeavor; doing so for a product with limited market potential could be more complex still. In principle, creating heat-stable vaccines could offer many benefits from eliminating the need for a cold chain: decreased distribution costs, reduced vaccine spoilage, improved immunization coverage and increased compliance with vaccination schedules. However, what had initially seemed like a straightforward scientific challenge to address a widely-shared goal, quickly revealed itself to be much more complex as Valenti began to navigate the complex global health ecosystem: vaccine industry stakeholders included pharmaceutical companies, charitable foundations, UN agencies, global health initiatives and the governments of LMIC countries."

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. It was funded by the Harvard Kennedy School’s Sustainability Science Program. This case is provided for free.

Teaching Case. Caught in a Storm: The World Health Organization and the 2014 Ebola Outbreak
GHELI repository link: https://repository.gheli.harvard.edu/repository/13276
This case summarizes the events of the 2014-2016 West Africa Ebola Outbreak, starting with the death of patient zero in December 2013 and ending in August 2014 when the World Health Organization declared the outbreak a Public Health Emergency of International Concern (PHEIC). The case asks students to consider the challenges associated with a transnational crisis that crosses borders as well as the limitations in the current instruments and processes of global governance.
As the abstract describes, "The case examines the role of the World Health Organization, a key actor in the epidemic, and provides further context into the strategy, finances, and organizational design of the organization. Additional information related to the Ebola Virus Disease (EVD), infectious disease epidemics, and the socioeconomic and political context of the three countries most affected by the outbreak (Sierra Leone, Liberia, and Guinea) is also provided."

It includes interviews with experts and stakeholders who are involved in the management of the epidemic and the assessment that followed. The case is accompanied by an epilogue which retraces events after the declaration of a PHEIC in August 2014.

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. This case is provided for free.

**Teaching Case. Social Distancing in the Midst of COVID-19**
GHELI repository link: https://repository.gheli.harvard.edu/repository/13275  
This case vignette will be most useful to high-school educators looking to introduce COVID-19 to their classroom. The case focuses on understanding why local and federal governments need to "implement guidelines for social distancing".

Students will learn what "social distancing" means, and how it can involve population-based measures such as canceling group events and closing public spaces as well as individual-level behavior change such as staying home, working remotely, and avoiding of crowds. Students will become familiar with the phrase and meaning of ‘flattening the curve,’ which refers to the potential effectiveness of using social distancing measures to prevent surges of sick patients requiring intensive care that could overwhelm the capacity of the health care system.

**Teaching Case. Coping with Crisis: Hong Kong Public Health Officials and the "Bird Flu"**
GHELI repository link: https://repository.gheli.harvard.edu/repository/13274  
This case focuses on the response of the public health sector in Hong Kong to a new avian-flu virus in 1998. The case analyzes the approach of the government and the public health authorities to mitigate the threat to human life, to effectively communicate with the public, and to do both in the setting of uncertainty.

The abstract sets the stage with the following description: "This case recounts the efforts of Hong Kong public health authorities first to identify and then control a dangerous new flu virus not previously known to infect humans. The case focuses on the authorities’ communication with the public, as they must seek to quell public fears notwithstanding their own incomplete knowledge of the disease. The case, too, describes the crisis management decision to undertake a massive slaughter of Hong Kong chickens, once they are shown to be the host of the deadly but difficult-to-transmit virus."

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. Each case in the series is designed to train public leaders, and introduces actual policy dilemmas along with data to equip students to learn how to apply the rigor of quantitative analysis in the real world. The funding source was the Civil Service Development Institute for the Leadership Enhancement and Development (LEAD) Program. This case may be purchased for a nominal fee; registered educators may obtain a free review copy.
Teaching Case. Swine Flu Scare in America (A)
GHELI repository link: https://repository.ghel.harvard.edu/repository/13272
This case focuses on the epidemiological investigation, government response, and civil society reaction to the swine-flu in 1976. The case also analyzes the response of the press, which framed the swine-flu as a potential repeat of the "highly fatal 1918 influenza pandemic".

The abstract sets the stage with the following description. "In 1976, the CDC received samples of an unknown pathogen from Fort Dix, a New Jersey Army training center. After extensive testing, it was discovered that the sample was swine flu, which had not been reported in persons 'out of touch with pigs' since the late 1920's. CDC director Dr. David Spencer wrote an 'action memorandum' detailing how the Federal government should proceed."

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. Each case in the series is designed to train public leaders, and introduces actual policy dilemmas along with data to equip students to learn how to apply the rigor of quantitative analysis in the real world. This case is available for free.

Also see: Swine Flu Scare in America (B)

Teaching Case. Swine Flu Scare in America (B)
GHELI repository link: https://repository.ghel.harvard.edu/repository/13273
This case is the second part (Part B) of a case on the government's response to the swine-flu in 1976. This section focuses on the interplay between the Centers for Disease Control and the federal government.

The abstract sets the stage with the following description. "In 1976, the CDC received samples of an unknown pathogen from Fort Dix, a New Jersey Army training center [...] CDC director Dr. David Spencer wrote an ‘action memorandum’ detailing how the Federal government should proceed. This section details how Dr. Theodore Cooper, of the CDC, took Spencer's paper to Washington D.C., and the resistance that his propositions faced."

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program. Each case in the series is designed to train public leaders, and introduces actual policy dilemmas along with data to equip students to learn how to apply the rigor of quantitative analysis in the real world. This case is available for free.

Also see: Swine Flu Scare in America (A)

Teaching Case. On the Frontlines of a Pandemic: Texas Responds to 2009 Novel H1N1 Influenza
GHELI repository link: http://repository.ghel.harvard.edu/repository/10810
This case study focuses on public health challenges state officials faced in Texas during some of the first U.S. outbreaks of the Novel H1N1 ("swine flu") pandemic. It explores how state health officials organized a response to the disease in the face of considerable uncertainty regarding its contagiousness, lethality, and geographic spread. Through the case, teachers and students can discuss the challenges of responding to a rapidly unfolding event featuring a high degree of novelty, the benefits and limitations of pre-event preparedness efforts, and the difficulties of coordinating an effective response among a number of partners and across multiple levels of government.

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program, hosted by the HKS Strengthening Learning and Teaching Excellence (SLATE) initiative, the world's largest producer and repository of case studies designed for teaching about how government works and how public policy is made. Each case in the series is designed to train public leaders, and introduces actual policy dilemmas along with data to equip students to learn how to apply the rigor of quantitative analysis in the real world.
Teaching Pack: COVID-19 Relevant Teaching Cases

This case may be purchased for a nominal fee; registered educators may obtain a free review copy. Online supplemental resources include short free documents and videos on how to teach with the case method, as well as downloadable related tip sheets and questions for class discussion.

Teaching Case. Tennessee Responds to the 2009 Novel H1N1 Influenza A Pandemic
GHELI repository link: http://repository.gheli.harvard.edu/repository/10809
This case study focuses on public health challenges state officials faced during the 2009 H1N1 influenza pandemic in Tennessee. It explores the mobilization of public-private partnerships to prepare for the “second wave” of the disease in 2010, and the challenges to address difficulties such as vaccine delivery, communicating with an anxious public, and managing a surge of patients seeking care. Students learn methods for preparing for a significant public health emergency and the difficulties of coordinating a response involving multiple jurisdictions and a mix of actors from both the public and private sectors.

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Teaching Case. Confronting a Pandemic in a Home Rule State: The Indiana State Department of Health Responds to H1N1
GHELI repository link: http://repository.gheli.harvard.edu/repository/10796
This case study describes how Indiana state health officials attempted to develop a united response to H1N1 (“Swine Flu”) in 2009. The challenge of coordinating efforts across nearly 100 independent local health units will prompt students to consider intergovernmental relations that impact health, and how public officials might work together better in routine decision-making as well as during times of crisis.

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program, hosted by the HKS Strengthening Learning and Teaching Excellence (SLATE) initiative, the world’s largest producer and repository of case studies designed for teaching about how government works and how public policy is made. Each case in the series is designed to train public leaders, and introduces actual policy dilemmas along with data to equip students to learn how to apply the rigor of quantitative analysis in the real world.

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Teaching Case. The Meningitis Vaccine Project
GHELI repository link: http://repository.gheli.harvard.edu/repository/10691
This case follows the vaccine development for Meningitis A, a disease that routinely caused deadly epidemics in Sub-Saharan Africa. The case explores why such a vaccine had not been developed previously and how the creation of the Meningitis Vaccine Project (MVP) - a partnership between the World Health Organization (WHO) and PATH, a non-
Teaching Pack: COVID-19 Relevant Teaching Cases

governmental organization - enabled the vaccine to be successfully developed over 10 years by creating a novel product
development partnership. Students examine why the public/private partnership was successful and how such a model
could be applied to the development of other vaccines and health technologies. Additionally, the case explores the
strategies applied by Marc LaForce, the MVP's director and veteran public health advocate, to make the MVP a success.
In particular, the case examines the management skills LaForce exercised during his tenure to develop a vaccine that
affected African countries could afford through their own health budgets.

Teaching Case. Ensuring Vaccine Supply for the Next Pandemic Flu
Moon S, Gordon R. Ensuring Vaccine Supply for the Next Pandemic Flu: Will the World Be Ready? Global Health
Education and Learning Incubator at Harvard University, Connors Center for Women’s Health at Brigham and Women’s
Hospital, FXB Center for Health and Human Rights, Harvard University 2014.
http://repository.gheli.harvard.edu/repository/10686.
GHELI repository link: http://repository.gheli.harvard.edu/repository/10686
This case highlights the challenges of managing externalities and sovereignty through the example of pandemic flu.
Recent outbreaks of both the H5N1 and H1N1influenza strains have illustrated that the global institutions charged with
preventing and responding to these pandemics are not up to the task. With both, there were significant problems with
the development, production, and distribution of flu vaccines. Indeed, stemming a modern day pandemic depends on
the rapid development, sufficient production, and equitable, timely access to influenza vaccines, all within a complex
global context. Compounding these challenges are the disease-specific “unknowns” related to the emergence of a new
virus, including severity levels, transmission ease, human immunity, and drug vulnerability. Specific themes covered in
Ensuring Vaccine Supply for the Next Pandemic Flu: Will the World Be Ready? include issues of sovereignty; the legitimacy,
authority, and credibility of the World Health Organization (WHO); uncertainty and risk; world dependence on private
vaccine manufacturers for an essential public health good; health as a security issue; and equity issues in vaccine
distribution.

Teaching Case. Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (B): Business Model
Innovation in Vaccine Delivery
Parker P, Marion P. Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (B): Business Model
https://cb.hbsp.harvard.edu/cbmp/product/IN1140-PDF-ENG.
GHELI repository link: http://repository.gheli.harvard.edu/repository/10758
This case study describes the challenges of scaling up the delivery of vaccines in low-income settings. The case focuses
on the dengue vaccine, first launched in 2015, and explores issues of affordability, distribution, and the role of
innovation across industries. It is accompanied by a complementary case, Dengue - Sustainable Large Scale Vaccine
This case study is offered for a small fee by Harvard Business School Publishing, which serves as a bridge between
academia and enterprises around the world through its myriad publications—including cases, articles, simulations,
books and chapters, online courses, and “core curriculum” modules on foundational topics—and content-delivery
platforms. Any registered user can create personalized libraries with shareable folders of resources, and individuals
with “Premium Educator access” may access publications for free as well as unlock supplemental materials, including
teaching notes.

Teaching Case. Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (A): The Challenges of
Vaccine Launches in Emerging Markets
Parker P, Marion P. Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (A): The Challenges of
https://cb.hbsp.harvard.edu/cbmp/product/IN1139-PDF-ENG.
GHELI repository link: http://repository.gheli.harvard.edu/repository/10757
This case study describes the challenges of scaling up the delivery of vaccines in low-income settings. The case focuses
on the dengue vaccine, first launched in 2015, and explores issues of affordability, distribution, and the role of
innovation across industries. It is accompanied by a complementary case, Dengue - Sustainable Large Scale Vaccine Delivery in Low-Income Markets (B): Business Model Innovation in Vaccine Delivery.

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Teaching Case. H1N1 in Texas, PART A
GHELI repository link: http://repository.gheli.harvard.edu/repository/10810
This case study focuses on public health challenges state officials faced in Texas during some of the first U.S. outbreaks of the Novel H1N1 (“swine flu”) pandemic. It explores how state health officials organized a response to the disease in the face of considerable uncertainty regarding its contagiousness, lethality, and geographic spread. Through the case, teachers and students can discuss the challenges of responding to a rapidly unfolding event featuring a high degree of novelty, the benefits and limitations of pre-event preparedness efforts, and the difficulties of coordinating an effective response among a number of partners and across multiple levels of government.

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This case study focuses on public health challenges state officials faced during the 2009 H1N1 influenza pandemic in Tennessee. It explores the mobilization of public-private partnerships to prepare for the “second wave” of the disease in 2010, and the challenges to address difficulties such as vaccine delivery, communicating with an anxious public, and managing a surge of patients seeking care. Students learn methods for preparing for a significant public health emergency and the difficulties of coordinating a response involving multiple jurisdictions and a mix of actors from both the public and private sectors.

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Teaching Case. H1N1 in Indiana


GHELI repository link: http://repository.gheli.harvard.edu/repository/10796

This case study describes how Indiana state health officials attempted to develop a united response to H1N1 (“Swine Flu”) in 2009. The challenge of coordinating efforts across nearly 100 independent local health units will prompt students to consider intergovernmental relations that impact health, and how public officials might work together better in routine decision-making as well as during times of crisis.

The case is part of a series produced by the Harvard Kennedy School (HKS) Case Program, hosted by the HKS Strengthening Learning and Teaching Excellence (SLATE) initiative, the world’s largest producer and repository of case studies designed for teaching about how government works and how public policy is made. Each case in the series is designed to train public leaders, and introduces actual policy dilemmas along with data to equip students to learn how to apply the rigor of quantitative analysis in the real world.

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COVID-19 in U.S: State Variation & Disparities
Resource Pack
2021

Overview

This set of resources provide insight into the trajectory and impact of the COVID-19 pandemic in the United States. Selected publications, data portals, interactives, and graphics depict the national experience over time, and allow users to explore the variation in epidemiology and outcomes by state and population subgroup.

Resources were selected to also reflect particular attributes of the U.S. experience, such as the increasing evidence for racial disparities in terms of the most severe outcomes, the widespread impact in what is the largest incarcerated population in the world, the lack of consistent and coordinated policy for immigrants and migrants, and the heterogeneity in policy responses across states.

These resources on COVID-19 in the United States, state variation and disparities are part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New resources will be added as they become available.

The Global Health Education and Learning Incubator at Harvard University supports interdisciplinary education about world health through the production, curation, and dissemination of educational public goods.
Selected Resources

CONTENTS AT-A-GLANCE

* Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count

* Resource Portal. Coronavirus Resources


* Data Interactive. COVID-19 Preparedness - How Ready is Your County?

* Resource Portal. COVID-19 Testing Communications Toolkit

* Infographic. An Incalculable Loss

* Data Portal. State Data and Policy Actions to Address Coronavirus

* Data Interactive. Tracking the Spread of Coronavirus Cases in the US and Worldwide


* Resource Portal. The Coronavirus Outbreak


* Data Interactive. The Health and Economic Impacts of COVID-19 Interventions
* Data Interactive. Location Data Says It All: Staying at Home During Coronavirus is a Luxury

* Online Learning. The Coronavirus Pandemic Series

* Activity. Racial Disparities in COVID-19

* Data Portal. Racial Data Dashboard

* Article. COVID-19 and the Coming Epidemic in U.S. Immigration Detention Centres

* Article. How Medical Bias Against Black People is Shaping COVID-19 Treatment and Care

* Article. Racial Health Disparities and COVID-19: Caution and Context

* Article. COVID-19 and Racial/Ethnic Disparities

* Article. What the Racial Data Shows: The Pandemic Seem to be Hitting People of Color the Hardest

* Data Interactive. Where Low-Income Jobs Are Being Lost to COVID-19
Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count
GHELI repository link: https://repository.gheli.harvard.edu/repository/13304
This interactive in The New York Times provides the latest map and case count for Coronavirus Disease 2019 (COVID-19) and is updated regularly. Users can engage with the most recent data on location hot spots, total cases, deaths, cases per capita, and recent trends for COVID-19 in the United States on an interactive map of the entire country and on the individual state and county level.

The interactive article also includes data on the places hit hardest in the United States, such as in hot spots, the counties with the highest number of cases per resident, and clusters, which are places such as nursing homes, correctional facilities, and cruise ships with densely packed people. Readers can download county-level data for COVID-19 cases and read more about the methodology on GitHub.

