



## ANBI 139

Evolution of Human Disease

### Lecture 14: Cultural Attitudes towards Disease



Pascal Gagneux

February 28, 2023

Siechehuus (Leper House) on the outskirts of Basel, Switzerland

### Compassion for fellow humans?

2 million year ago in Georgia



*Homo erectus* first appears outside Africa 2 million years ago.

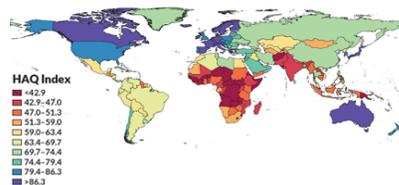
Among the 5 famous skulls discovered in Dmanisi, Georgia, one belonged to an aged individual who was practically toothless, yet clearly survived for many years, indicating that others helped in chewing and preparing food.

**Practice Question:** What kind of evidence do we have that our distant ancestors cared for the old?

**Answer:** Fossils from 2 million years ago that indicate that old individuals having lost all their teeth lived on for many years.

### Health Care Globally: Access and Quality

2015

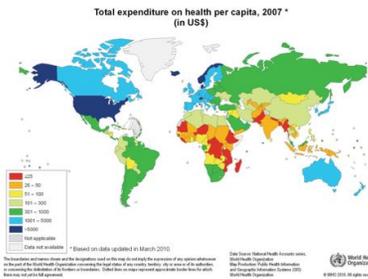


HEALTH CARE PALETTE Countries shaded with cooler hues had better health care quality and accessibility in 2015 than those with hotter colors. Researchers created the Healthcare Access and Quality Index to assess each country's status.

R. BARBER et al. / THE LANCET 2017

Modern Health Care symbolizes the willingness of societies to care for the sick and injured. Access and quality vary greatly among societies and reflect moral priorities and overall resources.

## Cost of Health Care Globally: Cost is not Quality!



Cost can be disproportionate to quality, the USA having extremely expensive systems.

**Practice Question:** The USA has the highest expenditure on healthcare per person, does it this also hold for quality and access to health care?

**Answer:** No, the US are way behind Canada and Western Europe.

## Biomedicine and Healing Arts

Evidence-based?

Value of trust, community, and human contact?

Economic opportunities \$

The YIN  
The YANG  
and mostly  
The YEN/YUAN

Attempts at healing others are likely as old as our species if not even older. In the last 150 years, western biomedicine has become the dominant system. Many traditional and alternative systems co-exist. Standards for evidence vary greatly. Age old use of natural compounds from plants and animals have provided many of the chemical compounds now further developed by modern pharmaceutical industry. What traditional and alternative systems lack in modern scientific evidence, these often make up for with human charisma of the practitioners, dedication of time to the patient and sense of community.

Practices like homeopathy lack any scientific evidence for their efficacy but also represent huge economic markets.....

**Global cost of healthcare industry's worth around 10 trillion USD.**

## Leprosy

Leprosy, also known as Hansen's disease (HD), is a long-term infection by the bacteria *Mycobacterium leprae* or *Mycobacterium lepromatosis*.

Leprosy is curable with antibiotics, but thrives due to poverty and taboos.



This bacterial infection has long stigmatized patients that develop the disease.

Most infected humans never develop symptoms. What determines that individuals get symptoms is still not understood. the bacteria attack nerve cells at extremities, where the temperature of tissues is slightly cooler. Leprosy can lead to blindness and paralysis but is mostly non-fatal. Transmission is by droplets in air.

**Practice Question:** If leprosy is curable by antibiotics treatment, why are there still large numbers of persons suffering from Hansen's disease?

**Answer:** Social taboos cause leprosy sufferers to be shunned and poverty prevents access to antibiotics.

## Leprosy

Leprosy, also known as Hansen's disease (HD), is a long-term infection by the bacteria *Mycobacterium leprae* or *Mycobacterium lepromatosis*



In the middle ages, European cities would exclude lepers and sufferers were forced to announce themselves with bells or wooden ratchets.

## Leprosy

Nine banded armadillo



The nine banded armadillos, one of the few mammals that invaded the southern part of North America after South and North America joined ~ 3 million years ago is one of the feral non-human mammals that carries leprosy. Female nine banded armadillos generally give birth to four genetically identical offspring (polyembryony).

