Public Health Priorities:
The Importance of Public Health (part 1) [excerpt]

COVID-19 has focused attention on global public health organizations such as the World Health Organization (WHO). What exactly is public health? What do public health organizations usually focus on? What are their capabilities during an infectious disease emergency?

Part 1 of this series focuses on why public health is important. **Part 2** looks at the funding for disease control organizations such as the WHO and the European Center for Disease Prevention and Control (ECDC) as well as how to make policy decisions about health programs. **Part 3** goes more in depth into the budget of the US Centers for Disease Control and Prevention (US CDC) as an example of historical and current budget priorities.

What is Public Health?

Public health is the concept of improving infrastructure for a common good. Infrastructure may be regulatory (seatbelts, occupational health agencies) or physical (sewer systems, health clinics, bed nets). Society has a self-interest in improving public health because illnesses spread (HIV, the flu), some diseases affect all populations relatively equally (Alzheimer's disease), and the societal cost of treating some diseases is so high that preventing and/or mitigating the illness (cancer, rotted teeth) or situation (premature births, drunk driving) is less expensive. Public health initiatives carry the torch forward when a scientific discovery is made, so the knowledge can be used globally.

Public health is also about equity. Everyone benefits from health-oriented rules (no smoking in workplaces), infrastructure (clean water; emerging disease identification and warning systems), and discoveries (vaccines). Although some diseases flourish due to specific conditions—poverty, natural and urban climates, genes – diseases on their own are impartial: everyone can be at risk.

Public health improvements, such as those described in **Figure 1** are responsible for saving millions of lives, improving the quality of life around the world and saving money.

Figure 1: Public health discoveries

John Snow knew contaminated water spread cholera and was able to prove it during an outbreak in London in 1854, when he mapped deaths from cholera and identified a specific water pump as the source of contamination. He also proved a waterworks company pulling water from sewage-filled areas of the Thames River also led to more cholera.
Public health initiatives: Sanitation infrastructure such as sewer systems and clean drinking water.
Yet: The WHO reported 132'000 cases in 2016, in particular in Yemen, Somalia and Tazania.

Louis Pasteur discovered in 1863 how to heat wine sufficiently to prevent bacterial contamination. This knowledge was then transferred to milk.
Public health initiatives: Laws requiring milk be pasteurized.
Yet: In Ethiopia, Somalia and Kenya, some pastoralists drink raw or sour milk, making them more likely to catch tuberculosis if their livestock have TB.

Tu Youyou identified the ancient traditional Chinese use of a plant called sweet wormwood to fight fevers, a symptom of malaria; she and her team extracted a substance, artemisinin, which is used today to fight malaria. She and colleagues won the Nobel Prize in the category "Physiology or Medicine" in 2015.
Public health initiative: The WHO recommends artemisinin-based combination therapy for malaria.
Yet: The WHO estimates there were 228 million cases of malaria and 405,000 deaths in 2018, due to lack of insecticide-treated nets and sufficient medical care.

Brief history of public health

Public health is intertwined with modern scientific research in the past few hundred years on how diseases spread and develop. Rather than being a moral failing, the result of bad humors or divine punishment, illness became recognized as having a natural origin that could be identified by microscope and treated by scientific observation.

The movement to manage diseases in Europe and the U.S. slowly grew. In 1848 the British Public Health Act established a General Board of Health to act as a central authority on sanitation and disease while in Germany a national physicians association (Deutsche Ärztevereinsbund) was founded in 1873 with goals including humane, scientific and sanitary considerations.[1] In the New York City, Lillian Wald created the term "public health nurse" in 1893 to reflect the integration of health care and the community. In addition to treating patients at home, Wald and her fellow nurses educated impoverished tenement residents on basic hygiene, sanitation, and nutrition; lobbied for improved housing conditions, public-school lunches, placing nurses in schools and workplace inspections to protect employees' health.

After World War II, the World Health Organization was founded in 1948 on the premise that health is a human right. The US CDC was also founded at that time (1946) to fight malaria, which was common in southern states, though its focus soon expanded to other public health issues such as communicable diseases.