Resource Portal. Coronavirus Resources
GHELI repository link: https://repository.gheli.harvard.edu/repository/13241
This resource collection from the Association for Prevention Teaching and Research (APTR) brings together webinars, podcasts, case studies, and articles for teaching COVID-19 in undergraduate or graduate-level classrooms. It is aimed at students and educators across the health professions. The collection not only includes evidence-based resources for teaching and learning about COVID-19, but also resources for effective remote teaching. Some featured resources include a patient simulation by the Case Network, a “health weather map” by Oregon State University to track the impacts of social distancing, and various public health trainings on navigating COVID-19.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13176
This web portal from the Centers for Disease Control and Prevention (CDC) hosts a wide range of information on the COVID-19 outbreak, from recent updates on disease spread to travel information. The basics of COVID-19 are included, such as how the disease spreads, symptoms, testing, and frequently asked questions. The CDC updates the situation summary regularly, providing insight into the steps taken by the organization to curb the spread of disease in the U.S., illness severity, and risk assessments. The portal also includes travel advisories, a map of confirmed cases, and the latest news on COVID-19.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13483
This report from the Council on Foreign Relations (CFR) examines the shortfalls of the Coronavirus Disease 2019 (COVID-19) pandemic response in the U.S. and provides recommendations to better address future public health crises. Despite decades of warnings and years of international planning for a pandemic, the U.S. and numerous other countries around the world faltered in COVID-19 response. This pandemic preparedness failure has led to an economic contraction and will ultimately cost hundreds of thousands of lives. The CFR found that the U.S. failed to adequately invest in pandemic preparedness efforts – such as prevention, detection, and response capabilities that have reduced the impact of COVID-19 in other countries. There were also shortcomings in global coordination and compliance with previously arranged agreements, including the International Health Regulations (IHR), which govern global health
security response. China’s reporting and information sharing – key tenants of IHR – were flawed at best as the outbreak began, shortening the time the global community had to prepare and respond to the growing crisis. The CFR continued to describe U.S. failures in response speed, the stockpiling of necessary health resources, communication with the general public, and investment in state and local health systems.

While it is clear that governments recognized the global threat of infectious diseases, they failed to adequately fund and execute plans made for disease response. In order to respond more effectively to the inevitability of future pandemics, the Council on Foreign Relations put forth recommendations to bolster pandemic preparedness. These recommendations range from adopting a robust strategy for domestic and global pandemic preparedness to strengthening the U.S. health system to building better global surveillance capabilities. Elevating pandemic preparedness to a key economic and security objective in the U.S., much like national defense, and revitalizing the Centers for Disease Control and Prevention, would be a significant step towards responding to future infectious disease outbreaks. These investments, along with other critical changes to pandemic preparedness infrastructure in the U.S., would allow the federal government to effectively anticipate, prevent, and respond to pandemics.

Data Interactive. COVID-19 Preparedness - How Ready is Your County?
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13217](https://repository.gheli.harvard.edu/repository/13217)
This data interactive from STAT, Applied XL, and the Center on Rural Innovation measures the preparedness of individual U.S. counties for a Coronavirus Disease 2019 (COVID-19) outbreak. The overall goal of the model is to identify areas of the country that are not prepared for a COVID-19 outbreak and it ultimately highlighted the vulnerability of rural America. Each county is given a score out of 100 based on five variables: the number of licensed hospital beds within a 40-minute drive, the number of critical care staff within a 40-minute drive, the percentage of the population 65 and older, the county’s score on the Social Vulnerability Index, and data from the Institute for Health Metrics and Evaluation’s (IHME) COVID-19 model. Rural areas have seen many hospital closings, a lack of health infrastructure compared to urban areas, and a shortage of health care professionals. The STAT model is tethered to IHME’s data, which assesses the severity of the COVID-19 outbreak in each location and is updated frequently.

Resource Portal. COVID-19 Testing Communications Toolkit
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13503](https://repository.gheli.harvard.edu/repository/13503)
This toolkit created jointly by the Brown School of Public Health and the Harvard Global Health Institute is a free, public online resource intended to communicate the importance of COVID-19 testing to communities in the United States. The toolkit includes an online library with images, animations, handouts, and templates that are free and available for use. Resources in the library cover topics including “why get tested,” “who should get tested,” “how testing works,” and “promote local testing.” The toolkit offers an animation informing users about the asymptomatic spread of COVID-19 and discusses who should consider taking a COVID-19 test. It also includes an additional set of resources to provide available evidence on asymptomatic testing, how coronavirus tests work, and the experience of getting a test. Users can start a personal campaign to spread awareness about coronavirus testing using the materials provided by the toolkit and can take tutorials to learn how to conduct community surveys and use social media to support their campaigns. They can also build on and support the existing #TakeTheTest campaign in their own communities and use crafted social media posts and images from the resource library.

Infographic. An Incalculable Loss
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13267](https://repository.gheli.harvard.edu/repository/13267)
This interactive article published by The New York Times provides a visual narrative of a sample of the nearly 100,000 lives lost to Coronavirus Disease (COVID-19) to date. As readers scroll through the interactive, the article shows the date – beginning in early March – and the number of total deaths at the top of the visual as figures of people in the
background accumulate and represent the deaths from COVID-19. The interactive incorporates quotes from obituaries about these people from around the United States and provides supplementary text about the impact of the pandemic on human life, death, and relationships.

Data Portal. State Data and Policy Actions to Address Coronavirus
GHELI repository link: https://repository.gheli.harvard.edu/repository/13206
This data portal from the Kaiser Family Foundation provides an in-depth overview of state-level policy actions to curtail the spread of Coronavirus Disease 2019 (COVID-19). The portal provides data on the number of COVID-19 cases, deaths, vaccinations, positivity rate, and specific policy actions taken for individual states. COVID-19 metrics are also displayed in separate maps highlighting race/ethnicity and those living in long-term care facilities. Policy actions tracked include eligibility for the COVID-19 vaccine, priority populations by state, social distancing, health policy, and telehealth. This data is presented in both map and table format and can be exported. This data portal can be incorporated in comparative classroom activities exploring state-level healthy policy action.

Data Interactive. Tracking the Spread of Coronavirus Cases in the US and Worldwide
GHELI repository link: https://repository.gheli.harvard.edu/repository/13307
This data visualization in USA Today provides daily updates on the spread of Coronavirus Disease 2019 (COVID-19) in the United States and around the world. It compiles interactive data with maps and charts from the World Health Organization, the Centers for Disease Control and Prevention, and other sources compiled by Johns Hopkins University. Readers can engage with data visualizations detailing the total confirmed cases, number of deaths, and number of recovered people at varying geographic resolutions including on the global, country, or state level. The maps illustrate the cumulative spread of the virus and are accompanied by supporting information about the disease.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13202
This web portal from the Centers for Disease Control and Prevention (CDC) brings together the CDC’s Morbidity and Mortality Weekly Reports (MMWR) into one place. The currently published MMWRs describe initial public health response and interim clinical guidance for Coronavirus Disease 2019 (COVID-19), as well as up-to-date information about new diagnoses in the U.S.

Resource Portal. The Coronavirus Outbreak
GHELI repository link: https://repository.gheli.harvard.edu/repository/13304
This web portal from The New York Times continuously updates with the latest news on the Coronavirus Disease 2019 (COVID-19) pandemic. All the news stories, editorials, as well as other COVID-19 related posts published by the New York Times are maintained in the portal and are available free to the public. Also included are frequently asked questions and a map tracking cases of COVID-19.

Resource Portal. Coronavirus (COVID-19)
GHELI repository link: https://repository.gheli.harvard.edu/repository/13205
This web portal from the Kaiser Family Foundation contains up to date policy information related to Coronavirus Disease 2019 (COVID-19), providing the user a different angle in which to view the pandemic. The portal, which contains information generally focused on the United States, contains polls, editorials, data portals, and policy papers related to the disease.

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gheli@harvard.edu
617-495-8222
Data Interactive. The Health and Economic Impacts of COVID-19 Interventions
GHELI repository link: https://repository.gheli.harvard.edu/repository/13266
This interactive tool produced by the RAND Corporation provides data on the current impact of Coronavirus Disease 2019 (COVID-19) and interventions by state in the United States. The tool provides up-to-date statistics on fatalities, hospitalizations, intensive care unit (ICU) usage, confirmed cases, and economic impacts. It also estimates the projected effects of several different levels of interventions on health outcomes including cumulative fatalities, ICU demand, hospital bed demand, and changes in gross state income. The tool also allows users to interact with different policies that have been implemented in previous pandemics or by other countries; it provides qualitative guidelines and descriptions of each of these policies. By interacting with the different indicators, interventions, and previous data, the tool allows policy decision-makers to evaluate how to best implement health and economic interventions for long-term outcomes related to COVID-19.

Data Interactive. Location Data Says It All: Staying at Home During Coronavirus is a Luxury
GHELI repository link: https://repository.gheli.harvard.edu/repository/13306
This interactive article in The New York Times explains that smartphone location data has shown that lower-income workers are continuing to leave their homes and move around, while wealthier populations are able to stay home and limit their exposure to Coronavirus Disease 2019 (COVID-19). The article presents results from analyses of cellphone data by the company Cuebiq, which tracks about 15 million cellphone users around the United States each day. The article shows changes in movement of people over time, beginning in early March, and shows both general trends and movement trends specific to major cities’ transportation systems. It shows the differences in movement between those in the top 10 percent of income and the bottom 10 percent of income, as well as a real-time analysis of people’s movement responses to government orders. The data focuses on metro areas in cities with high income disparity – Washington, Boston, Baltimore, San Francisco – and in areas with low income disparity – El Paso, Chattanooga, Little Rock, and Deltona-Daytona. The article reports more broadly on economic impacts of COVID-19 such as stimulus checks, small businesses, unemployment, and health insurance in the United States.

Online Learning. The Coronavirus Pandemic Series
GHELI repository link: https://repository.gheli.harvard.edu/repository/13181
This webcast seminar series from The Forum at the T.H. Chan School of Public Health takes on pressing questions about the COVID-19 pandemic. The series invites global and public health experts to discuss the pandemic’s ongoing development including preparedness efforts, vaccine development, health system responses, and health inequities. This Forum is presented jointly with The World from PRX & WGBH.

Activity. Racial Disparities in COVID-19
GHELI repository link: https://repository.gheli.harvard.edu/repository/13208
Students will examine how the current COVID-19 crisis may be exacerbating pre-existing health inequities in the U.S. In this activity, students will explore 2020 data on health disparities, especially in states like Louisiana and Michigan where Black Americans are currently experiencing alarming rates of infection and virus-related fatalities. Students will contextualize through a recent news article that examines some of the current, racialized trends in infection and map out the individual, family, community, and societal dimensions of this issue.

Resources
• Data Interactive: 2020 County Health Rankings State Report (Robert Wood Johnson Foundation 2020)
• **Article:** *Black Americans Face Alarming Rates of Coronavirus Infection in Some States* (The New York Times 2020)

**Activity**

• **Observe and Wonder:** The *County Health Rankings* data interactive from the Robert Wood Johnson Foundation paints a picture of state-level racial disparities in 2020 across multiple metrics. While there are options to drill deeper into county-level data, we recommend staying at state-level (the first check-box) for the purpose of this activity.

Students may want to look specifically at Louisiana and Michigan, two states where Black Americans are currently facing disproportionate rates of COVID-19 infection. If you are using a virtual platform like Zoom, this might be a good opportunity to use breakout rooms. As students spend time considering the state profile, they should consider the following questions:

  - What are the three measures included in the data interactive? Why do you think they were chosen for thinking about health?
  - How does the state compare to the nation for a particular measure?
  - What patterns or differences do you notice by racial group for each measure?
  - What do you wonder about the data?

• **Read and Discuss:** *The New York Times* article provides a rich case for contextualizing these observations and wonderings about the data. Though data on race and coronavirus is currently limited, researchers have observed that the virus is killing Black Americans at disproportionately high rates. In Chicago, for example, African-Americans account for 72% of virus-related fatalities, though they only represent less than a third of the population.

Experts in the article share how the current pandemic has exacerbated longstanding structural inequalities. Black Americans disproportionately belong to parts of the workforce that are not able to work from home, are less likely to be insured, and more likely to have preexisting health conditions and experience racial bias within the healthcare system. Historical, racist real estate practices from the 1930s mean many Black residents still live in segregated neighborhoods, without access to job opportunities and grocery stores and perhaps in areas where higher rates of asthma are more common.

In small groups or as a class, have students map out the factors at the individual, familial, community, and societal levels that are shaping the current experience of the COVID-19 crisis.

  - What do you notice?
  - How does the data you explored from the County Health Rankings fit into this picture, if at all?
  - If you were a public health official considering this information, where would you focus your attention in COVID-19 response? Why?

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**Data Portal. Data Dashboard**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13350](https://repository.gheli.harvard.edu/repository/13350)

This data portal from the COVID Tracking Project and *The Atlantic* provides race specific data for Coronavirus Disease 2019 (COVID-19) cases within each state in the U.S. The portal categorizes COVID-19 data by race and breaks down the cases by racial makeup of the state, by percentage of cases, and by percentage of deaths. The data is also tagged if racial/ethnic disparity is likely and if certain pieces of data should not be compared with percentage of population. Racial and ethnic population information is based on the Census Bureau's 2018 ACS 5-Year estimates and the COVID-19 data within the portal is updated numerous times per day. The information can also be downloaded in Excel and CSV formats.
Article. COVID-19 and the Coming Epidemic in U.S. Immigration Detention Centres
GHELI repository link: https://repository.ghello.harvard.edu/repository/13336
This article in The Lancet Infectious Diseases discusses challenges and consequences for individuals in United States Immigration and Customs Enforcement (ICE) detention resulting from the spread of Coronavirus Disease 2019 (COVID-19) and inadequate access to medical care. The article calls on the US Department of Homeland Security (DHS) to take action to address the moral and public health crisis of the individuals affected by the pandemic. Incarcerated individuals, including immigrants in ICE detention, are particularly vulnerable to infection and an outbreak of COVID-19 due to drivers and determinants of inequality that disproportionately affect them. The article urges a need for immediate infection prevention and control measures in immigration detention in order to prevent the spread of COVID-19 in the entire community and place additional burden on the health care system. The article also suggests routine screening and containment procedures for all individuals who enter facilities as well as a release of individuals in ICE detention and a halt in ICE enforcement in the community in order to conduct the most effective humanitarian and public health response.

Article. How Medical Bias Against Black People is Shaping COVID-19 Treatment and Care
GHELI repository link: https://repository.ghello.harvard.edu/repository/13355
This news article from Vox outlines how systemic and institutional racism within the U.S. healthcare system has impacted Black Americans throughout history – including during the Coronavirus Disease 2019 (COVID-19) pandemic. According to the article, the COVID-19 mortality rate for Black Americans is about 2.4 times higher than the mortality rate of white Americans and Black Americans are less likely to be referred to testing centers and for medical care. The article goes on to highlight three areas of medical bias experienced by African American populations: Black people’s health complaints are taken less seriously; Black communities are less likely to have the testing and medical supplies they need; and federal and local government has failed to gather the necessary data to protect these communities. Furthermore, the author points out numerous other periods in history where the American medical system has taken advantage of Black people in research and other areas. The article ends pleading for governments and stakeholders to take the necessary steps to address biases in medical care to better protect the health of minorities in the U.S.

Article. Racial Health Disparities and COVID-19: Caution and Context
GHELI repository link: https://repository.ghello.harvard.edu/repository/13345
This article from the New England Journal of Medicine addresses the calls for increased data collection on the racial disparities present in the number of Coronavirus Disease 2019 (COVID-19) cases in the U.S. The author highlights the importance of increased data collection related to vulnerable populations, but also stresses the importance of contextualizing the data with adequate analysis. Data without context can lead to harmful myths that actually undermine the goal of reducing racial health disparities. The author calls for COVID-19 data to be grounded in the context of the social determinants of health, the health issues brought on by racial discrimination, and material resource deprivation – and how these can lead to poor health outcomes.

Article. COVID-19 and Racial/Ethnic Disparities
GHELI repository link: https://repository.ghello.harvard.edu/repository/13343
This article from JAMA examines the racial and ethnic disparities in Coronavirus Disease 2019 (COVID-19) outcomes among African American and Latino individuals in the U.S. In Chicago, Illinois, for example, Latino populations experience the greatest number of COVID-19 cases at 1000 cases per 100,000 people and African American populations are not far behind at 925 cases per 100,000 people. In contrast, white populations have experienced significantly less cases at 389 per 100,000 people. The underlying causes of health disparities include social and structural determinants of health, racism, healthcare access and quality, as well as economic and educational disadvantages. Racial and ethnic
minority populations also have a disproportionate burden of comorbidities – such as obesity, kidney disease, HIV, and cardiovascular disease. As the article states in its opening, select underlying medical conditions, such as diabetes and obesity, have been identified as vulnerabilities to COVID-19. Public health professionals and policy makers, according to the author, need to respond to the drastic disparity in COVID-19 cases with targeted interventions to better enhance the health of racial and ethnic minority populations.

**Article. What the Racial Data Shows: The Pandemic Seems to be Hitting People of Color the Hardest**
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13354](https://repository.gheli.harvard.edu/repository/13354)
This news article from *The Atlantic* highlights the pressure being put on states, labs, and hospitals to report Coronavirus Disease 2019 (COVID-19) data by race. According to the author, Black and Latino Americans are about twice as likely as White Americans to be worried about COVID-19 as a threat to their health. The data broken down by race that has been released has shown racial disparities in the number of cases – where Black Americans are over-represented among the number of active cases and dead. The author – Ibram Kendi – highlights the worry about COVID-19 using his own personal narrative, where his partner is fighting on the front lines of the COVID-19 response and his family lives in hot spots of the pandemic. Kendi adds on to this personal story by including stark statistics of racial health disparity in areas across the country.

