Simple, preventable diarrhea and cholera are still killing people around the world, more than COVID-19 does, let’s stop this!

Claudio Valsangiacomo

SUPSI – University of Applied Sciences and Arts of Southern Switzerland, claudio.valsangiacomo@supsi.ch
Opinions expressed in this lecture, particularly those related to the covid-pandemic, do not represent any official position and are purely subjective ideas of the lecturer.
Critical perspective of public health numbers in terms of

history of pandemics

and

impact of diarrheal diseases
Mummy of Pharaoh Ramesses V (ca. 1196 to 1145 BCE), showing smallpox lesions, e.g., on the bridge of his nose
History of pandemics

(source https://www.visualcapitalist.com/history-of-pandemics-deadliest/)
Death toll

Antonine Plague 165–180 5M
Plague of Justinian 541-542 30-50M
Japanese Smallpox Epidemic 735-737 1M
Black Death (Bubonic Plague) 1347-1351 200M

Throughout the 17th and 18th centuries, a series of "Great Plagues" routinely ravaged cities across Europe.

Smallpox 1520

17th Century Great Plagues 1600 3M
DEATH TOLL
[HIGHEST TO LOWEST]

200M
Black Death (Bubonic Plague)
1347-1351

The plague originated in rats and spread to humans via infected fleas.

56M
Smallpox
1520

The outbreak wiped out 30-50% of Europe’s population. It took more than 200 years for the continent’s population to recover.

40-50M
Spanish Flu
1918-1919

Smallpox killed an estimated 90% of Native Americans. In Europe during the 1800s, an estimated 400,000 people were being killed by smallpox annually. The first ever vaccine was created to ward off smallpox.

30-50M
Plague of Justinian
541-542

The death toll of this plague is still under debate as new evidence is uncovered, but many think it may have helped hasten the fall of the Roman Empire.
DEATH TOLL
[HIGHEST TO LOWEST]

- **25-35M**
  - HIV/AIDS
  - 1981-PRESENT

- **12M**
  - The Third Plague
  - 1855

- **5M**
  - Antonine Plague
  - 165-180

- **3M**
  - 17th Century Great Plagues
  - 1600

- **2.5M***
  - COVID-19
  - 2019-9.24AM PT, FEB 24, 2021
  - [ONGOING]