Public Health priorities

Public health organizations tend to focus on five types of health situations (some of which can overlap):

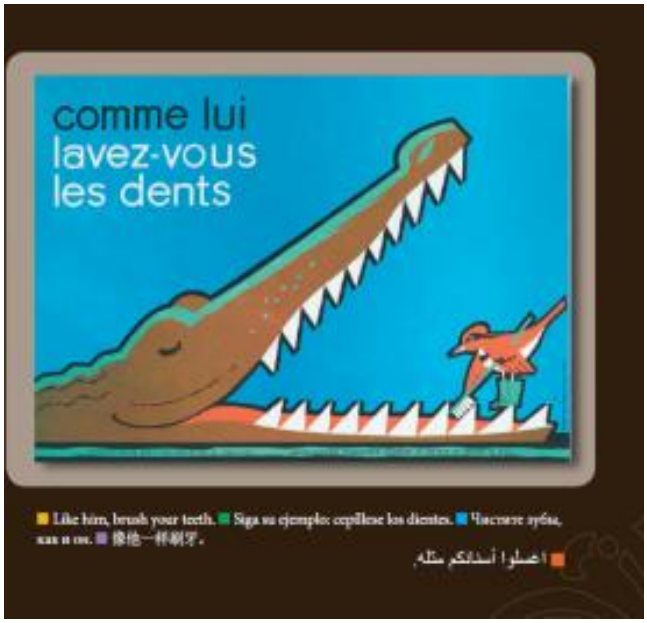
- **(Common) infectious diseases**, such as the flu, sexually transmitted diseases (STDs) and tuberculosis (TB)
- **Chronic & non-communicable diseases (NCDs)**, such as asthma, obesity, diabetes, cancer and mental health issues
- **Environmentally-caused diseases**, such as dysentery, cholera and other waterborne diseases; respiratory diseases caused by air pollution; and even poverty-related diseases such as asthma caused by rodents and cockroaches prevalent in some low-income housing
- **Emerging infectious diseases**, including HIV in the 1980s and 1990s and SARS, H1N1, Ebola, and now COVID-19
- **Other topics**, such as maternal health, birth defects, child mortality, developmental disabilities, and injuries

Some public health organizations also use a **One Health** approach, in which **human and animal disease specialists** collaborate to identify, track, and contain zoonotic infectious diseases, which jump between animals and humans.

Public Health messages

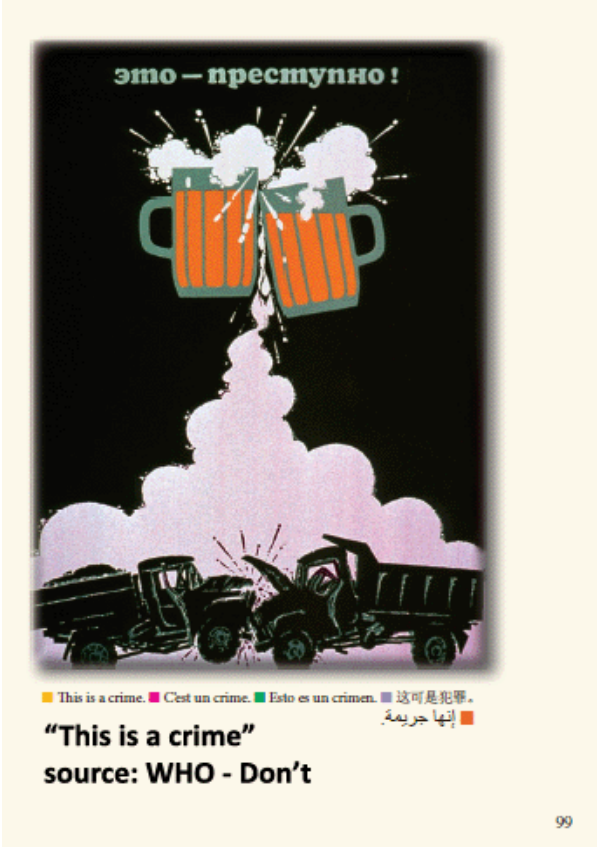
Public health organizations are known for their creative public health messages encouraging vaccinations, safe driving, and other healthy behaviors. The World Health Organization has a collection of international public health advertisements, some of which follow.