**Data Interactive. Where Low-Income Jobs Are Being Lost to COVID-19**
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13402](https://repository.gheli.harvard.edu/repository/13402)
This data interactive from the Urban Institute highlights the industries which are hit the hardest by COVID-19, disproportionately affecting low-income jobs, classified as those with annual earnings below $40,000. Users can sift through the total estimated low-income jobs lost by county or by metro area throughout the United States, between 20 different industries. This resource can be a useful tool for nonprofits, foundations, government agencies, and policymakers to support civilians where it’s most needed.
COVID-19 and Racism Resource Pack

2021

Overview

This curated resource portal highlights racial injustice in the United States, spanning from racial disparities in Coronavirus Disease 2019 (COVID-19) to the continued police violence experienced by persons of color. This sampling of resources provides an overview of the relationship between COVID-19 and the disproportionate number of cases and deaths experienced by Black Americans, broader health trends that result from racial inequities, and injury and mortality trends tied to police violence.

The resource collection incorporates articles explaining the broader context which has allowed these disparities to persist, data breaking down the cases demographically, informative teaching and web portals, and more. This teaching pack is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New resources will be added as they become available.

The Global Health Education and Learning Incubator at Harvard University supports interdisciplinary education about world health through the production, curation, and dissemination of educational public goods.
**Selected Resources**

**CONTENT AT-A-GLANCE**

* Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count


https://repository.gheli.harvard.edu/repository/collection/resource-pack-health-united-states.

* Data Publication. Key Facts on Health and Health Care by Race and Ethnicity

* Data Interactive. The Fullest Look Yet at the Racial Inequity of Coronavirus

* Primer. Deaths in Police Custody in the United States

* Data Interactive. Mapping Police Violence

* Article. Here Are the 98 Cities Where Protesters Were Tear-Gassed

* Article. COVID-19 and Racial/Ethnic Disparities

* Article. Growing Data Underscore that Communities of Color are Being Harder Hit by COVID-19
Growing Data Underscore that Communities of Color are Being Harder Hit by COVID-19. Henry J. Kaiser Family Foundation 2020.

* Report. Communities of Color at Higher Risk for Health and Economic Challenges Due to COVID-19

* Article. How Medical Bias Against Black People is Shaping COVID-19 Treatment and Care
Mtshali M. How Medical Bias Against Black People is Shaping COVID-19 Treatment and Care. Vox 2020; Jun 2.

* Article. Racial Health Disparities and COVID-19: Caution and Context
* Data Interactive. Racial Data Dashboard

* Article. What the Racial Data Shows: The Pandemic Seems to be Hitting People of Color the Hardest

* Activity. Black Americans Face Alarming Rates of Coronavirus Infection in Some States

* Resource Portal. Anti-Racism Toolkit

* Online Learning. Racism and COVID-19: Inequities and Policing
Annotated Bibliography

ANNOTATED CONTENTS OF RESOURCE PACK

Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count
GHELI repository link: https://repository.gheli.harvard.edu/repository/13304
This interactive in The New York Times provides the latest map and case count for Coronavirus Disease 2019 (COVID-19) and is updated regularly. Users can engage with the most recent data on location hot spots, total cases, deaths, cases per capita, and recent trends for COVID-19 in the United States on an interactive map of the entire country and on the individual state and county level.

The interactive article also includes data on the places hit hardest in the United States, such as in hot spots, the counties with the highest number of cases per resident, and clusters, which are places such as nursing homes, correctional facilities, and cruise ships with densely packed people. Readers can download county-level data for COVID-19 cases and read more about the methodology on GitHub.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13176
This web portal from the Centers for Disease Control and Prevention (CDC) hosts a wide range of information on the COVID-19 outbreak, from recent updates on disease spread to travel information. The basics of COVID-19 are included, such as how the disease spreads, symptoms, testing, and frequently asked questions. The CDC updates the situation summary regularly, providing insight into the steps taken by the organization to curb the spread of disease in the U.S., illness severity, and risk assessments. The portal also includes travel advisories, a map of confirmed cases, and the latest news on COVID-19.

https://repository.gheli.harvard.edu/repository/collection/resource-pack-health-united-states.
GHELI repository link: https://repository.gheli.harvard.edu/repository/collection/resource-pack-health-united-states
This resource pack was curated by the Global Health Education and Learning Incubator to explore current health and public health trends in the U.S. This collection of resources spotlights key health topics in the U.S., such as racial disparities in healthcare, opioids, emerging infectious disease concerns and antimicrobial resistance, as well as the effects of the social determinants of health.

The resources in this collection were selected for their diversity, quality, and timeliness. We specifically curated publications, data portals, interactives, and graphics that allow users to explore the differences in health and wellbeing in the U.S. across a variety of intersections—race/ethnicity, geography, gender, socioeconomic status, and more. The variety of resource types are well-suited for integration into classroom, hybrid, or online learning environments. Most of these resources are accessible for free and updated regularly.

These resources may be useful to educators as they develop lesson plans, activities, or assignments focusing on specific U.S. populations or health challenges. Learners could apply analytical skills through exploration of data interactives, use articles as rich case examples for discussion on a variety of pressing and current topics, or focus on specific issues that directly impact their communities.
Data Publication. **Key Facts on Health and Health Care by Race and Ethnicity**


This data publication from the Kaiser Family Foundation presents key facts on demographics, health coverage, access, utilization, and health status by race and ethnicity to provide information on health disparities and changes in disparities since the Affordable Care Act (ACA) coverage expansions in 2014. The analysis found that all racial and ethnic groups experienced improvements in health coverage, access, and utilization compared to the period prior to the ACA expansions. Non-elderly Blacks and Hispanics continued to fare worse than Whites across most measures after ACA, even as the expansion reduced some disparities in coverage, access, and utilization. The publication examines health indicators and measures of health status and presents the data in several graphs and figures.

Data Portal. **The Fullest Look Yet at the Racial Inequity of Coronavirus**


This data interactive from The New York Times presents new federal data collected by the Centers for Disease Control and Prevention (CDC) on Coronavirus Disease 2019 (COVID-19) focusing on the disproportionate cases and deaths experienced by Black and Latino populations in the U.S. The statistics are broken down by county using three different maps: the first displaying the race or ethnicity with the highest coronavirus infection rate in each county and the following two displaying coronavirus cases per 10,000 for Black and Latino residents in each county. These populations are three times as likely to become infected with COVID-19 as their white neighbors – and nearly twice as likely to die from the illness – according to the data. Black and Latino populations in the U.S. are at increased risk of exposure to the virus because, according to the article, they are more likely than white populations to have front-line jobs that prevent them from working at home, they rely on public transportation for these jobs, and are more likely to live in cramped apartments or multi-generational homes – making social distancing almost impossible. Access to healthy food options, ability to social distance, and access to COVID-19 testing and health care services are all determinants that play a role in COVID-19 cases and deaths. These disparities are seen throughout hundreds of counties in urban, suburban, and rural areas, and across all age groups of Blacks and Latinos. The New York Times noted that while the analysis spanned 974 counties representing more than half of the U.S. population, the data is far from complete, with thousands of cases missing race and ethnicity information as well as other epidemiologically relevant statistics. Readers can interact with the data online and learn more about the methodology used in the analysis.

Primer **Deaths in Police Custody in the United States**


This primer from Journalist’s Resource of the Harvard Kennedy School synthesizes and summarizes the latest research on police brutality and deaths in police custody in the U.S. It focuses on research about the deaths of Black people by white police officers, as well as the treatment of other racial minorities within the criminal justice system. The primer also describes recent legislative changes related to law enforcement and criminal justice, while also highlighting the challenges and injustices that remain. Across the board, incomplete or nonexistent data collection remains an issue. The primer culminates with a list of individual research publications and their abstracts, should users wish to explore further. The included articles examine deaths in police custody, the use of different types of police restraint, and how changing police force demographics may change the number of Black people dying in interactions with law enforcement. For educators seeking an evidence-based foundation for lessons and activities engaging with contemporary issues of racism and police violence, this primer is a comprehensive introduction and summary of the status quo and ongoing challenges.
Data Interactive. Mapping Police Violence
GHELI repository link: https://repository.gheli.harvard.edu/repository/13377
This data interactive, Mapping Police Violence, features a collection of interactive tools, maps, and figures that illustrate police violence in the United States. Users can view an interactive map of the United States showing all of the people killed by police for each day in 2020. The current data shows that there have only been 9 days in 2021 where police did not kill someone and that Black people are three times more likely to be killed by police than their white counterparts. The portal includes a calendar view of police killings and figures and graphs showing how race and ethnicity, location, and crime are connected to police violence. Users can also learn about police killings per state through several indicators: race, sex, armed status, cause of death, and year. The portal includes additional information, including a comparison by cities, a comparison by state, national trends, a police scorecard, and a detailed methodology. Users can also download the full dataset and access a resource to contact their representatives directly.

Article. Here Are the 98 Cities Where Protesters Were Tear-Gassed
GHELI repository link: https://repository.gheli.harvard.edu/repository/13376
This article from The New York Times illustrates the civilian protests against police brutality and racism occurring around the United States in recent weeks. An analysis by The New York Times showed that 98 law enforcement agencies have used tear gas against protesters, which is the most widespread domestic use of tear gas since the 1960s into the 1970s. The interactive includes a map of the United States showing all of the cities and locations where police used tear gas. It also includes photos of tear gas being used at protests in each of these cities, video evidence, and additional coverage of unrest. Reporters reached out to police departments and included portions of conversations with protesters, experts, academics, and members of police departments around the country. Evidence from protests show that police have used tear gas and other tactics for dispersing protesters inconsistent with the safest uses and best practices; protesters have experienced injuries from impact, and the widespread use of tear gas can both increase violence and worsen the spread of Coronavirus Disease 2019 (COVID-19). Readers can learn more about the methodology used by The New York Times and evidence from the Centers for Disease Control and Prevention.

Article. COVID-19 and Racial/Ethnic Disparities
GHELI repository link: https://repository.gheli.harvard.edu/repository/13343
This article from JAMA examines the racial and ethnic disparities in Coronavirus Disease 2019 (COVID-19) outcomes among African American and Latino individuals in the U.S. In Chicago, Illinois, for example, Latino populations experience the greatest number of COVID-19 cases at 1000 cases per 100,000 people and African American populations are not far behind at 925 cases per 100,000 people. In contrast, white populations have experienced significantly less cases at 389 per 100,000 people. The underlying causes of health disparities include social and structural determinants of health, racism, healthcare access and quality, as well as economic and educational disadvantages. Racial and ethnic minority populations also have a disproportionate burden of comorbidities – such as obesity, kidney disease, HIV, and cardiovascular disease. As the article states in its opening, select underlying medical conditions, such as diabetes and obesity, have been identified as vulnerabilities to COVID-19. Public health professionals and policy makers, according to the author, need to respond to the drastic disparity in COVID-19 cases with targeted interventions to better enhance the health of racial and ethnic minority populations.

Growing Data Underscore that Communities of Color are Being Harder Hit by COVID-19
GHELI repository link: https://repository.gheli.harvard.edu/repository/13378
This article from the Kaiser Family Foundation analyzes the risks of Coronavirus Disease 2019 (COVID-19) specifically facing communities of color due to the systemic health, social, and economic disparities disproportionately affecting them. This article provides data through written descriptions and an interactive map, where users can view confirmed
cases and deaths by race and ethnicity for each state in the United States. It reports on the observed disparities and impacts of COVID-19 for Blacks, Hispanics, Asians, American Indian or Alaska Native, and Native Hawaiian or Other Pacific Islander, noting that data is unavailable for smaller groups. The article also emphasizes that continuous, comprehensive data collection will be important for shaping and targeting response efforts of addressing disparities.

**Report. Communities of Color at Higher Risk for Health and Economic Challenges Due to COVID-19**
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13379](https://repository.gheli.harvard.edu/repository/13379)
This brief published by the Kaiser Family Foundation discusses the health and financial challenges that are disproportionately affecting families and groups of color throughout the Coronavirus Disease 2019 (COVID-19) pandemic. Black populations make up 45% of the total population in Washington, D.C., but have accounted for almost one third of the confirmed coronavirus cases and more than half of deaths as of early April 2020. Communities of color experience a disproportionate amount of underlying health conditions such as diabetes, heart disease, asthma and lung disease that put them at increased risk of serious illness if infected with coronavirus. The brief includes a series of figures reporting several health indicators and conditions by race and ethnicity in the United States. It also discusses issues of access to care, economic and social challenges, health risks, and future steps and policy changes that must be taken at the federal and state level related to mitigating challenges of COVID-19.

**Article. How Medical Bias Against Black People is Shaping COVID-19 Treatment and Care**
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13355](https://repository.gheli.harvard.edu/repository/13355)
This news article from Vox outlines how systemic and institutional racism within the U.S. healthcare system has impacted Black Americans throughout history – including during the Coronavirus Disease 2019 (COVID-19) pandemic. According to the article, the COVID-19 mortality rate for Black Americans is about 2.4 times higher than the mortality rate of white Americans and Black Americans are less likely to be referred to testing centers and for medical care. The article goes on to highlight three areas of medical bias experienced by African American populations: Black people’s health complaints are taken less seriously; Black communities are less likely to have the testing and medical supplies they need; and federal and local government has failed to gather the necessary data to protect these communities. Furthermore, the author points out numerous other periods in history where the American medical system has taken advantage of Black people in research and other areas. The article ends pleading for governments and stakeholders to take the necessary steps to address biases in medical care to better protect the health of minorities in the U.S.

**Article. Racial Health Disparities and COVID-19: Caution and Context**
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13345](https://repository.gheli.harvard.edu/repository/13345)
This article from *The New England Journal of Medicine* addresses the calls for increased data collection on the racial disparities present in the number of Coronavirus Disease 2019 (COVID-19) cases in the U.S. The author highlights the importance of increased data collection related to vulnerable populations, but also stresses the importance of contextualizing the data with adequate analysis. Data without context can lead to harmful myths that actually undermine the goal of reducing racial health disparities. The author calls for COVID-19 data to be grounded in the context of the social determinants of health, the health issues brought on by racial discrimination, and material resource deprivation – and how these can lead to poor health outcomes.

**Data Portal. Racial Data Dashboard**
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13350](https://repository.gheli.harvard.edu/repository/13350)
This data portal from the COVID Tracking Project and The Atlantic provides race specific data for Coronavirus Disease 2019 (COVID-19) cases within each state in the U.S. The portal categorizes COVID-19 data by race and breaks down the
cases by racial makeup of the state, by percentage of cases, and by percentage of deaths. The data is also tagged if racial/ethnic disparity is likely and if certain pieces of data should not be compared with percentage of population. Racial and ethnic population information is based on the Census Bureau's 2018 ACS 5-Year estimates and the COVID-19 data within the portal is updated numerous times per day. The information can also be downloaded in Excel and CSV formats.

Article. What the Racial Data Shows: The Pandemic Seems to be Hitting People of Color the Hardest
This news article from The Atlantic highlights the pressure being put on states, labs, and hospitals to report Coronavirus Disease 2019 (COVID-19) data by race. According to the author, Black and Latino Americans are about twice as likely as White Americans to be worried about COVID-19 as a threat to their health. The data broken down by race that has been released has shown racial disparities in the number of cases – where Black Americans are over-represented among the number of active cases and dead. The author – Ibram Kendi – highlights the worry about COVID-19 using his own personal narrative, where his partner is fighting on the front lines of the COVID-19 response and his family lives in hot spots of the pandemic. Kendi adds on to this personal story by including stark statistics of racial health disparity in areas across the country.

Activity. Black Americans Face Alarming Rates of Coronavirus Infection in Some States
Students will examine how the current COVID-19 crisis may be exacerbating pre-existing health inequities in the U.S. In this activity, students will explore 2020 data on health disparities, especially in states like Louisiana and Michigan where Black Americans are currently experiencing alarming rates of infection and virus-related fatalities. Students will contextualize through a recent news article that examines some of the current, racialized trends in infection and map out the individual, family, community, and societal dimensions of this issue.

Resources

Activity
- Observe and Wonder: The County Health Rankings data interactive from the Robert Wood Johnson Foundation paints a picture of state-level racial disparities in 2020 across multiple metrics. While there are options to drill deeper into county-level data, we recommend staying at state-level (the first check-box) for the purpose of this activity.

Students may want to look specifically at Louisiana and Michigan, two states where Black Americans are currently facing disproportionate rates of COVID-19 infection. If you are using a virtual platform like Zoom, this might be a good opportunity to use breakout rooms. As students spend time considering the state profile, they should consider the following questions:
  - What are the three measures included in the data interactive? Why do you think they were chosen for thinking about health?
  - How does the state compare to the nation for a particular measure?
  - What patterns or differences do you notice by racial group for each measure?
  - What do you wonder about the data?
- Read and Discuss: The New York Times article provides a rich case for contextualizing these observations and wonderings about the data. Though data on race and coronavirus is currently limited, researchers have observed that the virus is killing Black Americans at disproportionately high rates. In Chicago, for example,
African-Americans account for 72% of virus-related fatalities, though they only represent less than a third of the population.