- **1.1M**
  - Asian Flu
  - 1957-1958

- **1M**
  - Russian Flu
  - 1889-1890

- **1M**
  - Hong Kong Flu
  - 1968-1970

- **1M**
  - Cholera 6 outbreak
  - 1817-1923

- **1M**
  - Japanese Smallpox Epidemic
  - 735-737

- **600K**
  - 18th Century Great Plagues
  - 1700

- **200K**
  - Swine Flu
  - 2009-2010

- **100-150K**
  - Yellow Fever
  - LATE 1800s

- **11.3K**
  - Ebola
  - 2014-2016

- **850**
  - MERS
  - 2012-PRESENT

- **770**
  - SARS
  - 2002-2003

*Johns Hopkins University estimates
<table>
<thead>
<tr>
<th>Name</th>
<th>Time period</th>
<th>Type / Pre-human host</th>
<th>Death toll</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antonine Plague</td>
<td>165-180</td>
<td>Believed to be either smallpox or measles</td>
<td>5M</td>
</tr>
<tr>
<td>Japanese smallpox epidemic</td>
<td>735-737</td>
<td>Variola major virus</td>
<td>1M</td>
</tr>
<tr>
<td>Plague of Justinian</td>
<td>541-542</td>
<td>Yersinia pestis bacteria / Rats, fleas</td>
<td>30-50M</td>
</tr>
<tr>
<td>Black Death</td>
<td>1347-1351</td>
<td>Yersinia pestis bacteria / Rats, fleas</td>
<td>200M</td>
</tr>
<tr>
<td>New World Smallpox Outbreak</td>
<td>1520 – onwards</td>
<td>Variola major virus</td>
<td>56M</td>
</tr>
<tr>
<td>Great Plague of London</td>
<td>1665</td>
<td>Yersinia pestis bacteria / Rats, fleas</td>
<td>100,000</td>
</tr>
<tr>
<td>Italian plague</td>
<td>1629-1631</td>
<td>Yersinia pestis bacteria / Rats, fleas</td>
<td>1M</td>
</tr>
<tr>
<td>Cholera Pandemics 1-6</td>
<td>1817-1923</td>
<td>V. cholerae bacteria</td>
<td>1M+</td>
</tr>
<tr>
<td>Third Plague</td>
<td>1885</td>
<td>Yersinia pestis bacteria / Rats, fleas</td>
<td>12M (China and India)</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>Late 1800s</td>
<td>Virus / Mosquitoes</td>
<td>100,000-150,000 (U.S.)</td>
</tr>
<tr>
<td>Russian Flu</td>
<td>1889-1890</td>
<td>Believed to be H2N2 (avian)</td>
<td>1M</td>
</tr>
<tr>
<td>Name</td>
<td>Time period</td>
<td>Type / Pre-human host</td>
<td>Death toll</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Spanish Flu</td>
<td>1918-1919</td>
<td>H1N1 virus / Pigs</td>
<td>40-50M</td>
</tr>
<tr>
<td>Asian Flu</td>
<td>1957-1958</td>
<td>H2N2 virus</td>
<td>1.1M</td>
</tr>
<tr>
<td>Hong Kong Flu</td>
<td>1968-1970</td>
<td>H3N2 virus</td>
<td>1M</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>1981-present</td>
<td>Virus / Chimpanzees</td>
<td>25-35M</td>
</tr>
<tr>
<td>Swine Flu</td>
<td>2009-2010</td>
<td>H1N1 virus / Pigs</td>
<td>200,000</td>
</tr>
<tr>
<td>SARS</td>
<td>2002-2003</td>
<td>Coronavirus / Bats, Civets</td>
<td>770</td>
</tr>
<tr>
<td>Ebola</td>
<td>2014-2016</td>
<td>Ebolavirus / Wild animals</td>
<td>11,000</td>
</tr>
<tr>
<td>MERS</td>
<td>2015-Present</td>
<td>Coronavirus / Bats, camels</td>
<td>850</td>
</tr>
<tr>
<td>COVID-19</td>
<td>2019-Present</td>
<td>Coronavirus – Unknown (possibly pangolins)</td>
<td>2.2M (Johns Hopkins University estimate as of Feb 1, 2021)</td>
</tr>
</tbody>
</table>

*Note: Many of the death toll numbers listed above are best estimates based on available research. Some, such as the Plague of Justinian and Swine Flu, are subject to debate based on new evidence.*
Exercise:
Let’s compare two pandemics: the Spanish Flu of 1918 to the ongoing Covid pandemic
**FLU**

**Symptoms:** Begin 1-4 days after exposure

**Cause:** Influenza virus (there are many strains)

**Complications:** Less likely to occur because of immunity built up over time

**Prevention:** Flu shot

---

**COVID-19**

**Symptoms:** Begin 1-14 days after exposure

**Cause:** SARS-CoV-2 virus

**Complications:** Severe respiratory complications may come on extremely quickly

**Prevention:** Self-isolation

---

*verywell*
Target population for Spanish flu and Covid

Spanish Flu 1918 | Covid 2019
Distribution of deaths due to the Covid-19 by age group (Poland in 2020)
Distribution of deaths due to the Spanish flu of 1918

Source: Wellcome Library
Diarrhoeal disease

2 May 2017

Key facts

- Diarrhoeal disease is the second leading cause of death in children under five years old. It is both preventable and treatable.
- Each year diarrhoea kills around 525,000 children under five.
- A significant proportion of diarrhoeal disease can be prevented through safe drinking-water and adequate sanitation and hygiene.
- Globally, there are nearly 1.7 billion cases of childhood diarrhoeal disease every year.
- Diarrhoea is a leading cause of malnutrition in children under five years old.
Causes of deaths in children under 5 years 
(over 8 million/year)

- Newborns 41%
- Children 59%

- Preterm 12%
- Asphyxia 9%
- Sepsis 6%
- Other neonatal 5%
- Pneumonia, neonatal 4%
- Congenital 3%
- Tetanus 1%
- Diarrhoea, neonatal 1%
- AIDS 2%
- Pertussis 2%
- Meningitis 2%
- Measles 1%
- Other infections 9%
- Malaria 8%
- Noncommunicable diseases 4%
- Injury 3%
- Diarrhoea 14%
- Pneumonia 14%
In the WHO European Region diarrhoeal diseases cause an estimated
14 deaths per day due to inadequate

**WaSH**
**WATER** **SANITATION** **HYGIENE**

Diarrhoeal diseases can be prevented through:

- safely managed drinking-water
- adequate sanitation and safely managed wastewater disposal
- good handwashing practices.