## Tuberculosis (TB)

Tuberculosis is caused by *Mycobacterium tuberculosis*

the "white plague" or consumption

The most common cause of TB stigma is the perceived risk of transmission from TB-infected individuals to susceptible community members. Depending on geographic region, however, TB is also stigmatized because of its associations with HIV, poverty, low social class, malnutrition, or disreputable behavior.



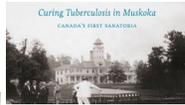
When diseases are stigmatized, the fear of the social and economic consequences following diagnosis can make individuals reluctant to seek and complete medical care. The structure of a community's beliefs and norms about a disease and the resulting stigma can, therefore, substantially impact health.

**Practice question:** It is estimated that ~ 30% of humans are infected by *Mycobacterium tuberculosis*, yet far fewer ever develop symptoms of TB. What does that say about TB pathogenesis?

**Answer:** Host factors, such as genetics of immunity must be a big part of the equation.

## Tuberculosis (TB)

Tuberculosis is caused by *Mycobacterium tuberculosis*  
the "white plague" or consumption



## The Black Death: Trade, Plague and flagellants

14th century ravage of Europe



Sanatoria were built in many mountain resorts of Europe and North America to treat patients suffering from TB. Mountain air was beneficial to TB patients with symptoms.

The Black Death, (bubonic plague) caused by the bacterium *Yersinia pestis* swept through Europe multiple times starting in the 14th century. It killed around 30% of Europe's population, destabilized governments and the Church, contributing to the reformation and the birth of many new Christian denominations. The flagellants were groups of 200 to 300 people who went from town to town whipping themselves to do penance for their sins. They did not bathe and probably contributed to the spread of the plague.

Jews across Europe were blamed for the pestilence and thousands of them were massacred, the plague continued. Pope Clement VI eventually banned the flagellants and appealed to people to stop killing Jews.

**Practice question:** How could flagellants, an order of fanatic Christians have contributed to the spread of the plague in Europe?

**Answer:** These people did not bathe and wandered from city to city, whipping themselves in public places to appease God's wrath.....

They must have been walking "flea bags" and with fleas came the plague.

## 1349 Basel, Switzerland



Blame: Jewish communities massacred across Europe



1356: Massive Earthquake hit the same city (painting Ernst Stuckelberg)

Always eager to blame other for disease: the 14th century plague was no exception: across Europe, Jews were accused of poisoning wells, leading to multiple programs where the entire Jewish population of several cities was murdered. This did not stop the plague and neither did it anti-Jewish prejudices.

## SARS outbreak 2003



Severe acute respiratory syndrome virus outbreak in 2003, links to religious communities. Rapid reaction by the Chinese authorities and temporary changes of religious practices helped control the spread.

## Quarantine



A quarantine is used to separate and restrict the movement of persons; it is a state of enforced isolation

Infected people were separated to prevent spread of disease among the ancient Israelites under the Mosaic Law, as recorded in the Old Testament



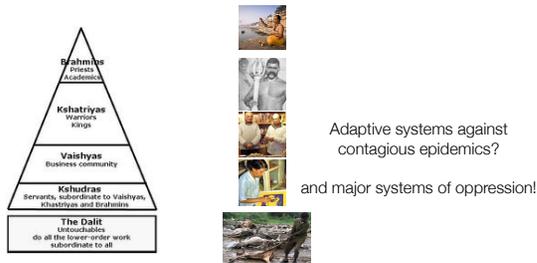
quaranta giorni, meaning 'forty days'. This is due to the 40-day isolation of ships and people before entering the city of Dubrovnik in Croatia 1348.

This was practiced as a measure of disease prevention related to the Black Death. Between 1348 and 1359, the Black Death wiped out an estimated 30% of Europe's population, and a significant percentage of Asia's population.

**Practice question:** What is the origin of the word quarantine?

**Answer:** Forty days in Italian, the time ships were required to anchor off harbors in order to make sure these were not importing disease.

### Hindu Cast System: Four Varnas



The cast system in India goes back to the arrival of pastoralist Aryans from Mesopotamia. These new arrivals established a stratified social system and kept the darker skinned local populations (all Dravidian hunter gatherers) in lower castes. The people dealing with “impure” tasks such as emptying latrines and removing corpses were deemed “untouchable”. Such a system might serve to contain infectious disease in times prior to antibiotics.

**Practice question:** As unfair as cast systems are, how could these social systems have helped diminish the risk of epidemics in ancient cities?