Experts in the article share how the current pandemic has exacerbated longstanding structural inequalities. Black Americans disproportionately belong to parts of the work force that are not able to work from home, are less likely to be insured, and more likely to have preexisting health conditions and experience racial bias within the health care system. Historical, racist real estate practices from the 1930s mean many Black residents still live in segregated neighborhoods, without access to job opportunities and grocery stores and perhaps in areas where higher rates of asthma are more common.

In small groups or as a class, have students map out the factors at the individual, familial, community, and societal levels that are shaping the current experience of the COVID-19 crisis.

- What do you notice?
- How does the data you explored from the County Health Rankings fit into this picture, if at all?
- If you were a public health official considering this information, where would you focus your attention in COVID-19 response? Why?

**Resource Portal. Anti-Racism Toolkit**


GHELI repository link: [https://repository.g heli.harvard.edu/repository/13395](https://repository.g heli.harvard.edu/repository/13395)

This toolkit from the Association for Prevention Teaching and Research provides diverse resources on systemic racism in the U.S. The included resources highlight evidence and interventions for addressing racism in health professions education, as well as resources that unpack racism’s impact on health and well being. The toolkit resources about health professions education cover approaches for teaching cultural competence; addressing privilege; and supporting diverse student success and positive institutional climates. Users can also find evidence on the impact of racism on health — including information on health inequities, effects of discrimination, and structural racism — that are suitable for anchoring graduate-level syllabi, lesson plans, activities, assignments.

The resources within the toolkit include academic articles, books, videos and documentaries, news stories, blog posts, and teaching material – such as teaching cases, glossaries, lessons, and study guides. The vast majority of the resources provided are open-access and freely available to users. This toolkit may be most useful to graduate-level educators, from public health and other health professions, seeking to incorporate anti-racist approaches to pedagogy in their courses or looking to teach about racism’s causes and effects.

**Online Learning. Racism and COVID-19: Inequities and Policing**


GHELI repository link: [https://repository.g heli.harvard.edu/repository/13381](https://repository.g heli.harvard.edu/repository/13381)

This webcast seminar from The Forum at the T.H. Chan School of Public Health focuses on racial injustice in the United States – from racial disparities in Coronavirus Disease 2019 (COVID-19) cases to the continued police violence experienced by persons of color. During the pandemic, the country has seen a significant rise in unrest as activists have taken to the streets to protest the murder of George Floyd and the continued violence against communities of color by police. Black Americans are also experiencing a COVID-19 mortality rate that is more than double that of White, Asian, and Latinx Americans. David Harris, Managing Director of the Charles Hamilton Houston Institute for Race and Justice at Harvard Law School, joins the Forum in a question and answer session focused on these issues. The Forum is jointly presented by the Harvard T.H. Chan School of Public Health and The World from PRX and WGBH. This resource provides an important case example for undergraduate and graduate educators exploring social determinants of health through contemporary issues.
Resource Pack: COVID-19 and Racism

Also see:

- [Resource Pack: Racism and COVID-19](#), Global Health Education and Learning Incubator at Harvard University
COVID-19 Scientific Portals
Resource Pack
2020

Overview
This digital collection includes portals that provide scientific articles and evidence-based resources about COVID-19 that are freely accessible to anyone, without a subscription. Portals are hosted by major health organizations, such as the National Institutes of Health (NIH) and World Health Organization (WHO); leading public health and clinical medicine journals such as The Lancet, JAMA, BMJ and The New England Journal of Medicine; and publishing groups such as Wiley Online Library, Elsevier, and Springer Nature.

Explore the different portals to identify the format that is most useful for your needs. In addition to publication date, many organize resources by subtopic and region. Others include companion materials such as data portals, data visualizations, and multimedia. Educators may find these portals useful to identify specific scientific resources for syllabi, new course material, and student assignments.

This collection of scientific portals is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New portals will be added as they become available.

The Global Health Education and Learning Incubator at Harvard University supports interdisciplinary education about world health through the production, curation, and dissemination of educational public goods.
Selected Resources

CONTENTS AT-A-GLANCE

Coronavirus Disease 2019 (COVID-19) JAMA Resource Center. JAMA.


* Web Portal. COVID-19 Literature Situation Report

* Resource Portal. PubMed Coronavirus Search
https://pubmed.ncbi.nlm.nih.gov/?term=%28%28wuhan%5BAll+Fields%5D+AND+%28%22coronavirus%22%5BMeSH+Terms%5D+OR+%22coronavirus%22%5BAll+Fields%5D+AND+2019%2F12%5BPDAT%5D+%3A+2030%5BPDAT%5D+OR+2019-nCoV%5BAll+Fields%5D+OR+2019nCoV%5BAll+Fields%5D+OR+COVID-19%5BAll+Fields%5D+OR+SARS-CoV-2%5BAll+Fields%5D.

* Resource Portal. WHO Global Literature on Coronavirus Disease


* Resource Portal. National Institutes of Health: LitCOVID


* Resource Portal. NEJM: Coronavirus (COVID-19)


* Resource Portal. Elsevier: Novel Coronavirus Information Center


Resource Pack: COVID-19 Scientific Portals

IEEE Xplore: COVID-19. Institute of Electrical and Electronics Engineers.
Annotated Bibliography

ANNOTATED CONTENTS OF RESOURCE PACK

Coronavirus Disease 2019 (COVID-19) JAMA Resource Center. JAMA.
GHELI repository link: https://repository.gheli.harvard.edu/repository/13196
This web portal from JAMA curates timely research about Coronavirus Disease 2019 (COVID-19) in a mostly free, open-access collection. Users can access the journal's publications related to the epidemiology of COVID, clinical management of the disease, public health preparedness, as well as accessible information for patients and families. This portal allows users to stay up to date on the most recent global guidance on managing the pandemic, citing relevant information from Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

GHELI repository link: https://repository.gheli.harvard.edu/repository/13197
This web portal from The BMJ contains recently published articles, editorials, news and other publications related to the Coronavirus Disease 2019 (COVID-19) pandemic. All COVID-19 related information published by The BMJ is available for free to the general public, allowing users to stay current on the most recent research related to the pandemic. The portal also contains learning modules related to infectious diseases.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13198
This web portal from The Lancet contains recently published articles, comments, editorials, correspondence, and other publications related to the Coronavirus Disease 2019 (COVID-19) pandemic. All COVID-19 related information published by The Lancet is available for free to the general public, allowing users to stay current on the most recent research related to the pandemic.

Web Portal. COVID-19 Literature Situation Report
GHELI repository link: https://repository.gheli.harvard.edu/repository/13484
This web portal from the University of Washington’s Alliance for Pandemic Preparedness provides a daily synopsis of the latest scientific literature surrounding the Coronavirus Disease 2019 (COVID-19) pandemic. The summaries provide an overview of both published scientific articles and pre-published manuscripts, with each situation report providing a count of each. It is important to note that pre-published manuscripts have been made available online but have not undergone the peer review process. These situation reports are updated daily, Monday through Friday, and cover clinical characteristics of COVID-19, geographic spread, disease modeling, public health policy, transmission, vaccine development, and more. Each situation report includes a “key takeaway” section, highlighting the most important updates, and then breaks down article summaries by topic. Other resources and commentaries related to COVID-19 are also included and are hyperlinked in each situation report.
Resource Portal. **PubMed Coronavirus Search**

PubMed Coronavirus Search. U.S. National Library of Medicine. [https://pubmed.ncbi.nlm.nih.gov/?term=%28%28wuhan%5BAll+Fields%5D+AND+%22coronavirus%22%5BMeSH+Terms%5D+OR+%22coronavirus%22%5BAll+Fields%5D+OR+2019%2F12%5BPDAT%5D+OR+2019-nCoV%5BAll+Fields%5D+OR+COVID-19%5BAll+Fields%5D+OR+SARS-CoV-2%5BAll+Fields%5D](https://pubmed.ncbi.nlm.nih.gov/?term=%28%28wuhan%5BAll+Fields%5D+AND+%22coronavirus%22%5BMeSH+Terms%5D+OR+%22coronavirus%22%5BAll+Fields%5D+OR+2019%2F12%5BPDAT%5D+OR+2019-nCoV%5BAll+Fields%5D+OR+COVID-19%5BAll+Fields%5D+OR+SARS-CoV-2%5BAll+Fields%5D).

GHELI repository link: [https://repository.gheli.harvard.edu/repository/13504](https://repository.gheli.harvard.edu/repository/13504)

This web portal created by the National Library of Medicine at the National Institutes of Health (NIH) includes filtered search results showing all publications, journal articles, trials, and reviews related to Coronavirus Disease 2019 (COVID-19) on the online search engine PubMed. Users can browse almost 80,000 results referring to COVID-19, and can filter resources by type, text availability, journal, author, and publication date. The portal contains peer-reviewed articles, reports, case studies, literature reviews, and clinical publications, many of which are free to access in full.

Resource Portal. **WHO Global Literature on Coronavirus Disease**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13507](https://repository.gheli.harvard.edu/repository/13507)

This web portal from the World Health Organization (WHO) is a global literature collection of over 100,000 journal articles and other resources related to Coronavirus Disease 2019 (COVID-19). Users can explore articles, linked databases, and clinical trials and studies. Users can also sort resources by language, journal, clinical aspect, year of publication, or main subject, covering a range of topics related to COVID-19 including health care delivery, viral pneumonia, quarantine, mental health, and coronavirus infections.

Resource Portal. **WHO: Coronavirus Disease (COVID-19) Outbreak**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13195](https://repository.gheli.harvard.edu/repository/13195)

This web portal from the World Health Organization (WHO) presents curated and regularly updated information about the global response to the COVID-19 outbreak. The portal includes a Q&A fact sheet, videos, a database of global research, daily situation reports, and other training and e-learning resources.

Resource Portal. **Nature: Coronavirus Collection**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13509](https://repository.gheli.harvard.edu/repository/13509)

This web portal from Nature is a collection of resources containing the latest research on the Coronavirus Disease 2019 (COVID-19) outbreak. The portal compiles research articles, news articles, reviews, and comments from Springer's journal Nature. These resources focus on topics such as the physiology of the coronavirus, virus detection, treatment and evolution, epidemiological research, and current events. All articles in this collection have been made freely available.

Resource Portal. **National Institutes of Health: LitCOVID**


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13218](https://repository.gheli.harvard.edu/repository/13218)

This web portal from the National Institutes of Health (NIH) is a curated repository of scientific research that connects users to a growing number of articles on Coronavirus Disease 2019 (COVID-19). The portal compiles articles from numerous journals, including The Lancet, JAMA, Respiratory Medicine and more - with many of the articles available to the public for free. The research articles are categorized by topic, ranging from general information on COVID-19 to transmission, to prevention, to forecasting. The portal also displays the number of publications about COVID-19 per week and tracks the countries mentioned in abstracts via an interactive map—a useful starting place for educators and learners.
Resource Pack: COVID-19 Scientific Portals

GHELI repository link: https://repository.gheli.harvard.edu/repository/13221
This web portal maintained by the Wiley Online Library contains freely accessible up-to-date research articles, book chapters, and entries about Coronavirus Disease 2019 (COVID-19) from its major reference sources and academic journals. Articles are organized by date of publication, with the newest articles listed first – newly published articles are made free for access within 24 hours of publication, and many are already open access. Wiley is continually monitoring developments and is updating the portal with the latest information about diagnosis, treatment, prevention, and research about COVID-19 and similar viral respiratory infections.

Resource Portal. NEJM: Coronavirus (COVID-19)
GHELI repository link: https://repository.gheli.harvard.edu/repository/13222
This web portal from The New England Journal of Medicine (NEJM) is a collection of articles and other resources about the Coronavirus Disease 2019 (COVID-19) outbreak. Resources in the portal include clinical reports, management guidelines, commentaries and editorials, and multimedia resources such as videos, images, and interactives. Each is dated and labeled by type of resource. The portal also contains sections of Journal Watch Summaries from NEJM, Catalyst Articles and Podcasts, and NEJM Resident 360 – a specific resource hub for medical residents – with discussions on COVID-19 cases. All NEJM content related to the COVID-19 outbreak has been made freely available for users.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13220
This web portal from Springer Nature is a collection of resources containing the latest available research, evidence, and data related to the novel SARS-CoV-2 virus causing the COVID-19 disease outbreak around the world. The portal compiles research articles from all of Springer's journals, including Nature, American Journal of Cardiovascular Drugs, and Hepatology International, as well as additional commentaries and books about the outbreak. It also includes a collection of updated information on trials for treating and managing COVID-19 in patients and health care systems. The portal organizes articles and releases by resource type – featured research, reviews, books and chapters, trials – and publishes a blog about Springer’s work. The portal also links to an online interactive data tracking dashboard. This dashboard and all of the published content on the portal is free to access.

Resource Portal. Elsevier: Novel Coronavirus Information Center
GHELI repository link: https://repository.gheli.harvard.edu/repository/13219
This web portal from Elsevier provides a wealth of health information and medical research on Coronavirus Disease 2019 (COVID-19). The portal includes access to the latest scientific research on COVID-19 from journals like The Lancet as well as access to 21,000 related articles via ScienceDirect. The Information Center also provides clinical information related to COVID-19, research translated into Chinese, public health information, and patient resources. The web portal compiles information from governments, the World Health Organization, and the media to provide an in-depth overview on the state of COVID-19 response.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13506
This web portal from the National Library of Medicine (NLM) contains resources, databases, and news updates about the Coronavirus Disease 2019 (COVID-19) outbreak. It includes a comprehensive collection of resources maintained by the NLM, such as PubMed and LitCovid, which are journal and literature hubs tracking up-to-date scientific information. Users can also access GenBank data which holds interactive dashboards, genetic trees of complete COVID-19
sequences, and additional genetic data. The portal includes news updates related to COVID-19 and other ongoing research at the NLM.


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13508](https://repository.gheli.harvard.edu/repository/13508).

This web portal from the Cochrane Library is a collection of resources focusing on the Coronavirus Disease 2019 (COVID-19) pandemic. It includes an updated register of primary research studies on COVID-19 and additional evidence relevant to both critical care and clinical rehabilitation in several languages. It also has its own web portal of high-quality news and resources, published to educate others on how to make informed health decisions. Users can explore a set of special collections on key topic areas related to the prevention and treatment of COVID-19. These topics include infection control and prevention, options for quitting smoking during the pandemic, reducing drug use in anesthesia, remote care through telehealth, optimizing health in the home workspace, and support for wellbeing in the health care workforce. The portal also provides published Cochrane Reviews with the latest evidence on clinical aspects of the virus.


GHELI repository link: [https://repository.gheli.harvard.edu/repository/13510](https://repository.gheli.harvard.edu/repository/13510).

This web portal from the Institute for Electrical and Electronics Engineers (IEEE) is a collection of over 1,000 resources about Coronavirus Disease 2019 (COVID-19). It features articles, journals, conference papers, and other documents related to the work of the IEEE on COVID-19. Resources address topics such as artificial intelligence, software, algorithms, diagnostic tools, and other applications of technology for responding to the pandemic. Users can sort resources by type, topic, and year of publication.
Ethics, Human Rights, Pandemics
Resource Pack
2020

Overview
This curated resource collection includes reports, articles and guidelines that consider both ethics and human rights, as they relate to public health practice and clinical research in the setting of national and international emergencies, particularly epidemics and pandemics.

In addition to ethical frameworks developed specifically for pandemic preparedness, the collection also includes insights from prior guidelines focusing on research, compassionate use therapeutics and vaccine trials for Ebola. Other resources outline how to conduct research effectively and ethically in the context of global emergencies.

Browse through these documents to create your own collection. Educators may find this curated collection useful for generating evidence-based discussion and debate using the contemporary context of COVID-19.

These resources on ethics, human rights and pandemics is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New resources will be added as they become available.

The Global Health Education and Learning Incubator at Harvard University supports interdisciplinary education about world health through the production, curation, and dissemination of educational public goods.
# Selected Resources

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| * Resource Portal. Integrating Ethics in Infectious Disease Outbreaks  
Integrating Ethics in Infectious Disease Outbreaks. World Health Organization. [https://extranet.who.int/ethics](https://extranet.who.int/ethics). |
| * Report. WHO Guidelines on Ethical Issues in Public Health Surveillance  
| * Report. Ethics in Epidemics, Emergencies and Disasters: Research, Surveillance and Patient Care  
| * Report. Addressing Ethical Issues in Pandemic Influenza Planning  
| * Report. Ethical Considerations in Developing a Public Health Response to Pandemic Influenza  
| * Article. Principles of the Ethical Practice of Public Health  
| * Report. Addressing Human Rights as Key to the COVID-19 Response  
* Teaching Case. Casebook on Ethical Issues in International Health Research

* Report. Global Consultation on Addressing Ethical Issues in Pandemic Influenza Planning

* Report. Ethics of Using Convalescent Whole Blood and Plasma During the Ebola Epidemic

* Report. Ethical Issues Related to Study Design for Trials on Therapeutics for Ebola Virus Disease

* Report. Ethical Considerations for Use of Unregistered Interventions for Ebola Virus Disease


* Report. Research Ethics Committees: Basic Concepts for Capacity-Building


* Report. Expert Consultation on the Use of Placebos in Vaccine Trials

* Article. A Code of Ethics for Public Health

* Report. Public Health Ethics: Mapping the Terrain

* Teaching Case. Global Health Research in an Unequal World: Ethics Case Studies From Africa

* Article. The New International Health Regulations
DOI: https://doi.org/10.17226/24739.