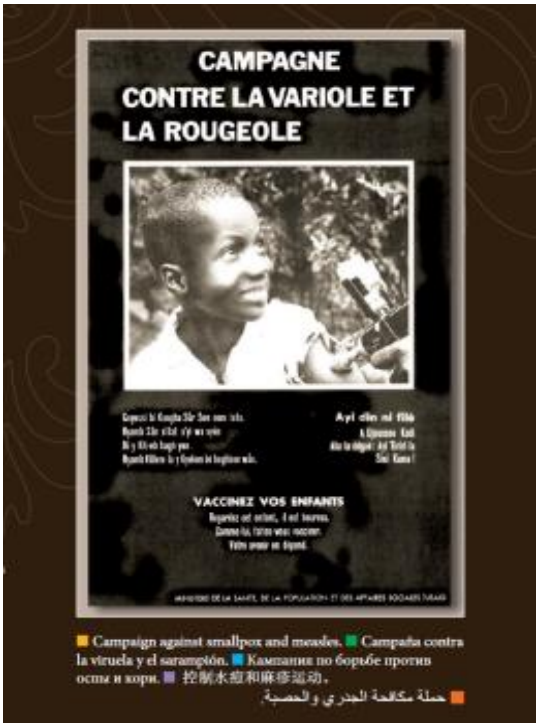
[1] https://www.aerztebatt.de/app/print.asp?id=38584



"Like him, brush your teeth"

Source: WHO





Campaign against smallpox and measles

Source: WHO

Mortality rates

Test your knowledge: How many people die annually from the causes and illnesses on the left side? Match the cause of death with a mortality rate on the right side of **Figure 2**.

Figure 2: Mortality rates

Illness/cause of death	Mortality rate
1. Heart disease/stroke	a. Over 15 million people died from this
2. Diarrheal disease	b. Second most common cause of death in low-income countries
3. Deaths in Africa due to communicable, maternal, perinatal or nutritional issues	c. 56%
4. Alzheimer's Disease and Related Dementias (ADRD)	d. Almost 2,000,000 people died from this worldwide
5. Syphilis	e. 10th most frequent cause of death for children under 5 worldwide
6. Road injury	f. Top cause of death for children 5-14 years of age worldwide
7. HIV/AIDS	g. 6th cause of death for men 15-49 in the Americas
8. Self-harm	h. A leading cause of death for young women in southeast Asia and Europe
source: WHO mortality data https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death, https://www.who.int/gho/mortality_burden_disease/causes_death/top_10/en/ and https://www.who.int/gho/mortality_burden_disease/causes_death/region_text/en/	

Answers provided at end of article.

Life without Public Health

What would the costs be, both for health care as well as societal costs to businesses, trade, and families due to death and injuries, without public health initiatives?

Three health issues provide good illumination into the importance of public health efforts: life expectancy, maternal mortality and smallpox.

Figure 3: Swiss Life Expectancy

Year	Total
1876	40.19
1880	42.47
1885	43.92
1890	45.01
1895	46.93
1899	49.31

Source: https://www.mortality.org/hmd/CHE/STATS/E0per.txt

Life expectancy

Until the 1900s, the average life expectancy in Europe was around 40 years (see **Figure 3**). A major driver of the low life expectancy was high infant mortality. In Switzerland in 1876, 27% of deaths were of children under one and another 8% were in children 5 and under; each age group over five represented only about 1% of deaths for the year.[2]

Infectious diseases were historically the main drivers of infant mortality, including pneumonia, influenza, and diarrheal diseases. In France, approximately one-third of babies died before age one in the 1700s, until improvements in birthing

[2] The Human Mortality Database. https://www.mortality.org/hmd/CHE/STATS/Deaths_1x1.txt (accessed April 2020)

techniques and smallpox vaccinations reduced the infant mortality rate to one in six infants by 1850.[3]