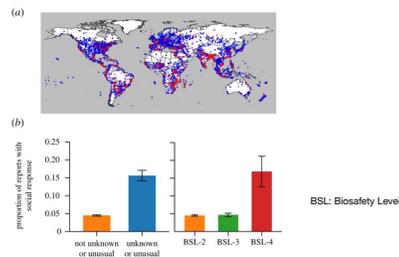
**Answer:** By minimizing contact between people who had high likelihood of infecting themselves by virtue of their occupations (latrine cleaners, tanners, undertakers etc )

### Burakumin 部落民



In Feudal Japan, the Burakumin, were relegated special parts of the cities. These people were treated as outcast based on their occupation, which included butchering and leather tanning and leather work. The social stigma of the neighborhoods survives into modern times.

Social response most frequently occurs when the disease is novel to the region or clinically severe.



Shannon M. Fast et al. *J. R. Soc. Interface* 2015;

Social response most frequently occurs when the disease is novel to the region or clinically severe. (a) The 11 926 disease outbreaks recorded by Ascel Bio between May 2008 and 2009 are shown. The majority of events were not associated with social response (blue); however, there were regional clusters of events with social response (red). (b) If a disease is unusual or atypical in a region or seen as unknown or mysterious to local experts, there is an increased likelihood of social response. Outbreaks of diseases with the highest BSL are likely to have social responses. BSL-4 diseases are severe and fatal, with no available treatments.

**Practice Question:** What aspects of infectious disease prompt the strongest social response?

**Answer:** Diseases that are novel to the region and clinically severe.

## Unusual (rare) phenotypes



Albinos in Africa



Red heads in Europe



Al-Shymaa Kway-Geer, Tanzanian parliament member with albinism

Discrimination against society members with rare or unusual phenotypes include treatment of albinos in subsaharan Africa, Red heads or Gingers in Europe, left handed people in Europe and Asia.

Practice question:

**Practice question:** Name two rare human phenotypes that have been historically strongly discriminated against:

**Answer:** albinos and red hairs.

## The need for blame

Magical thinking, witchcraft



Litigation



RICHARD GAGE  
& ASSOCIATES  
Top Vaccine Injury Attorney  
in the entire United States  
Serving Clients Nation-Wide

Often disease is blamed on third parties. Both witch doctors and lawyers can make an easy living out of these tendencies.

**Practice question:** What are the parallels of witchcraft and litigation lawyers in the context of disease?

**Answer:** Both can make a living out of the urge to blame someone for the loss of a loved one.

## Blame continued:

Bruno Bettelheim and "Refrigerator Mothers"

Fraudulent child  
psychologist at  
U. of Chicago



In the middle of the 20th century, psychologists tried to blame autism on the lack of emotional warmth of mothers.

**Practice question:** What was the infamous mid 1900s theory for explaining autism?

**Answer:** "Refrigerator mother" emotionally distant

## HIV/AIDS

### Blaming the victim:

Gay Plague  
Disease of Sex workers

### Denial:

Syndrome Inventé pour  
Décourager les Amoureux (SIDA)

### Blaming the CIA:

KGB operation



In 1992, Director of Foreign Intelligence Service (SVR) Yevgeny Primakov admitted that the KGB was behind the Soviet newspaper articles claiming that AIDS was created by the US government: operation INFEKTION.

Victims of disease are another easy target.

Fear of terrible disease has been “weaponized” in propaganda wars such as the soviet operation INFEKTION.

## Blame the others: case study Syphilis

The appearance of syphilis in 15th century Renaissance Europe became a classic example of passing the blame. Syphilis was christened the 'French disease' by the British, but the French held the Italians responsible. They returned the compliment. The Dutch blamed the Spanish, while the Russians blamed the Poles. In Japan the Portuguese were at fault, whereas the Turks simply called it the Christian disease. And when in 1769 Captain Cook observed the disease on Tahiti, it was known to all islanders as the British disease.



It is always the “other”

## Indian Plague / Navajo Flu (Sin Nombre virus) 1993



2009 H1N1: Mexican Flu, Veracruz Flu etc....  
Wuhan virus, Kungflu, China virus.....

Recent outbreaks that were almost named after “outsiders” or geography

By this logic, HIV should be called the Los Angeles virus, after the first place where it was diagnosed.

## Mental Disease

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Possibly the most taboo of all diseases.



## Disability or Other Ability?

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The Price of 'Disability Denial'  
Catherine Kudlick

Is deafness simply “other abled” or is it a disability?