* Report. Research in Global Health Emergencies

* Article. Putting Human Rights at the Centre of Struggles for Health and Social Equality

* Article. Human Rights Protections are Needed Alongside PPE for Health-Care Workers Responding to COVID-19

* Resource Portal. Human Rights Watch: Coronavirus
**Annotated Bibliography**

## ANNOTATED CONTENTS OF RESOURCE PACK

### Resource Portal. COVID-19 Ethics Resource Center

**GHELI repository link:** [https://repository.gheli.harvard.edu/repository/13514](https://repository.gheli.harvard.edu/repository/13514)

This web portal from the American Medical Association (AMA) Journal of Ethics is a collection of resources focused on helping to promote ethical reflection and decision-making during the Coronavirus Disease (COVID-19) pandemic. Resources address issues related to rationing limited health care resources, restricting individual movement and liberties, professional duties to treat patients despite personal danger, and disparities in the United States. Readers can explore resources — articles, reports, videocasts — that are organized by date of publication in the portal.

### Article. Pandemic Disease, Public Health, and Ethics

**GHELI repository link:** [https://repository.gheli.harvard.edu/repository/13346](https://repository.gheli.harvard.edu/repository/13346)

This article from Oxford University Press highlights pressing challenges which surface when responding to pandemic disease, such as the coordination in global governance, priority setting, and acting in isolation and quarantine. This document serves as a guiding tool for public health officials who are working amidst a crisis to serve the public’s needs.


**GHELI repository link:** [https://repository.gheli.harvard.edu/repository/13341](https://repository.gheli.harvard.edu/repository/13341)

This document from the Pan American Health Organization (PAHO) and World Health Organization (WHO) provides specific guidelines for research as it relates to the COVID-19 pandemic. While human subjects research is being done quickly and rigorously, this document is published to ensure that the research is also being conducted ethically. The contributors to the document suggest the installation of new committees to oversee these efforts. The report suggests that digital communications can help in streamlining ethics review processes and decision-making will need to prioritize the well-being of subjects.

### Report. Managing Ethical Issues in Infectious Disease Outbreaks

**GHELI repository link:** [https://repository.gheli.harvard.edu/repository/13313](https://repository.gheli.harvard.edu/repository/13313)

This report from the World Health Organization (WHO) outlines guidelines for policymakers, researchers, and public health professionals on the ethical issues likely to arise with infectious disease outbreaks. Outbreaks bring uncertainty, social and institutional disruption, and fear and distrust that may compete with ethical values. This report serves as a complementary set of guidelines to existing guidance on ethics in public health and can help set up decision-making systems and procedures to ensure that ethically appropriate responses are taken if an outbreak occurs. Health-care institutions, international organizations, and other actors involved in epidemic response must collaborate to develop practical strategies and tools to apply these principles to their own settings and contexts. The report particularly emphasizes the following ethical principles that can be applied to infectious disease outbreaks: justice, beneficence, utility, respect for persons, liberty, reciprocity, and solidarity.
Resource Portal. Integrating Ethics in Infectious Disease Outbreaks
GHELI repository link: http://repository.gheli.harvard.edu/repository/12561
This resource portal from the World Health Organization (WHO) provides a platform of resources on ethical principles for public health officials and frontline workers engaged in the identification and prevention of infectious diseases. The site outlines key principles that govern decision-making, how to use them, and how to integrate ethics in every aspect of responses to an infectious disease outbreak. Topic sections include Ethics Matters, a video summarizing why ethics are important in epidemiologic responses; Ethics Issues, an illustrated summary of intersections between surveillance and research; Ethics in Action, an online case-based quiz to train viewers on strengthening effective responses; and Resources, with links to checklists, training courses, video materials, WHO publications, and other institutional resources.

Report. WHO Guidelines on Ethical Issues in Public Health Surveillance
GHELI repository link: https://repository.gheli.harvard.edu/repository/13312
This document from the World Health Organization (WHO) outlines 17 ethical guidelines for everyone involved in public health surveillance including government agency officials, health workers, NGOs, and the private sector. The guidelines aim to help policymakers and health practitioners approach the ethical issues associated with surveillance. Disease surveillance is essential for epidemic response but can also contribute to reducing inequalities of suffering and understanding the global burden of noncommunicable diseases. Public health surveillance can extend to environmental surveillance, as well as provide evidence to inform health policy and advocacy. This report highlights the importance of surveillance but also addresses its limitations and associated risks in order to fill the gap in international guidelines directly on public health surveillance.

Report. Ethics in Epidemics, Emergencies and Disasters: Research, Surveillance and Patient Care
GHELI repository link: https://repository.gheli.harvard.edu/repository/13314
This training manual from the World Health Organization (WHO) provides information on ethical issues related to research, surveillance, and patient care in the context of epidemics, emergencies, and disasters around the world. It aims to build on the existing International Health Regulations (IHR) that serve as a coordination of the management of events that constitute of public health emergency of international concern, but hopes to fill the gap on other aspects of research, surveillance, and patient care for all countries. The manual has two parts: Part 1 covers ethical issues in research and surveillance such as ethics oversight and publication ethics, while Part 2 overviews patient care including triage, standards of care, and the professional duties of health care workers in emergencies. The manual includes seven core competences and 26 learning objectives that function as teaching modules to give participants a level of proficiency in ethical reasoning and awareness of ethical dilemmas that arise in global emergencies.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13347
This report from the Oxford University Press balances the multiple factors taken into consideration when preparing for and responding to a public health emergency. Resource allocation and care for vulnerable populations require strategic decision-making and attention to ethical standards. With this in mind, the contributors outline best practices when responding to public health emergencies.
Report. Addressing Ethical Issues in Pandemic Influenza Planning
GHELI repository link: https://repository.gheli.harvard.edu/repository/13325
This collection of discussion papers from the World Health Organization (WHO) disseminates the key ethical issues in pandemic preparedness and response. This volume has the background papers prepared by the chairpersons in consultation with their working group members which convened to review the response. The working groups included experts in ethics, law, public health, WHO staff, and country representatives. The collection of discussion papers cover ethics and scarcity in a pandemic, antiviral drugs, priority setting in therapeutic care, and vaccination.

Report. Ethical Considerations in Developing a Public Health Response to Pandemic Influenza
Ethical Considerations in Developing a Public Health Response to Pandemic Influenza. World Health Organization 2007. 
GHELI repository link: https://repository.gheli.harvard.edu/repository/13326
This technical paper asks essential and crucial questions needed when planning for a pandemic. It highlights how essential it is to plan to cope with a pandemic in order to mitigate its impact. Some of the key general ethical considerations highlighted are: balancing rights, interests, values, transparency, public engagement, social mobilization, information, education, and communication. Priority setting must be maintained while also considering human rights when planning for social distancing measures. Core governmental responsibilities include developing core capacities for public health surveillance while adhering to international legal obligations. Of note, this document discusses the role and obligations of health care workers during an outbreak of pandemic influenza—moral obligations, professional obligations, contractual obligations, and non-contractual legal obligations. This document is especially important for policymakers, who must incorporate international considerations into influenza pandemic preparedness planning.

Article. Principles of the Ethical Practice of Public Health
GHELI repository link: https://repository.gheli.harvard.edu/repository/13335
This code of ethics document from the Public Health Leadership Society states key principles of ethics in public health. These are designed for institutions within the U.S. with public health missions, however, other organizations outside the public health sector and transnational organizations can still learn from these principles and apply them in their work. This guide serves to make institutions and the public aware of the right to health so that collective action can be taken to ensure that these ideals are upheld.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13333
This report published by the Human Rights Watch addresses human rights concerns related to the Coronavirus Disease 2019 (COVID-19) outbreak, framing the pandemic in the context of international human rights law. The authors draw on the International Covenant on Economic, Social, and Cultural Rights by the United Nations and the Siracusa Principles adopted in 1984 as international standards for defining and addressing human rights concerns. The report is divided into specific sections addressing issues such as protecting people in custody and in institutions, fulfilling the right to education despite school closures, addressing stigma and discrimination, ensuring humanitarian aid, and more. For each human rights concern, the report provides an overview of government responses thus far and suggests recommendations for governing bodies to ensure the respect of human rights for people through the outbreak.
Report. Addressing Human Rights as Key to the COVID-19 Response
GHELI repository link: https://repository.gheli.harvard.edu/repository/13349
This brief from the World Health Organization emphasizes protecting human rights as countries respond to the Coronavirus Disease 2019 (COVID-19) pandemic. The brief addresses numerous issues, including stigma and discrimination associated with COVID-19, gender equality and protecting women from violence, supporting vulnerable populations, quarantine and restrictive measures, shortages of supplies, and the obligations of governments to cooperate and provide international assistance. Incorporating human rights into COVID-19 response measures provides ethical guidance to countries as they make critical pandemic response decisions.

Teaching Case. Casebook on Ethical Issues in International Health Research
GHELI repository link: http://repository.gheli.harvard.edu/repository/10532
This casebook is a collection of 64 case studies, each of which raises an important and difficult ethical issue connected with planning, reviewing, or conducting health-related research. The casebook aims to help investigators, researchers, ethics review committee members, health authorities, and others by highlighting issues which need thoughtful analysis. Educators can use the case studies to look at specific examples of dilemmas which arise in international health research, allowing for in-depth discussion on these topics. The casebook includes a teaching guide, which aides those using these case studies in their teaching or training workshops by dissecting the process of teaching case studies.

Report. Global Consultation on Addressing Ethical Issues in Pandemic Influenza Planning
GHELI repository link: https://repository.gheli.harvard.edu/repository/13327
This consultation report from the World Health Organization (WHO) draws from discussions between representatives of international organizations, government ministries, academic institutions, and the WHO Secretariat to consider a broad range of ethical issues related to the development and implementation of pandemic influenza preparedness and response plans. It highlights key values, emphasizing the importance of social justice and protecting the vulnerable, global justice, and equity in access to information. Logistically, it outlines the details of isolation, quarantine, border control and social-distancing methods. There may be issues that arise between governments when developing a multilateral response to a potential outbreak of pandemic influenza, addressed in this document, while drawing on perspectives from multiple countries.

Report. Ethics of Using Convalescent Whole Blood and Plasma During the Ebola Epidemic
GHELI repository link: https://repository.gheli.harvard.edu/repository/13315
This report from the World Health Organization (WHO) discusses the ethical issues surrounding the potential use of convalescent whole blood and convalescent plasma in research and clinical settings. It is aimed at ethics review committees, researchers, national health authorities, and blood transfusion services who are directly working with these experimental interventions and treatments. The report includes background information on convalescent whole blood and convalescent plasma as potential interventions for people with Ebola virus disease, ethically relevant facts such as constraints and uncertainty, and analysis and recommendations for maximizing the benefits of efforts and managing risks based on the ethical issues that may arise.
Report. Ethical Issues Related to Study Design for Trials on Therapeutics for Ebola Virus Disease
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13316]
This report summarizes the discussions of the Ethics Working Group of the World Health Organization (WHO) that included statisticians, methodologists, drug regulators, researchers, ethics committee members, and delegates from communities in West Africa affected by Ebola virus disease. The participants of the meeting convened to learn about clinical trial designs for Ebola virus disease, conduct ethical analyses of the available study design options, and provide advice on the relevant ethical considerations for utilizing various study designs. This resulting document from the meeting includes a decision matrix that takes into account many of the issues and considerations for all of the study design options; this matrix can be used by investigators, ethics committees, or other stakeholders when developing research studies.

Report. Ethical Considerations for Use of Unregistered Interventions for Ebola Virus Disease
GHELI repository link: [https://repository.gheli.harvard.edu/repository/13317]
This report summarizes a World Health Organization (WHO) consultation with an advisory panel to consider and assess ethical implications for using unregistered interventions for Ebola virus disease. These unregistered interventions have shown promising results in the laboratory and in animal models but that have not been evaluated for safety and efficacy in humans. The members of the panel unanimously concluded that it would be acceptable to use unregistered interventions as potential treatments for prevention, given certain conditions. Key parts of the ethical criteria that makes it acceptable include transparency about all aspects of care, fair distribution in the face of scarcity, promotion of cosmopolitan solidarity, informed consent, freedom of choice, confidentiality, respect for the person, and preservation of dignity and involvement of the community. The panel also discussed moral obligations of physicians and other clinical contexts for evaluating the safety and efficacy of these investigatory interventions.

GHELI repository link: [https://repository.gheli.harvard.edu/repository/13310]
This report from the World Health Organization (WHO) summarizes the discussions of a scoping meeting about ethical issues associated with vector-borne diseases, which particularly highlighted environmental and social determinants of health, the ethics of vector control, new technologies, ethics of surveillance and research, and the ethics of mass public health interventions. Over 25 international experts convened at this meeting and aimed to provide comprehensive WHO guidelines. Their findings are compiled in this report which can be used to inform policy-making and future guidance.

GHELI repository link: [https://repository.gheli.harvard.edu/repository/13323]
This report from the World Health Organization (WHO) outlines ethical issues in research, specifically in public health emergency situations. Although they are similar to those addressed in general ethics guidelines, differences in emergency situations include changes in perceptions of risks, benefits and trust, heightened need for attention to organizational values like accountability and transparency, and insufficient time for standard ethics review processes. Some ethical issues which arise while researching infectious disease outbreaks include priority setting and ensuring equitable access, isolation, and developing a multilateral response. This resource is highly valuable for researchers who are making rapid decisions to ensure quick turnaround while also ensuring ethical accountability, and for educators who are highlighting issues that come up in these situations.
Resource Pack: Ethics, Human Rights, Pandemics

Report. Research Ethics Committees: Basic Concepts for Capacity-Building
GHELI repository link: https://repository.gheli.harvard.edu/repository/13324
This report from the World Health Organization (WHO) covers concepts for capacity-building. This manual contains six chapters on general topics: the role of research ethics committees, ethical analysis, training programs, evaluation of risks and benefits, confidentiality and informed consent, with annexes covering financial conflicts of interest in medical research and international guidelines and regulations.

GHELI repository link: https://repository.gheli.harvard.edu/repository/13321
This guidance report from the World Health Organization (WHO) addresses research ethics committees and researchers who design and implement studies with human participants. By protecting rights and well-being of the participants, ethics can be upheld in research studies, benefiting total communities. While research is meant to uncover the truth in complex issues, the means by which researchers come to these conclusions must also be ethical. The standards that are outlined for research ethics committees include pointers on their ideal composition, resources, training tips, and guidance on transparency.

Report. Expert Consultation on the Use of Placebos in Vaccine Trials
GHELI repository link: https://repository.gheli.harvard.edu/repository/13319
This report from the World Health Organization (WHO) summarizes an expert consultation meeting on the use of placebo in vaccine trials. The meeting participants examined the ethical issues in three main categories: overarching ethical principles relevant for all research studies, ethical issues relevant to placebo-controlled trials in general, and ethical issues specific to placebo-controlled vaccine trials when an efficacious vaccine against the condition under study already exists. A placebo-controlled trial is a common model for evaluating a new vaccine when there is no existing vaccine – in this meeting, experts discussed acceptability of use of placebos and identified situations where the conduct of a placebo-controlled trial may be justified. They also proposed procedural and substantive recommendations directed towards sponsors, researchers, research ethics committees, public health authorities, and policymakers.

Article. A Code of Ethics for Public Health
GHELI repository link: https://repository.gheli.harvard.edu/repository/13337
This editorial published in the American Journal of Public Health details the development of the widely recognized code of ethics by the Public Health Leadership Institute. The article details the process of writing the code, content of the code, dissemination and adoption of the code, and future improvements that can be made, especially when this code is being applied in practice. This code aims to make clear to the public the public health ideals that institutions strive for, as well as the morals for which they need to be held accountable.

Article. Public Health Ethics: Mapping the Terrain
GHELI repository link: https://repository.gheli.harvard.edu/repository/13338
This article published in the Journal of Law, Medicine & Ethics lays out the groundwork for public health ethics by specifying what public health is, in order to delve deeper into moral considerations in public health ethics. Some examples of public health morals include: keeping promises and commitments, disclosing information truthfully, and producing benefits while removing harms. While public health efforts across institutions and disciplines can come off as
This article aims to lay the foundations anew by outlining the theories in public health ethics which will lead to the realization of social justice and human rights, as they relate to health.

**Teaching Case. Global Health Research in an Unequal World: Ethics Case Studies From Africa**


This book-length collection of 42 fictionalized cases, published by Wellcome Trust and CAB International, offers a wide range of narratives on everyday ethical dilemmas and challenges that may accompany global health research in places with substantial global, political, and economic inequality. Each story-based case includes discussion questions, suggested group activities, an invitation to reflect on personal experience, further readings, and facilitator notes with learning objectives. Facilitator guidance, templates, and additional resources on using the case studies are also included. The ethical themes addressed in the cases are organized by relational issues—researcher/participant, community and family, institutional, and staff relationships—and a concluding index lists topical themes by alphabetical keyword. The second part of the book explores key perspectives informing the research approach, offers an analysis of the medical research context in Africa, and outlines what anthropology and the social sciences can offer.