04/2016
• Diarrhea disease is the second leading cause of death in children under five years old, and is responsible for killing over half a million children every year.
• Diarrhea can last several days, and can leave the body without the water and salts that are necessary for survival. In the past, for most people, severe dehydration and fluid loss were the main causes of diarrhea deaths.
• Now, other causes such as septic bacterial infections are likely to account for an increasing proportion of all diarrhea-associated deaths. Children who are malnourished or have impaired immunity as well as people living with HIV are most at risk of life-threatening diarrhoea.
Death rate from diarrheal disease in children vs. GDP per capita, 2017

The annual number of deaths from diarrheal diseases in children under 5 per 100,000 individuals. Gross domestic product (GDP) per capita is measured in 2011 international $. 

Select countries  Average annual change  Hide countries < 1 million people

Africa  Asia  Europe  North America  Oceania  South America  No data

Death rates
Diarrheal diseases death rates
GDP per capita
$20,000  $40,000  $60,000  $80,000  $100,000
Child mortality rate, 2017
The share of newborns who die before reaching the age of five.
Deaths globally by age

56 Million people died in 2017. Shown here is at what age each person died.
Child mortality in 1800, 1950 and 2015

The share of children (born alive) who died before reaching their 5th birthday.

Child mortality in 1800

in the borders of 2015

- Historical estimates suggest that up to at least the year 1800 more than one-third (usually closer to half) of children died before reaching their 5th birthday.
- These historical estimates come with substantial uncertainty.

Our World in Data

SSPH+ ETH Zürich
Child mortality in 1950 in the borders of 2015
Child mortality in 2015

**Introductory text**

With great apprehension, the world is now watching the birth of a novel pandemic already causing tremendous suffering, death, and disruption of normal life. Uncertainty and dread are exacerbated by the belief that what we are experiencing is new and mysterious. However, deadly pandemics and disease emergences are not new phenomena: they have been challenging human existence throughout recorded history. Some have killed sizeable percentages of humanity, but humans have always searched for, and often found, ways of mitigating their deadly effects. We here review the ancient and modern histories of such diseases, discuss factors associated with their emergences, and attempt to identify lessons that will help us meet the current challenge.

Historical comparison and comparison with other death causes (for example diarrhea or cholera) is important and mandatory for correct understanding of this public health issue.

Around 12,000 years ago, small family/clan groups of humans abandoned nomadic hunting and gathering to settle down in stable locations, cultivating crops and raising domestic animals for food, labor, and clothing (the Neolithic revolution). For the first time, humans and newly domesticated animals were living together in complicated ecosystems of villages, towns, cities, and pasturages. Under conditions of intense human-animal proximity and environmental alterations, enzootic and zoonotic diseases appeared. The agents of measles, smallpox, plague tuberculosis, and many other pandemic diseases evolved from animal pathogens that switched hosts to become human infectious agents. As human populations continued to expand, these agents were able to initiate epidemics and pandemics.

The preserved mummy of Pharaoh Ramesses V clearly shows smallpox lesions, indicating that fatal smallpox epidemics prevailed more than 3,000 years ago. At some point, smallpox spread pandemically over most of the world, sparing the Western Hemisphere for millennia, up to the 16th century, when the first known epidemic occurred there in 1520. Until its eradication was declared in 1980, smallpox killed untold millions over at least 3 millennia.

Heralding the end of Greece’s Golden Age, the explosive “plague of Athens” (430 to 425 BCE) was perhaps the first recorded pandemic: it spread over much of the world known to the Greeks, including the Mediterranean and northern Africa.
Suggested discussion questions

1) In terms of Public Health relevance, how could we rank the ongoing Covid-Pandemic among other ongoing epidemics such as AIDS, Tuberculosis, Cholera, Diarrhea?

2) Let’s compare the Spanish flu of 1918 with the ongoing Covid Pandemic, differences? Similarities?