## Patient Advocacy

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Little people of America is a powerful lobbying group for research and medical access. The people affected have self-organized and contribute to deciding new developments of therapies and other important developments.

**Practice question:** Name a genetic condition that is well represented by a patient advocacy group:

**Answer:** Achondroplastic dwarfism by Little People of America





## US Navy: Molecular Surveillance

NAVY MEDICINE  
ABOUT YOUR HEALTH CARE EFFORTS CAREERS PRESS ROOM

Journal of Clinical Microbiology, Nov. 2010, p. 4238-4244  
DOI:10.1128/JCM.01810-10  
Copyright © 2010, American Society for Microbiology. All Rights Reserved.

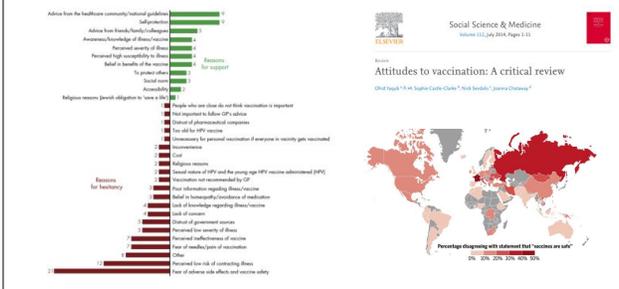
Vol. 48, No. 11

**Initial Identification and Characterization of an Emerging Zoonotic Influenza Virus Prior to Pandemic Spread<sup>1</sup>**  
David Metzgar,<sup>1\*</sup> Darin Baynes,<sup>1†</sup> Christopher A. Myers, Peter Kammerer, Michelle Unwin, Dennis J. Fair, and Francis J. Blatt  
Department of Respiratory Disease Research, Naval Health Research Center, San Diego, California  
Received 20 June 2010/Returned for modification 10 August 2010/Accepted 10 September 2010

The H1N1 swine Flu virus was initially characterized right here in San Diego by US Navy Medical Researchers.  
Active molecular surveillance is tantamount for a fleet with boats carrying large number of service personnel.

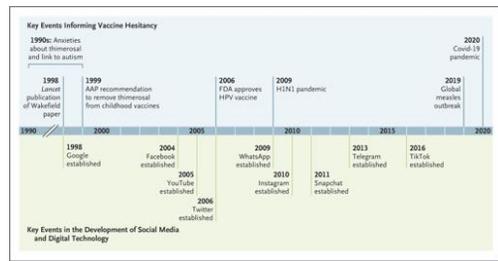
David Metzgar and Antonella Zampoli  
Run Total Raptor experience  
<https://www.totalraptorexperience.com/book-online>

## Public: attitudes towards Immunizations



Mixed reasons for both positive and negative attitudes towards immunization

## Public: attitudes towards Immunizations



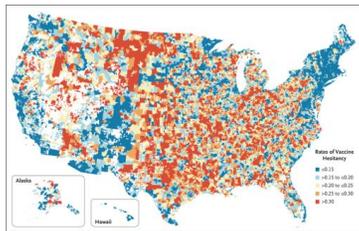
Larson, H.J.; Gakidou, E.; Murray, C.J.L. The Vaccine-Hesitant Moment. *N. Engl. J. Med.* 2022, 387, 58-65

Timeline of Key Events Prompting Vaccine Hesitancy and Milestones in the Expansion of Social Media and Digital Technology.

Vaccine hesitancy as a state of indecision and uncertainty that precedes a decision to become (or not become) vaccinated. Vaccine hesitancy is an attitude or sentiment, whereas vaccination is an action, which is measured to determine vaccine coverage. The period of hesitancy and indecision is a time of vulnerability, as well as opportunity. Sentiments concerning whether to undergo vaccination can change, and change again, as evidenced in multiple surveys showing that Covid-19 vaccine sentiments are influenced by factors such as a new report of vaccine risks or perceptions of increasing or decreasing disease threats.

## Public confidence crisis!

The lack of public confidence in vaccines risks undermining the political will necessary to rapidly respond to a more severe pandemic in the future!