This case collection is structured to be a user-friendly illustrated resource, suitable for high school or college student classes as well as training opportunities within medical research organizations, universities, collaborative sites, and non-governmental organizations.

**Article. The New International Health Regulations**


This article published in the *Journal of Law, Medicine & Ethics* discusses the adoption of new International Health Regulations (IHR), a progressive step in global health. The purpose of the new IHR is “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.” The new IHR emphasize the state’s right to protect its people’s health and underscore obligations to take health-protecting actions with careful considerations regarding trade and travel. The new IHR are broader in scope and are a pillar in global health governance.


This report from the National Academies Press (NAP) highlights the intersections between clinical research and epidemic response, drawing from lessons from the Ebola virus. There are several considerations to be made, such as ethical planning during research trials, assessment of vaccine trials, engaging communities in research and response, and facilitating international coordination and collaboration. The lessons learned from the past show that properly designed clinical research trials—especially during global emergencies—are imperative in tackling the epidemic at hand.

**Report. Research in Global Health Emergencies**


This report published by the Nuffield Council on Bioethics underscores the importance of conducting sound and ethical research during public health emergencies, and what long-term effects and implications may be. National governments,
intergovernmental organizations, the private sector, and humanitarian agencies are especially influential actors, and their roles are outlined in this report.

**Article. Putting Human Rights at the Centre of Struggles for Health and Social Equality**
GHELI repository link: https://repository.gheli.harvard.edu/repository/13348
This article in OpenGlobalRights illuminates gaping social inequalities, which are threatening democracies across the globe. This article calls for ethical principles to be applied to address the roots of poverty. This can be made possible through social mobilization and democratic law reform. Human rights for social change should be woven into broader social movements and should not only be dependent on institutions, but should draw upon the power of individuals and communities alike.

**Article. Human Rights Protections are Needed Alongside PPE for Health-Care Workers Responding to COVID-19**
GHELI repository link: https://repository.gheli.harvard.edu/repository/13339
This article from The Lancet Global Health highlights the additional protections needed by healthcare workers – alongside personal protective equipment (PPE) – in order to ensure their safety. Along with exposure to COVID-19, healthcare workers have also experienced violence, harassment, discrimination, and censorship from governments and the general population. One example provided by the author focused on Dr. Li Wenliang, who was forced to sign a confession by the Chinese government stating he had made false statements and disturbed public order after he was the first to raise the alarm about COVID-19. Healthcare providers must have their human rights protected, alongside their health, during the COVID-19 pandemic.

**Resource Portal. Human Rights Watch: Coronavirus**
GHELI repository link: https://repository.gheli.harvard.edu/repository/13353
This web portal from the Human Rights Watch provides a collection of resources related to human rights and Coronavirus Disease 2019 (COVID-19). The portal includes commentary, videos, reports, and news on a variety of topics ranging from the health of immigrants during the pandemic to unsafe work practices, to food security. Also available within the portal is the Human Rights Watch report on COVID-19, Human Rights Dimensions of COVID-19 Response.
COVID-19 College/Graduate Resources
Teaching Pack
2021

Overview

How can educators make course content relevant to learners? The current COVID-19 pandemic offers a wealth of opportunities for college and graduate educators to integrate real-world events, salient to their students everyday lives, into existing or new courses. This collection brings together timely, high-quality material that explores global and local patterns of disease, transmission and epidemiology, social determinants of health, health sector and non-health sector responses, and the variation in policies and their impact.

Each tile within this collection brings together a key resource on the topic -- such as a data visualization, interactive, organizational hub, scientific portal, or publication -- that can be leveraged in online, physical, or hybrid learning environments. This teaching pack is part of a COVID-19 Teaching Toolkit under development by the Global Health Education and Learning Incubator at Harvard University. New resources will be added as they become available.

The Global Health Education and Learning Incubator at Harvard University supports interdisciplinary education about world health through the production, curation, and dissemination of educational public goods.
Selected Resources

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* Activity. Black Americans Face Alarming Rates of Coronavirus Infection in Some States

* Lesson Material. A Timeline of the Coronavirus Pandemic

* Infographic. Visualizing the History of Pandemics

* Article. American Journal of Public Health: Influenza Pandemics, 1918-2018

* Article. Pandemic Preparedness and Response – Lessons from H1N1 Influenza of 2009
* Video. How Pandemics Spread

* Chapter. Pandemics: Risks, Impacts, and Mitigation

* Article. Emerging, Evolving, and Established Infectious Diseases and Interventions
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Resource Portal. COVID-19 Dashboard
GHELI repository link: https://repository.gheli.harvard.edu/repository/13762
This web portal from the Viswanath Lab at the Harvard T.H. Chan School of Public Health brings together a wide variety of credible Coronavirus Disease 2019 (COVID-19) related information that is easy to access, digest, and act upon. The rapid spread of COVID-19 has simultaneously led to a rapid spread of information, misinformation, and disinformation related to the pandemic. This portal seeks to aid journalists, non-governmental organizations, and community members in navigating this deluge of COVID-19 information. The COVID-19 dashboard provides answers to frequently asked questions (FAQs) and resources on COVID-19 vaccines; answers to FAQs about COVID-19; a Mythbusters section aiming to debunk common COVID-19 misconceptions; infographics and reliable resources; mental health tips for managing stress and promoting wellbeing during the pandemic; a data spotlight providing up-to-date information on current cases; social media tips for using the platforms responsibly; and tips for tobacco users during the pandemic. All of this information is free, updated frequently, and is readily available in Portuguese, Spanish, and Hindi.

Resource Portal. Coronavirus Resources
GHELI repository link: https://repository.gheli.harvard.edu/repository/13241
This resource collection from the Association for Prevention Teaching and Research (APTR) brings together webinars, podcasts, case studies, and articles for teaching COVID-19 in undergraduate or graduate-level classrooms. It is aimed at students and educators across the health professions. The collection not only includes evidence-based resources for teaching and learning about COVID-19, but also resources for effective remote teaching. Some featured resources include a patient simulation by the Case Network, a “health weather map” by Oregon State University to track the impacts of social distancing, and various public health trainings on navigating COVID-19.

Article. R0, the Messy Metric That May Soon Shape Our Lives, Explained
GHELI repository link: https://repository.gheli.harvard.edu/basement/r/17/13289
This article is a simple explanation of R0 (pronounced “R-naught”) which is used in scientific articles, news articles and laypress. Educators may find it a useful quick read for students with no background in epidemiology.

R0 represents the number of new infections estimated to stem from a single case. In other words, if R0 is 2.7, then one infected person is expected to transmit the infection to, on average, 2.7 others. An R0 below 1 implies that the number of cases is shrinking, whereas an R0 greater than 1 implies that the number of cases is growing. While the epidemiology of COVID-19 is far more complicated than a simple value of R0, this basic article provides students with a general understanding of a basic infectious disease principle, and lays the foundation for learning more.

Data Interactive. Why Outbreaks Like Coronavirus Spread Exponentially, and How to “Flatten the Curve”
GHELI repository link: https://repository.gheli.harvard.edu/repository/13305
This article in The Washington Post provides interactive data on Coronavirus Disease 2019 (COVID-19), illustrating the exponential growth of cases over time in the United States, transmission of the disease between health and infected people, the change in number of recovered people over time, and other outcomes through simulations.
The interactive provides six simulations for educators and learners to explore, to understand how many people in a population would be healthy, sick, and recovered based on four different sample populations and different levels of severity of social distancing measures. The series of simulations highlights that extensive social distancing measures predict the most effective outcomes for “flattening the curve” of new cases and deaths. Data for this interactive was collected by the Johns Hopkins University Center for Systems Science and Engineering, and users can download it on GitHub.

**Data Interactive. Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering**


GHELI repository link: https://repository.gheli.harvard.edu/repository/13178

This data interactive by Johns Hopkins Center for Systems Science and Engineering can display numerous different data sets related to COVID-19 on an interactive map. Upon entering the interactive, the map shows global cumulative confirmed cases of COVID-19. However, the user can also view active cases of Coronavirus Disease 2019, the incidence rate, the case-fatality ratio by country, global vaccinations, US vaccinations, and US testing rate. The user can zoom in and out along the map and select different outbreaks to see specific information related to that country. The global data, which is updated numerous times per day, can also be broken down by region, country, and state or province.

**Data Interactive. Coronavirus Disease (COVID-19) - Statistics and Research**


GHELI repository link: https://repository.gheli.harvard.edu/repository/13207

This data interactive from Our World in Data contains more than 40 data visualization on all aspects of the Coronavirus Disease 2019 (COVID-19) pandemic, from total confirmed deaths to daily new confirmed cases. The data visualizations are based on data from the European Center for Disease Prevention and Control (ECDC), which publishes daily statistics on COVID-19 for the entire world. Many of the interactives allow the user to choose specific countries or regions for data comparison and much of the raw data can be downloaded directly from the visualization.

**Data Interactive. Tracking the Spread of Coronavirus Cases in the US and Worldwide**


GHELI repository link: https://repository.gheli.harvard.edu/repository/13307

This data visualization in USA Today provides daily updates on the spread of Coronavirus Disease 2019 (COVID-19) in the United States and around the world. It compiles interactive data with maps and charts from the World Health Organization, the Centers for Disease Control and Prevention, and other sources compiled by Johns Hopkins University. Readers can engage with data visualizations detailing the total confirmed cases, number of deaths, and number of recovered people at varying geographic resolutions including on the global, country, or state level. The maps illustrate the cumulative spread of the virus and are accompanied by supporting information about the disease.

**Teaching Pack. Teaching Pack: COVID-19 Relevant Teaching Cases**


GHELI repository link: https://repository.gheli.harvard.edu/repository/collection/teaching-pack-covid-relevant-cases

This curated collection includes teaching cases that could serve as useful resources for educators teaching about topics that are relevant to COVID-19, including but not limited to: pandemic risk preparedness, mitigation and response; policy coordination between federal, state and local government; drugs, vaccines and supply chains; international collective action and global governance.

Cases include both domestic and international experiences with SARS, H1N1, H5N1, Ebola and COVID-19. While some cases are older, they represent the challenges, opportunities and lessons learned from past events surrounding complex epidemics and pandemics. This teaching pack is part of a COVID-19 Teaching Toolkit under development by
the Global Health Education and Learning Incubator at Harvard University. New cases will be added as they become available.

Resource Portal. Harvard Medical School: Medical Student COVID-19 Curriculum
GHEL repository link: https://repository.gheli.harvard.edu/repository/13511
This portal is a curriculum written by Harvard Medical School students that includes eight modules about Coronavirus Disease 2019 (COVID-19) and its spread in society. The modules are updated weekly with the latest and most accurate research. The curriculum is aimed towards medical students but is available to the public. The eight modules address the following topics:

- Module 1: From Bench to Bedside
- Module 2: Epidemiology Principles
- Module 3: Health Disparities, Policy Changes, and Socioeconomic Effects in the United States
- Module 4: Mental Health in the Time of COVID-19
- Module 5: Communicating Information About COVID-19
- Module 6: Training for Potential Clinical Roles
- Module 7: Global Innovation and Collaboration
- Module 8: Medical Ethics in Relation to COVID-19

Educators and students using this curriculum can also explore the COVID-19 Student Response website for additional resources, a K-12 curriculum, and causes and organizations to support. The modules are accompanied by a podcast, Antiviral, which offers an audio translation of the curriculum with additional information and expert interviews.

Resource Portal. COVID-19 Classroom
GHEL repository link: https://repository.gheli.harvard.edu/repository/13515
This online curriculum produced by the COVID-19 Student Response Team at Harvard Medical School (HMS) is a resource portal containing information about Coronavirus in three formats tailored to elementary school students, middle school students, and high school and college age students. Modules for elementary students include a guided series of printable coloring pages. Middle school students can learn the science behind viruses and the timeline of COVID-19 via a series of videos, readings, and interactive worksheets. High school and college age students can participate in a virtual case simulation and learn the basics of clinical medicine in the context of a COVID-19 patient. The curriculum portal includes a Caregiver and Teacher Guide with materials and practices to support kids and adolescents throughout the pandemic, also tailored to several age groups. The portal also provides related resources that are freely accessible and have been curated by the team at HMS to offer additional information for families, caregivers, and children. These resources cover topics including temporary homeschooling, building resilience, ensuring child wellbeing, supporting children with anxiety or ADD/ADHD, and expressing emotions throughout the pandemic.

Resource Portal. Coronavirus Disease (COVID-19) Outbreak
GHEL repository link: https://repository.gheli.harvard.edu/repository/13195
This web portal from the World Health Organization (WHO) presents curated and regularly updated information about the global response to the COVID-19 outbreak. The portal includes a Q&A fact sheet, videos, a database of global research, daily situation reports, and other training and e-learning resources.
Resource Portal. WHO Global Literature on Coronavirus Disease
World Health Organization Global Literature on Coronavirus Disease. World Health Organization.
GHeli repository link: https://repository.gheli.harvard.edu/repository/13507
This web portal from the World Health Organization (WHO) is a global literature collection of over 100,000 journal articles and other resources related to Coronavirus Disease 2019 (COVID-19). Users can explore articles, linked databases, and clinical trials and studies. Users can also sort resources by language, journal, clinical aspect, year of publication, or main subject, covering a range of topics related to COVID-19 including health care delivery, viral pneumonia, quarantine, mental health, and coronavirus infections.

GHeli repository link: https://repository.gheli.harvard.edu/repository/13180
These data publications from the World Health Organization (WHO) present daily updates about the current COVID-19 outbreak. Each situation report highlights key takeaways from current data as well as a snapshot of current numbers. Surveillance data is further disaggregated by region, population, confirmed and suspected cases, and deaths. The reports also outline up-to-minute preparedness and response guidelines, research updates, and advice to the public.

GHeli repository link: https://repository.gheli.harvard.edu/repository/13176
This web portal from the Centers for Disease Control and Prevention (CDC) hosts a wide range of information on the COVID-19 outbreak, from recent updates on disease spread to travel information. The basics of COVID-19 are included, such as how the disease spreads, symptoms, testing, and frequently asked questions. The CDC updates the situation summary regularly, providing insight into the steps taken by the organization to curb the spread of disease in the U.S., illness severity, and risk assessments. The portal also includes travel advisories, a map of confirmed cases, and the latest news on COVID-19.

GHeli repository link: https://repository.gheli.harvard.edu/repository/13202
This web portal from the Centers for Disease Control and Prevention (CDC) brings together the CDC’s Morbidity and Mortality Weekly Reports (MMWR) into one place. The currently published MMWRs describe initial public health response and interim clinical guidance for Coronavirus Disease 2019 (COVID-19), as well as up-to-date information about new diagnoses in the U.S.

Resource Portal. LitCOVID
GHeli repository link: https://repository.gheli.harvard.edu/repository/13218
This web portal from the National Institutes of Health (NIH) is a curated repository of scientific research that connects users to a growing number of articles on Coronavirus Disease 2019 (COVID-19). The portal compiles articles from numerous journals, including The Lancet, JAMA, Respiratory Medicine and more - with many of the articles available to the public for free. The research articles are categorized by topic, ranging from general information on COVID-19 to transmission, to prevention, to forecasting. The portal also displays the number of publications about COVID-19 per week and tracks the countries mentioned in abstracts via an interactive map--a useful starting place for educators and learners.
Glossary. Coronavirus (COVID-19) Outbreak Glossary
GHELI repository link: https://repository.gheli.harvard.edu/repository/13210
This glossary from the Kaiser Family Foundation is a collection of key terms and concepts in the Coronavirus Disease 2019 (COVID-19) outbreak. Terms are organized from A to Z and include relevant words and phrases from ‘Coronavirus’, ‘Flattening the Curve’, ‘Case Fatality Rate’ and more. Each term and phrase has a short definition or description relating to coronavirus.

Resource Portal. COVID-19 Resource Centre
GHELI repository link: https://repository.gheli.harvard.edu/repository/13198
This web portal from The Lancet contains recently published articles, comments, editorials, correspondence, and other publications related to the Coronavirus Disease 2019 (COVID-19) pandemic. All COVID-19 related information published by The Lancet is available for free to the general public, allowing users to stay current on the most recent research related to the pandemic.

Report. Exploring Lessons Learned From a Century of Outbreaks
GHELI repository link: https://repository.gheli.harvard.edu/repository/13000
This 2019 report examines the lessons from influenza pandemics and other major outbreaks. The report summarizes the findings of two National Academies of Sciences, Engineering, and Medicine workshops aimed at understanding the extent to which lessons learned could be applied to help countries prepare for future pandemics. This publication summarizes the presentations and discussions from both workshops, and includes a commissioned background paper. Key chapters include:

1. Introduction
2. Is the World Ready to Respond to the Next Influenza Pandemic?
3. Global Progress to Prepare for the Next Influenza Pandemic
4. Reflections on a Century of Infectious Disease Outbreaks and Pandemics
5. Building Local and National Capacities for Outbreak Preparedness
6. A Spectrum of Considerations for Pandemic Vaccines
7. The Development of the PIP Framework: Global Lessons on Equity and Fairness for Pandemic Preparedness
8. Overcoming Impediments to Achieving Greater Preparedness
9. Visions on Potential Priorities and Actions for Preparedness by 2030
Educators can tailor lessons or activities based on a specific chapter. The report is best suited for courses focusing on health equity, global governance, infectious disease management, and disaster preparedness.