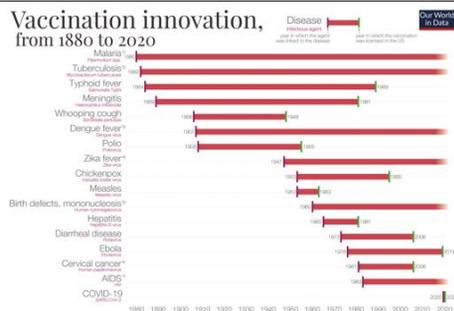
Larson, H.J.; Gakidou, E.; Murray, C.J.L. The Vaccine-Hesitant Moment. *N. Engl. J. Med.* 2022, 387, 58-65

Rates of Vaccine Hesitancy across U.S. ZIP Codes, December 2021.

The data are based on responses to the U.S. Covid-19 Trends and Impacts Survey.

Salomon JA, Reinhart A, Bilinski A, et al. The US COVID-19 Trends and Impact Survey: continuous real-time measurement of COVID-19 symptoms, risks, protective behaviors, testing, and vaccination. *Proc Natl Acad Sci U S A* 2021;118(51)

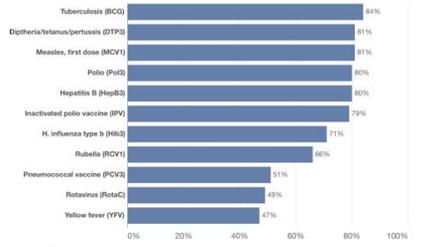
## Vaccination innovation, from 1880 to 2020



© 2021 Our World in Data. All rights reserved. This work is licensed under a Creative Commons Attribution 4.0 International License. For more information, see our website: [ourworldindata.org](https://ourworldindata.org).  
 1. The data for this chart is based on the following sources: <https://ourworldindata.org/vaccine-innovation>.  
 2. The data for this chart is based on the following sources: <https://ourworldindata.org/vaccine-innovation>.  
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 5. The data for this chart is based on the following sources: <https://ourworldindata.org/vaccine-innovation>.

### Vaccination coverage, World, 2021

Share of one-year-olds who have been immunized against a disease or a pathogen.

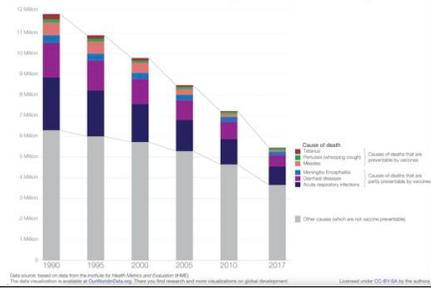


Source: WHO, UNICEF (2022)

OurWorldInData.org/vaccination - CC BY

### Global number of child deaths per year – by cause of death

Shows the number of children younger than 5 years who died in a year. The length of the bar shows the total number of deaths with colored sections showing the number of children who died of diseases that are wholly or partially preventable by vaccines. The number of child deaths for which there are vaccines available declined from 5.5 million deaths in 1990 to 1.8 million deaths in 2017.

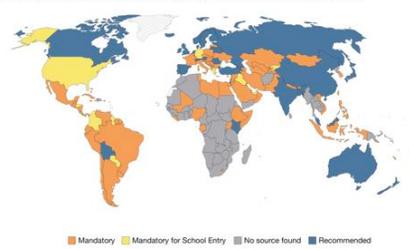


Data source: Based on data from the Institute for Health Metrics and Evaluation (IHME). The data visualization is a product of OurWorldInData.org. Thank you for research and model visualizations on global development.

Licensed under CC-BY 4.0 by the author.

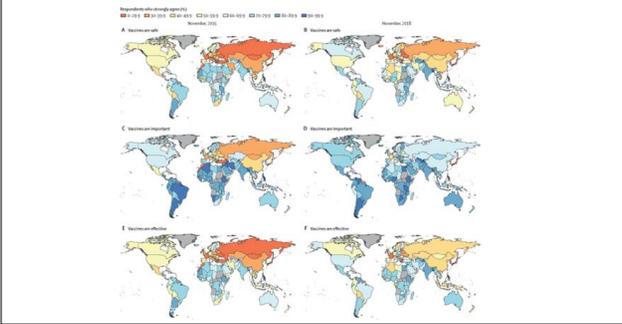
### Which countries have mandatory childhood vaccination policies?

Countries are mapped based on having requirements or recommendations for at least one vaccine in 2019.



Source: Vanderhoff & Marks (2021). Charting mandatory childhood vaccination policies worldwide. Vaccine. Note: Policies can vary at the state level in some countries. OurWorldInData.org/vaccination - CC BY

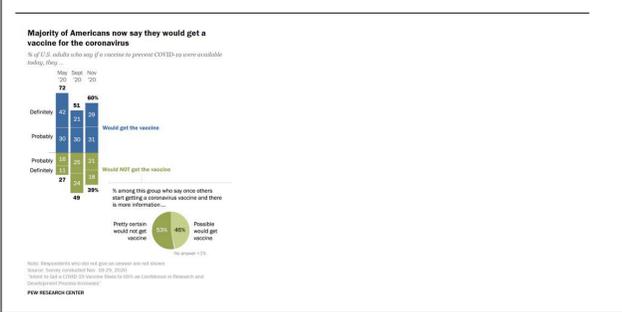
Global trends in perceptions towards the safety of vaccines in November, 2015, and November, 2018



Global trends in perceptions towards the safety of vaccines in November, 2015, and November, 2018

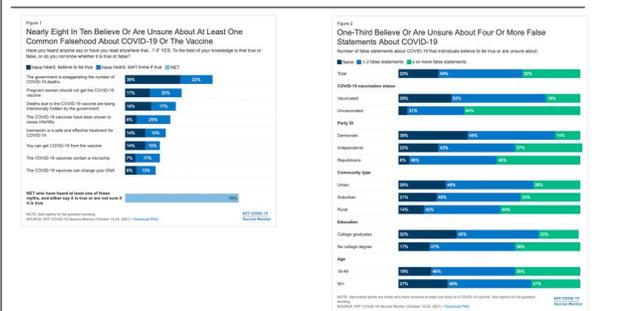
Figure shows model-based estimates of the percentage of respondents strongly agreeing that vaccines are safe (panels A, B), important for children to have (panels C, D), and effective (panels E, F) in November, 2015, and November, 2018. No data were available for countries in grey.

Public: attitudes towards Immunizations



Mixed reasons for both positive and negative attitudes towards immunization

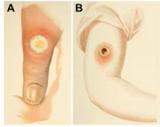
Public: attitudes towards Immunizations



Mixed reasons for both positive and negative attitudes towards immunization

## Hundred of millions of lives saved just by small pox vaccine

Cow pox and Horse pox viruses used to immunize humans long (>100 years) before viruses were even discovered!! Due to cross-immunity to related Orthopoxviruses.



In 1796, the British country doctor Edward Jenner decided to test the hypothesis that previous contact with a disease of cattle known as cowpox would prevent the development of smallpox.

Esparza et al. *PLoS Pathogens* 2018

## Ebola: massive impact of social response!

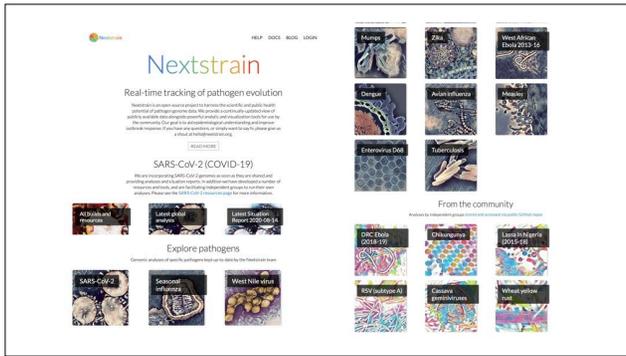


Highly contagious infections with devastating consequences and no cure can drive mass panic. Patient who survive such terrible infections can find themselves shunned even after they have recovered.

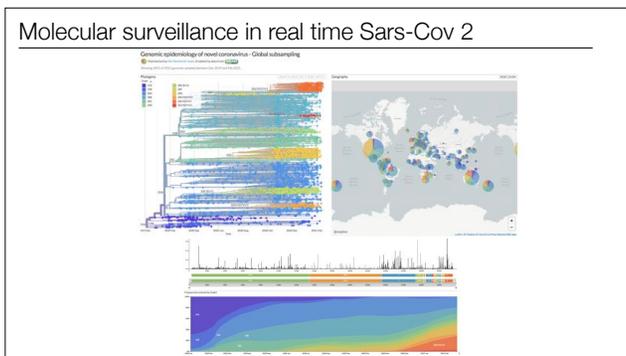
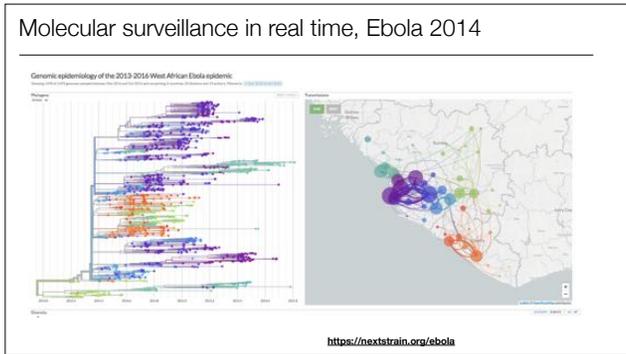
## Ebola: massive impact of social response!