Teaching Case. COVID-19: The Global Shutdown
GHELI repository link: https://repository.gheli.harvard.edu/repository/13283
This teaching case focuses on the COVID-19 pandemic from a global perspective. In addition to describing the public health emergency, the case focuses on the enormous impact on global economics as world trade, tourism, capital flows, remittances, and commodity prices have all been affected by efforts to contain the virus.

Key questions posed in the abstract include, "What policy options existed to mitigate the financial and economic distress of containment, and what factors did different countries weigh in deciding which paths to choose? Was there a terrible choice - either damage livelihoods through extended lockdowns, or sacrifice thousands or even millions of lives to the virus - or were policies reinforcing? What was the role of government, businesses, communities and individuals? After the worst of the health crisis was mitigated, what kind of shape would world economies take?"
Online Learning. The Coronavirus Pandemic Series
GHELI repository link: https://repository.gheli.harvard.edu/repository/13181
This webcast seminar series from The Forum at the T.H. Chan School of Public Health takes on pressing questions about the COVID-19 pandemic. The series invites global and public health experts to discuss the pandemic’s ongoing development including preparedness efforts, vaccine development, health system responses, and health inequities. This Forum is presented jointly with The World from PRX & WGBH.

Data Interactive. Coronavirus in the U.S.: Latest Map and Case Count
GHELI repository link: https://repository.gheli.harvard.edu/repository/13304
This interactive in The New York Times provides the latest map and case count for Coronavirus Disease 2019 (COVID-19) and is updated regularly. Users can engage with the most recent data on location hot spots, total cases, deaths, cases per capita, and recent trends for COVID-19 in the United States on an interactive map of the entire country and on the individual state and county level.

The interactive article also includes data on the places hit hardest in the United States, such as in hot spots, the counties with the highest number of cases per resident, and clusters, which are places such as nursing homes, correctional facilities, and cruise ships with densely packed people. Readers can download county-level data for COVID-19 cases and read more about the methodology on GitHub.

Data Portal. State Data and Policy Actions to Address Coronavirus
GHELI repository link: https://repository.gheli.harvard.edu/repository/13206
This data portal from the Kaiser Family Foundation provides an in-depth overview of state-level policy actions to curtail the spread of Coronavirus Disease 2019 (COVID-19). The portal provides data on the number of COVID-19 cases, deaths, vaccinations, positivity rate, and specific policy actions taken for individual states. COVID-19 metrics are also displayed in separate maps highlighting race/ethnicity and those living in long-term care facilities. Policy actions tracked include eligibility for the COVID-19 vaccine, priority populations by state, social distancing, health policy, and telehealth. This data is presented in both map and table format and can be exported. This data portal can be incorporated in comparative classroom activities exploring state-level healthy policy action.

Activity. Black Americans Face Alarming Rates of Coronavirus Infection in Some States
GHELI repository link: https://repository.gheli.harvard.edu/repository/13208
Students will examine how the current COVID-19 crisis may be exacerbating pre-existing health inequities in the U.S. In this activity, students will explore 2020 data on health disparities, especially in states like Louisiana and Michigan where Black Americans are currently experiencing alarming rates of infection and virus-related fatalities. Students will contextualize through a recent news article that examines some of the current, racialized trends in infection and map out the individual, family, community, and societal dimensions of this issue.

Resources
Activity

- **Observe and Wonder:** The [County Health Rankings](https://www.rwjf.org/en/county-health-rankings) data interactive from the Robert Wood Johnson Foundation paints a picture of state-level racial disparities in 2020 across multiple metrics. While there are options to drill deeper into county-level data, we recommend staying at state-level (the first check-box) for the purpose of this activity. Students may want to look specifically at Louisiana and Michigan, two states where Black Americans are currently facing disproportionate rates of COVID-19 infection. If you are using a virtual platform like Zoom, this might be a good opportunity to use breakout rooms. As students spend time considering the state profile, they should consider the following questions:
  - What are the three measures included in the data interactive? Why do you think they were chosen for thinking about health?
  - How does the state compare to the nation for a particular measure?
  - What patterns or differences do you notice by racial group for each measure?
  - What do you wonder about the data?

- **Read and Discuss:** The [New York Times](https://www.nytimes.com) article provides a rich case for contextualizing these observations and wonderings about the data. Though data on race and coronavirus is currently limited, researchers have observed that the virus is killing Black Americans at disproportionately high rates. In Chicago, for example, African-Americans account for 72% of virus-related fatalities, though they only represent less than a third of the population. Experts in the article share how the current pandemic has exacerbated longstanding structural inequalities. Black Americans disproportionately belong to parts of the work force that are not able to work from home, are less likely to be insured, and more likely to have preexisting health conditions and experience racial bias within the health care system. Historical, racist real estate practices from the 1930s mean many Black residents still live in segregated neighborhoods, without access to job opportunities and grocery stores and perhaps in areas where higher rates of asthma are more common. In small groups or as a class, have students map out the factors at the individual, familial, community, and societal levels that are shaping the current experience of the COVID-19 crisis.
  - What do you notice?
  - How does the data you explored from the County Health Rankings fit into this picture, if at all?
  - If you were a public health official considering this information, where would you focus your attention in COVID-19 response? Why?

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Lesson. A Timeline of the Coronavirus Pandemic

**GHELI repository link:** [https://repository.gheli.harvard.edu/repository/13211](https://repository.gheli.harvard.edu/repository/13211)

This timeline from *The New York Times* documents key events throughout the Coronavirus Disease 2019 (COVID-19) pandemic. The timeline begins on December 31st, 2019 – when Chinese authorities were treating numerous cases of an unknown pneumonia – and new events are added as they occur. Each event is accompanied by a brief description, providing the user further information on the events significance, and many times includes a hyperlink to another New York Times story.

Infographic. Visualizing the History of Pandemics

**GHELI repository link:** [https://repository.gheli.harvard.edu/repository/13291](https://repository.gheli.harvard.edu/repository/13291)

This infographic from the Visual Capitalist depicts a visual history of pandemics, from the Antonine Plague to the current COVID-19 pandemic. It illustrates the impact of the marked shift to agrarian communities, widespread trade, and urbanization on infectious disease spread - both scale and scope.
In addition to providing historical context to the COVID-19 epidemic, educators can use this visualization to have students explore the impact of quarantine which began in the 14th century (aimed at protecting coastal cities from epidemics) and improved health care, which lowered case fatality rates associated with epidemics.

There is also a visualization depicting \( R_0 \), pronounced “\( R \) naught”, which represents the number of susceptible people, on average, each infected person will in turn infect.

**Article. American Journal of Public Health: Influenza Pandemics, 1918-2018**

This special section of the *American Journal of Public Health* highlights lessons learned from the 1918 influenza pandemic that has ramifications for contemporary responses to influenza, even 100 years later. In particular, devastation from the 2018 seasonal influenza outbreak illuminated the potential consequences of a 1918-type influenza pandemic in the present-day. The special section unpacks the historical influences of the 1918 pandemic on biomedicine, preparedness response, and public health, while also describing how the rapid urbanization and great population density of today may exacerbate future transmission risks.

**Articles in this special section include:**
- The 1918 Influenza Pandemic: Lessons Learned and Not—Introduction to the Special Section
- The Mother of All Pandemics Is 100 Years Old (and Going Strong)!
- The Spanish Flu, Epidemics, and the Turn to Biomedical Responses
- The Physician’s Duty to Treat During Pandemics
- “Spanish Flu”: When Infectious Disease Names Blur Origins and Stigmatize Those Infected
- Better Prepare Than React: Reordering Public Health Priorities 100 Years After the Spanish Flu Epidemic
- 100 Years of Medical Countermeasures and Pandemic Influenza Preparedness

**Article. Pandemic Preparedness and Response – Lessons from H1N1 Influenza of 2009**

This article from *The New England Journal of Medicine* discusses the global pandemic caused by the influenza A (H1N1) strain. H1N1 presented a public health emergency of uncertain scope, duration, and effect, and prompted the first activation of provisions under the 2005 International Health Regulations (IHR). The pandemic exposed strengths of the newly implemented IHR as well as a number of shortcomings and vulnerabilities in terms of “global, national, and local public health capacities, limitations of scientific knowledge, difficulties in decision making under conditions of uncertainty, complexities in international cooperation, and challenges in communication among experts, policymakers, and the public”. This article reviews the experience of the pandemic, with special attention given to the function of the 2005 IHR and the performance of the WHO, and highlights steps that can be taken to improve global readiness to deal with future pandemics. Educators can leverage this as a rich case example for classroom discussion about global governance, disaster response, and infectious disease.

**Video. How Pandemics Spread**

In our increasingly globalized world, a single infected person can board a plane and spread a virus across continents. Mark Honigsbaum describes the history of pandemics and how that knowledge can help halt future outbreaks. "How Pandemics Spread" is a lesson by Mark Honigsbaum and was animated by Patrick Blower.

For educators incorporating this resource into their classrooms, the resource includes a short post-video quiz and links to archival material on the 1918 Influenza Pandemic.
Chapter. Pandemics: Risks, Impacts, and Mitigation
GHELI repository link: http://repository.gheli.harvard.edu/repository/12682
This report chapter from the World Bank examines the latest data and analysis for worldwide pandemics, their risks, impacts, and tactics of mitigation. In it, the authors outline the history and correlation between pandemic emergence, trends in globalization, and evolving policy approaches used by the international community to strengthen pandemic preparedness. Despite improvements in pandemic trends due to these policies, progress has been uneven and has led to greater mortality impacts in low- and middle-income countries (LMICs).

Article. Emerging, Evolving, and Established Infectious Diseases and Interventions
GHELI repository link: http://repository.gheli.harvard.edu/repository/11165
This article discusses how the shifting landscape of infectious diseases and interventions poses challenges. Planning, implementing, and evaluating interventions against infectious diseases depend on the nature of the infectious disease; the availability of intervention measures; and logistical, economic, and political constraints. Infectious diseases and vaccines—or drug-based interventions—can be loosely categorized by the degree to which the infectious disease and the intervention are well established. Pertussis, polio, and measles are three examples of long-known infectious diseases for which global vaccination has dramatically reduced the public health burden. Focused field epidemiology and surveillance are needed to provide the information required to make informed policy decisions about interventions to further global public health.
Resource Pack:
Diagnostic Tests, Bayes, and COVID-19


Overview

This resource pack provides a curated set of articles, perspectives, and interactives about diagnostic testing for COVID-19. The pack provides materials that will be particularly useful for educators who are teaching diagnostic test performance, value of information, and probability revision using Bayes’ theorem.

The majority of papers focuses on reverse transcriptase polymerase chain reaction (RT-PCR) performed on samples obtained from the respiratory tract by nasopharyngeal swab, but some also focus on serological antibody testing. The mechanism of false negative results (e.g., timing of sample collection in relation to illness onset, deficiency in sampling technique, etc.), and less commonly occurring false positive results (e.g., technical errors and reagent contamination) are discussed. Several articles quantitatively illustrate the Bayesian approach, using information on the prior probability (prevalence), the probability of a positive test given disease (sensitivity) and the probability of a negative test given no disease (specificity) to calculate the post-test probability of COVID-19. Several papers include illustrations and graphics, one with an interactive, to illustrate these relationships and provide quantitative insight.

Papers and perspectives are also included that discuss the impact of the “spectrum effect” on measures of test performance, the nature of inadequate diagnostic capacity early in the epidemic in the U.S., and the implications of false negative results from an individual and population-level perspective. Finally, there is a small subset of papers unrelated to COVID-19 that focus on the fundamentals of diagnostic testing, probability revision, and related issues.

A companion teaching pack and set of multimedia materials are under development by Jake Waxman and Sue Goldie. If you would like to be notified when completed and available, please email Christina Fasano.
Selected Resources – At a Glance

Article. Interpreting COVID-19 Test Results: A Bayesian Approach

Article. Interpreting a COVID-19 Test Result

Editorial. Interpreting Diagnostic Tests for SARS-CoV-2

Exercise. The Test is Positive: Interpreting Evidence
The Test is Positive: But What are the Odds It's Wrong? Interpreting the Evidence. Motivate, part of the Millennium Mathematics Project at the University of Cambridge 2011. http://motivate.maths.org/content/MathsHealth/PositiveTest

Article. The Spectrum Effect in Tests for Risk Prediction, Screening, and Diagnosis

Tutorial/Primer. Diagnostic Test Calculator
Schwartz A. Diagnostic Test Calculator. http://araw.mede.uic.edu/cgi-bin/testcalc.pl?DT=0&Dt=0&dT=0&dt=0&2x2=Compute

Online Learning. Diagnostic Test Accuracy (DTA) Reviews: A Pathway

Article. Do Doctors Overestimate Diagnostic Probabilities?

Article. Clinical Decision Making: Using a Diagnostic Test
Not Open Access

Editorial. Diagnostic Testing for the Novel Coronavirus

Tools/Models. Interactive Graphic: Interpreting a COVID-19 Test Result

Article. Bayes' Theorem, COVID-19, and Screening Tests
Editorial. False Negative Tests for SARS-CoV-2 Infection – Challenges and Implications

Editorial. Waiting for Certainty on COVID-19 Antibody Tests — At What Cost?

Tool. COVID-19 Antibody Tests: Calculator for Interpreting Test Results

Article. Testing for SARS-CoV-2 Antibodies

Article. Explosion of New Coronavirus Tests That Could Help to End the Pandemic


Guidelines. Interim Guidance for Antigen Testing for SARS-CoV-2

Review. Performance Characteristics of 5 Immunoassays for SARS-CoV-2

Review. Rapid, Point-of-Care Tests for Diagnosis of SARS-CoV-2 Infection
Annotated Bibliography

**Article. Interpreting COVID-19 Test Results: A Bayesian Approach**


CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/3583](https://repository.chds.hsph.harvard.edu/repository/3583)

This article considers the following question with respect to interpreting the results of polymerase chain reaction (PCR) assays from nasal and pharyngeal swabs for COVID-19 to inform clinical decision making: "While a positive result in an acutely ill patient is straightforward, how should physicians interpret negative tests in patients with suspected COVID-19 infection?"

Using an assumption of near-perfect specificity of PCR assays for COVID-19, the authors acknowledge the uncertainty of test sensitivity. They consider two clinical scenarios with different contact history and clinical presentations. Using a Bayesian approach and example calculations, they illustrate the influence of the prior probability (prevalence), the probability of a positive test given disease (sensitivity) and the probability of a negative test given no disease (specificity) on the post-test probability of COVID-19. In particular, the scenarios they choose illustrate the influence of the prior (prevalence) on the post-test probability of disease - the clinical relevant conditional probability for decision making.

**Article. Interpreting a COVID-19 Test Result**


CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/3585](https://repository.chds.hsph.harvard.edu/repository/3585)

Viral RNA tests for COVID-19, using reverse transcriptase polymerase chain reaction (RT-PCR), rely on samples obtained from the respiratory tract by nasopharyngeal swab. Testing for COVID-19 theoretically could "identify infected individuals who can then be isolated to reduce spread, allow contact tracing for exposed individuals, and provide knowledge of regional and national rates of infection to inform public health interventions." However, how to interpret test results with respect to individual patient results is not straightforward.

This article adopts a Bayesian perspective to demonstrate the influence of the prior probability of COVID-19, the sensitivity (i.e., the probability of a positive test conditional on disease presence), and the specificity (i.e., the probability of a negative test conditional on disease absence) on the post-test probability of disease. They quantitatively demonstrate this influence through two case scenarios, using well-designed graphics to depict the conceptual basis behind test interpretation. Of particular relevance to educators is this interactive graphic.

In addition, the authors point out the challenges due to lack of a "gold-standard" for evaluating the performance of COVID-19 tests and illustrate how the origin of estimates of "sensitivity" can introduce bias.

**Editorial. Interpreting Diagnostic Tests for SARS-CoV-2**


CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/3586](https://repository.chds.hsph.harvard.edu/repository/3586)

This viewpoint describes how to interpret two types of diagnostic tests commonly used for SARS-CoV-2 infections – reverse transcriptase-polymerase chain reaction (RT-PCR) and IgM and IgG enzyme-linked immunosorbent assay (ELISA) – and how the results may vary over time.
False-negative results mainly occurred due to inappropriate timing of sample collection in relation to illness onset and deficiency in sampling technique, especially of nasopharyngeal swabs. Specificity of most of the RT-PCR tests is 100% because the primer design is specific to the genome sequence of SARS-CoV-2. Occasional false-positive results may occur due to technical errors and reagent contamination.

The authors synthesize evidence and suggest a clinically-relevant timeline for diagnostic markers for detection of COVID-19. They emphasize that most of the available data are for adult populations who are not immunocompromised, and that the time-course of PCR positivity and seroconversion may vary in children and other groups, including the large population of asymptomatic individuals who go undiagnosed without active surveillance.