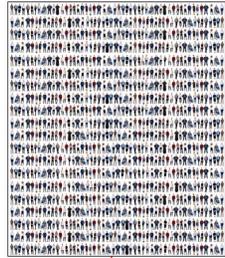
Many of the survivors are recruited to help with care of patients, which they can do at minimal risk, given that they have protective antibodies and T-cell responses.



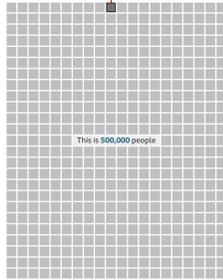
Very important international resource.



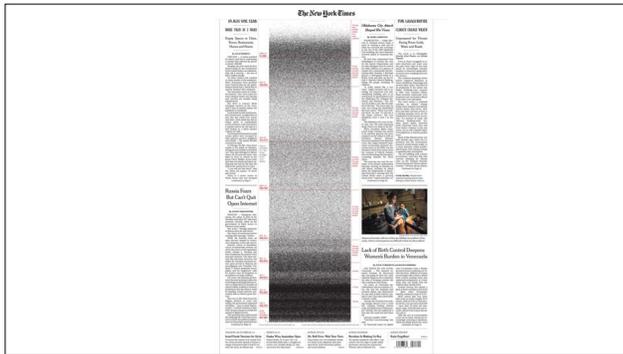
## Grim Covid 19 Milestone: 500,000 dead in the USA!



Imagine each of these squares is 1,000 people



The USA has just reached half a million Covid 19 deaths, more than any country on earth.



CORONAVIRUS CHRONICLES MARCH 11, 2021 ISSUE

### WHY DOES THE PANDEMIC SEEM TO BE HITTING SOME COUNTRIES HARDER THAN OTHERS?

*While the virus has ravaged rich nations, reported death rates in poorer ones remain relatively low. What probing, epidemiological mystery can tell us about global health.*

By Siddhartha Mukherjee  
February 22, 2021

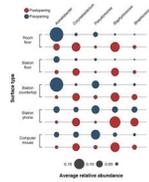


## Health Care and Nosocomial Infections



### Study in new Chicago hospital opened in 2013

Metagenomic analyses revealed that genes conferring antimicrobial resistance were consistently more abundant on room surfaces than on the skin of the patients inhabiting those rooms. In addition, persistent unique genotypes of *Staphylococcus* and *Propionibacterium* were identified.



Lax et al. *Science Translational Medicine* 24 May 2017

Modern Hospitals get rapidly colonized by numerous microbes. Most US hospitals have their own resident TB bacteria and also house multiple drug resistant bacteria. A yearlong survey of the bacterial diversity associated with the patients, staff, and surfaces of the newly constructed Center for Care and Discovery (University of Chicago), an inpatient hospital for medical and surgical patients. Sampling began 2 months before the hospital opening on 23 February 2013 and continued for a year thereafter. We collected 6523 microbial samples from multiple sites.

**Practice question:** What is a nosocomial infection?

**Answer:** Hospital acquired infection.

## Summary

Human societies have a variety of attitudes towards individuals suffering from different diseases.

Attitudes range from exclusion and ostracism to profound compassion and care.

Toothless skull of *H. erectus* 2 million years ago in Dmanisi is evidence for how far back caring for the elderly goes.

Social taboos generally help the disease, especially where these are infectious, e.g. leprosy, TB, HIV/AIDS, STIs.

Social systems may have been shaped by the threat of infectious disease: outcasts, untouchables, burakumin.

Cultural practices can be very harmful via spread of disease.

The need for explanations often leads to blaming, the victim, other groups, or the involvement of witchcraft (the governments, or big Pharma).

Our best tools against infectious diseases (immunizations) are being jeopardized by lack of trust, conspiracy theories and political exploitation of these.