**Exercise. The Test is Positive: Interpreting Evidence**

The Test is Positive: But What are the Odds It’s Wrong? Interpreting the Evidence. Motivate, part of the Millennium Mathematics Project at the University of Cambridge 2011. [http://motivate.maths.org/content/MathsHealth/PositiveTest](http://motivate.maths.org/content/MathsHealth/PositiveTest)

CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/3262](https://repository.chds.hsph.harvard.edu/repository/3262)

This worksheet, created by the Millennium Mathematics Project at the University of Cambridge, contains three practice problems on the probability of a particular diagnosis or event, given a positive or negative test result.

The worksheet builds on the student's prior understanding of probability, and uses the example of a mammogram to diagnose breast cancer, a test for colorectal cancer, and a DNA test to determine the verdict in a court case. Students build an understanding by completing a table, tree diagram, or Venn diagram.

This resource is one part of the pack by the Millennium Mathematics Project called "The Test is Positive: But What Are the Odds It's Wrong?" The resource landing page contains all the teaching resources in this pack, including this and other worksheets, slide sets, videos, and an answer key.

**Article. The Spectrum Effect in Tests for Risk Prediction, Screening, and Diagnosis**

Usher-Smith JA, Sharp SJ, Griffin SJ. The Spectrum Effect in Tests for Risk Prediction, Screening, and Diagnosis. BMJ 2016; 353. [https://doi.org/10.1136/bmj.i3139](https://doi.org/10.1136/bmj.i3139)

CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/3588](https://repository.chds.hsph.harvard.edu/repository/3588)

This article discusses the impact of the spectrum effect on measures of test performance, and its implications for the development, evaluation, application, and implementation of such tests. The authors describe this effect as the variation between settings in performance of tests used to predict, screen for, and diagnose disease among different population subgroups. They emphasize that a test developed in a population with a higher prevalence of disease (or at higher risk) will typically have a lower sensitivity and higher specificity when applied in a population with lower disease prevalence (or at lower risk).

In addition to a discussion of the spectrum effect with examples from the literature, quantitative examples are used to illustrate variation in the sensitivity, specificity, and likelihood ratio, with different assumptions about the prevalence and population distribution of the condition. They point out the importance of considering the spectrum effect in the development, evaluation, and choice of tests.

While, in an ideal world, new tests should be developed and evaluated using data from the population(s) in which they are intended to be used, this may not be possible in a context such as a global pandemic with a new infectious agent. In this instance, an understanding of the types of biases that emerge with
assumptions about data performance from a very specific population will help in using clinical reasoning when interpreting test results from the general population.

**Tutorial/Primer. Diagnostic Test Calculator**

Schwartz A. Diagnostic Test Calculator. [http://araw.mede.uic.edu/cgi-bin/testcalc.pl?DT=0&Dt=0&dT=0&dt=0&2x2=Compute](http://araw.mede.uic.edu/cgi-bin/testcalc.pl?DT=0&Dt=0&dT=0&dt=0&2x2=Compute)

CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/2567](https://repository.chds.hsph.harvard.edu/repository/2567)

This calculator determines diagnostic test characteristics (sensitivity, specificity, likelihood ratios) and/or the post-test probability of disease, given the pre-test probability and test characteristics.

Users fill out clearly marked sections and then select the “Compute” button. Sections not filled out are automatically filled out and computed, and a nomogram will display the probability that a patient has the disease after a positive or negative test.

**Online Learning. Diagnostic Test Accuracy (DTA) Reviews: A Pathway**


CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/2529](https://repository.chds.hsph.harvard.edu/repository/2529)

These video cases are part of an introductory series developed by Cochrane Screening & Diagnostic Test Methods Group to support authors in the production of systematic reviews of diagnostic test accuracy (DTA). Each resource is designed to be a stand-alone learning unit, although they are presented as a progressive learning pathway. Users can access the resources in any order, although those not familiar with Cochrane DTA Reviews may find it most productive to work through the resources in the order presented.

The slide casts were developed by the Cochrane Screening & Diagnostic Test Methods Group. There are 16 lessons available.

Educators interested in introductory material as a supplement to other lesson plans about diagnostic tests include:

- Types of medical tests and their uses
- Stages of diagnostic test evaluation
- Introduction to test accuracy
- Formulating a Cochrane DTA Review question

**Article. Do Doctors Overestimate Diagnostic Probabilities?**


CHDS repository link: [https://repository.chds.hsph.harvard.edu/repository/3113](https://repository.chds.hsph.harvard.edu/repository/3113)

This article reports on a physician survey on “subadditivity” in physicians’ estimations of probabilities, and concordance among doctors in probability estimates. Subadditivity is an error in probability estimation that occurs when the sum of all the estimated probabilities from a set of outcomes is greater than one, when the alternatives are mutually exclusive and collectively exhaustive. For example, a physician who estimates that a patient with chest pain has a 30% probability of angina, 40% probability of acid reflux, and 35% probability of a chest infection demonstrates subadditivity, as a total probability sum to 105% is impossible.
Article. Clinical Decision Making: Using a Diagnostic Test
Not Open Access
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3553
This article is part of a 6-part series on clinical decision making. The authors use two clinical examples to review the principles of interpreting diagnostic test results. They outline an approach that can be used to determine how to select and apply tests and their results to the practice of internal medicine. Topics covered in the two case studies include sensitivity and specificity, positive predictive and negative predictive value of tests, and how to estimate the post-test probability of a condition using this information and the pre-test probability of the condition. Multiple approaches are discussed, which include the use of a 2x2 table, Bayes’ Theorem using a nomogram, and the importance of considering prevalence in determining the false-positive and false-negative rates despite positive or negative test results.

Editorial. Diagnostic Testing for the Novel Coronavirus
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3589
This perspective provides insights about the controversies over diagnostic testing that have dominated U.S. headlines with regard to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the novel coronavirus responsible for coronavirus disease-2019 (COVID-19).

The authors review early testing challenges, beginning with the initial technical problems with the first test developed by the Centers for Disease Control and Prevention (CDC), which left the U.S. with inadequate diagnostic capacity early in the epidemic. They discuss the "diagnostic testing gap" and explain how the COVID-testing issue highlights a controversial area of public policy: the regulation of laboratory-developed tests. They postulate that "while initial testing criteria were too narrow to monitor and control the spread of the disease, the sudden pivot to a far broader testing approach, could be an overcorrection."

It should be noted that this perspective was written in the relatively earlier stages of the epidemic. As a supplement to teaching materials, this perspective can provide students with a brief informative narrative to better understand how the regulatory structure for diagnostic tests in the U.S. interacts with public health emergencies.

Tools/Models. Interactive Graphic: Interpreting a COVID-19 Test Result
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3590
Currently, the most common diagnostic test for COVID-19 relies on reverse transcriptase polymerase chain reaction (RT-PCR), and most often uses samples obtained from the respiratory tract by nasopharyngeal swab. This interactive graphic demonstrates the influence of the prior probability of COVID-19, the test sensitivity (i.e., the probability of a positive test conditional on disease presence), and the test specificity (i.e., the probability of a negative test conditional on disease absence) on the post-test probability of disease.

The interactive is associated with an article published in BMJ entitled "Interpreting a COVID-19 Test Result."* The article presents two case scenarios with well-designed graphics to quantitatively demonstrate the
influence of the prevalence of COVID-19 and of the sensitivity and specificity of RT-PCR, on the posterior (i.e., post-test) probability of disease.


**Article. Bayes' Theorem, COVID-19, and Screening Tests**
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3591

This article reviews the implications of increased testing for COVID-19 using reverse transcriptase polymerase chain reaction (rRT-PCR) through the application of Bayes’ Theorem for three hypothetical, stylized case scenarios.

The scenarios involve three patients with a low, moderate, and high pre-test probability of COVID-19 infection. The category of low probability would include "asymptomatic individuals in a presumed low prevalence environment" and might vary from 10 to 20%. The category of moderate probability would include "individuals with cough and fever in a city/jurisdiction with known cases of COVID-19" and might vary from 40 to 60%. The category of high probability would include patients "with fever, cough, shortness of breath and with a known close contact with confirmed COVID-19" and might be estimated to be 80 to 90%.

For each of these individuals, the implications of a "positive" and "negative" result are quantified using Bayes’ Theorem, and discussed. The examples include the use the likelihood-ratio form of Bayes and nomograms.

**Editorial. False Negative Tests for SARS-CoV-2 Infection – Challenges and Implications**
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3592

This article discusses the implications of uncertain test performance within the contextualized rationale for widespread SARS-CoV-2 testing as essential to safely reopen the U.S. They argue that while much attention has been given to test availability, test accuracy may be the larger long-term problem.

Authors provide a solid review of the relationship and influence of the prior probability, test sensitivity, and test specificity on the post-test probability of disease. They connect the quantitative information with the implications for clinical practice and policy. For example, they discuss the consequences of false-positive results, in that they can erroneously label a person infected, with consequences including unnecessary quarantine and contact tracing. They also point out that false-negative results may be even more consequential, because infected persons (including those that are asymptomatic) may not be isolated and can infect others. In addition to recommendations about the research needed to ascertain test performance, they emphasize the need for establishing consensus on thresholds for ruling out infection.

Educators teaching Bayes' Theorem may find the straightforward explanations valuable about the impact of prior probability, test sensitivity, and test specificity on the post-test probability of disease. The use of illustrations and graphics, which include an interactive, are effective to illustrate these relationships and provide quantitative insight.
Editorial. Waiting for Certainty on COVID-19 Antibody Tests — At What Cost?
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3603
This perspective anticipates the availability of serologic antibody testing and considers its potential usefulness in mitigation policy to reduce COVID-19 transmission. For example: Could we screen for serologic antibodies as a proxy for possible immunity and identify people who could return to the workplace with less severe mitigation measures?

The authors acknowledge the uncertainties raised by many policy actors, including the WHO, such as, "Do antibodies confer immunity and, if so, for how long? How accurate is the antibody test? What are the individual and collective harms that may be caused if persons with no actual immunity are certified for return to the workplace? How great is the danger that people desperate to return to work may seek intentional exposure to the virus in the hope of developing antibodies?"

The major point made by the authors is that waiting to “guarantee” the accuracy of serologic antibody testing is unlikely to be a winning strategy. In the context of a pandemic, where options are limited, uncertainties are inevitable, and decisions need to be made, we need to weigh the potential benefits and consequences of using an imperfect test with the costs and consequences of doing nothing.

Tool. COVID-19 Antibody Tests: Calculator for Interpreting Test Results
https://www.bmj.com/content/370/bmj.m3325/infographic
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3660
Antibody testing can determine previous exposure to SARS-CoV-2 virus. This interactive calculator, linked to the article below* on antibody testing for SARS-CoV-2 virus, allows users to vary the prior probability of infection, the sensitivity of SARS-CoV-2 antibody testing, and the specificity of SARS-CoV-2 antibody testing.

Key points made in the article accompanying the interactive include: (1) antibody testing is likely to be most useful 2 weeks after infection, (2) sensitivity and specificity will vary over time and results will need to be contextualized with that in mind, and (3) antibody testing could play a role in patients with late presentation, prolonged symptoms, or negative results from reverse transcription polymerase chain reaction (PCR) tests. The authors acknowledge that there is an evidence gap in terms of whether individuals with SARS-CoV-2 antibodies have protective immunity.

http://dx.doi.org/10.1136/bmj.m3325

Article. Testing for SARS-CoV-2 Antibodies
http://dx.doi.org/10.1136/bmj.m3325
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3661
Antibody testing can determine previous exposure to SARS-CoV-2 virus. Recently, the UK government has made antibody testing available to anyone wanting it, even if there is no clinical indication. The purpose of this article is to provide guidance for when to consider antibody testing in individuals with and without symptoms suggestive of current or past SARS-CoV-2 infection.
Key points made by the authors include: (1) antibody testing is likely to be most useful 2 weeks after infection, (2) sensitivity and specificity will vary over time and results will need to be contextualized with that in mind, (3) antibody testing could play a role in patients with late presentation, prolonged symptoms, or negative results from reverse transcription polymerase chain reaction (PCR) tests. The authors acknowledge that there is an evidence gap in terms of whether individuals with SARS-CoV-2 antibodies have protective immunity.

The article contains useful graphics and a link to an interactive that allows users to vary prior probability of infection, the sensitivity of SARS-CoV-2 antibody testing, and the specificity of SARS-CoV-2 antibody testing.

**Article. Explosion of New Coronavirus Tests That Could Help to End the Pandemic**
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3663
The standard test to detect SARS-CoV-2, the reverse-transcription polymerase chain reaction, or RT-PCR, requires trained personnel, specific chemical supplies and expensive instruments that take hours to provide results and are often available only in labs that provide routine, centralized services. This limits the number of tests that can be done, especially in developing countries. Research groups around the world are now devising tests that go beyond PCR. Dozens of diagnostic methods are in development, all of which detect viral material but in different ways: some are tweaks for RT-PCR that make the test faster or easier to use; others use the gene-editing tool CRISPR to home in on genetic snippets of SARS-CoV-2; and some identify the virus using proteins that sit on its surface.

**Review. Antibody Tests for Identification of Current and Past Infection with SARS-CoV-2**
https://doi.org/10.1002/14651858.CD013652
CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3662
The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus and resulting COVID-19 pandemic present important diagnostic challenges. Several diagnostic strategies are available to identify current infection, rule out infection, identify people in need of care escalation, or to test for past infection and immune response. Serology tests to detect the presence of antibodies to SARS-CoV-2 aim to identify previous SARS-CoV-2 infection, and may help to confirm the presence of current infection.

The objective of this review is to assess the diagnostic accuracy of antibody tests to determine if a person presenting in the community or in primary or secondary care is infected by SARS-CoV-2 or has previously had SARS-CoV-2, and the accuracy of antibody tests for use in seroprevalence surveys.

Pooled results for IgG, IgM, IgA, total antibodies and IgG/IgM all showed low sensitivity during the first week since onset of symptoms (all less than 30.1%), rising in the second week and reaching their highest values in the third week. The combination of IgG/IgM had a sensitivity of 30.1% for 1 to 7 days, 72.2% for 8 to 14 days, 91.4% for 15 to 21 days. Estimates of accuracy beyond three weeks are based on smaller sample sizes and fewer studies. Summary specificities exceeded 98% for all target antibodies.
Guidelines. Interim Guidance for Antigen Testing for SARS-CoV-2


CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3687

U.S. Food and Drug Administration (FDA) has granted emergency use authorization for antigen tests that can identify SARS-CoV-2. Antigen tests are immunoassays that detect the presence of a specific viral antigen, which implies current viral infection. They are currently authorized to be performed on nasopharyngeal or nasal swab specimens.

Antigen tests are relatively inexpensive, and most can be used at the point of care. Most of the currently authorized tests return results in approximately 15 minutes. Antigen tests for SARS-CoV-2 are generally less sensitive than real-time reverse transcription polymerase chain reaction (RT-PCR) and other nucleic acid amplification tests (NAATs) for detecting the presence of viral nucleic acid.

This interim guidance is intended for clinicians who order antigen tests, receive antigen test results, and perform point-of-care testing. The purpose of this interim technical guidance is to support effective clinical use of antigen tests for different testing situations.

Review. Performance Characteristics of 5 Immunoassays for SARS-CoV-2


CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3688

SARS-CoV-2 antibodies typically start to appear at least 5–7 days post infection and are therefore an unreliable marker for early acute infection. The degree and duration of immunity that antibodies confer are unclear. A prominent use for serological testing has therefore been at a population level, for informing the extent of population exposure.

Immuoassays used for SARS-CoV-2 testing detect either specific types of antibody (eg, IgM or IgG) or total antibody. To date, few thorough, direct assessments of immunoassay performance on large sample sets have been done. In this study, a head-to-head assessment of five immunoassays was done. The study found that four commercial, widely available assays and a scalable 384-well ELISA can be used for SARS-CoV-2 serological testing to achieve sensitivity and specificity of at least 98%.

Adapted from publication abstract.

Review. Rapid, Point-of-Care Tests for Diagnosis of SARS-CoV-2 Infection


https://doi.org/10.1002/14651858.CD013705

CHDS repository link: https://repository.chds.hsph.harvard.edu/repository/3689

Several diagnostic strategies are available to identify or rule out current infection with SARS-CoV-2, identify people in need of care escalation, or to test for past infection and immune response. Point-of-care antigen and molecular tests to detect current SARS-CoV-2 infection have the potential to allow earlier detection and isolation of confirmed cases compared to laboratory-based diagnostic methods, with the aim of reducing household and community transmission.
This study sought to assess the diagnostic accuracy of point-of-care antigen and molecular-based tests to determine if a person presenting in the community or in primary or secondary care has current SARS-CoV-2 infection.

For antigen tests, sensitivity varied considerably across studies: the average sensitivity was 56.2% and average specificity was 99.5% based on 8 evaluations in 5 studies on 943 samples. For rapid molecular assays, sensitivity showed less variation compared to antigen tests, and average sensitivity was 95.2% and specificity 98.9% based on 13 evaluations in 11 studies on 2255 samples.