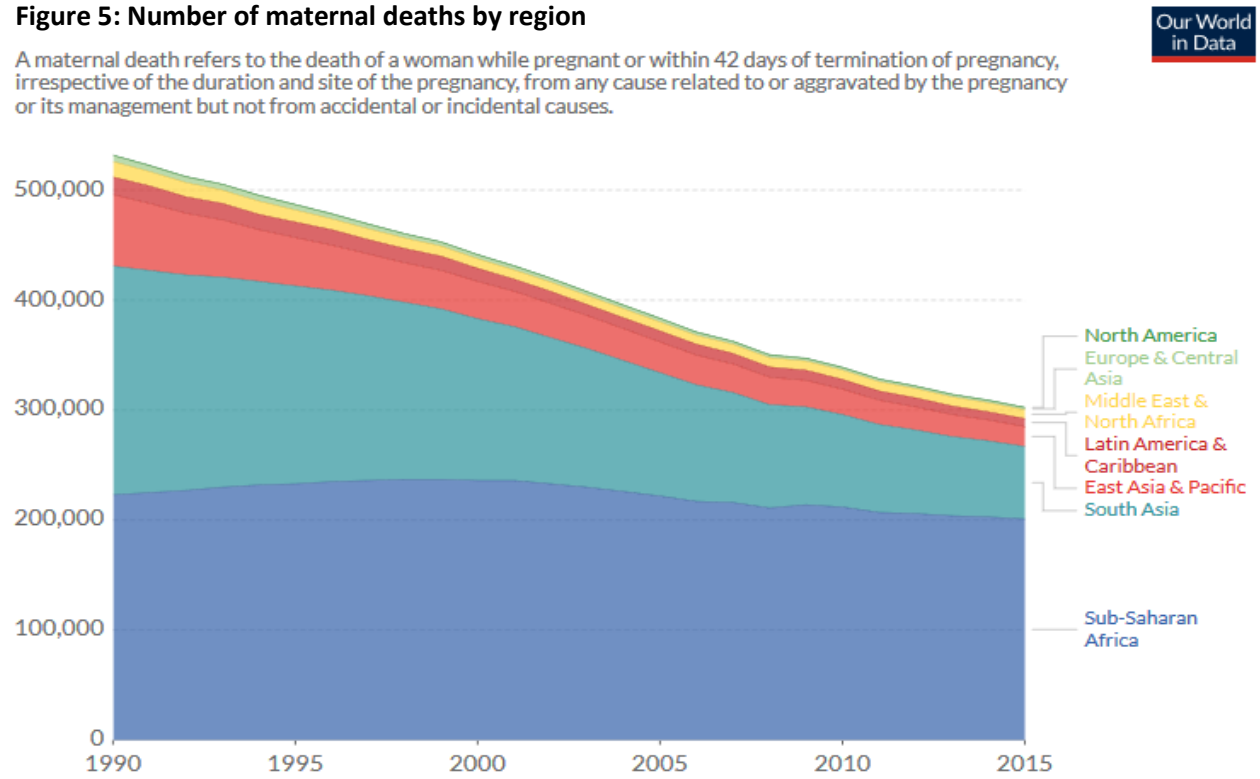
Public health efforts, including vaccinations, pasteurization of milk, and water filtration and chlorination, as well as improvements in living standards and medical care, all caused the decrease in infant mortality now enjoyed in the developed world.

Yet today 2 million children die each year from pneumonia and diarrhea, almost one-third of all child deaths around the world.[4] Infant mortality in developing countries is sadly due to similar causes as in Europe 200 years ago. Public health initiatives and political will are needed to bring appropriate medical care, clean water and sanitation, and other infrastructure to prevent these deaths.

Death in childbirth

Maternal mortality is a good barometer of health care systems. In developed countries, very few women die in childbirth or due to childbirth complications. The average rate of maternal deaths is 8 per 100,000 live births in the European Union (EU). By comparison, in Sierra Leone 1,360 women out of 100,000 die giving birth, or 1 in 75.

Figure 5: Number of maternal deaths by region



As **Figure 5** shows, over 200,000 women in sub-Saharan Africa die due to childbirth each year, largely unchanged since 1990, with the next largest group being in South Asia, which has seen a dramatic

[3] Institut national d'études démographiques (INED). "Infant mortality in France". https://www.ined.fr/en/everything_about_population/demographic-facts-sheets/focus-on/infant_mortality_france/
[4] World Health Organization (WHO). "Ending preventable deaths from pneumonia and diarrhea by 2025". https://www.who.int/maternal_child_adolescent/news_events/news/2013/gappd_launch/en/

reduction in the past several decades.[5] According to the WHO, women die due to severe bleeding after childbirth, infections, high blood pressure during pregnancy (pre-eclampsia), complications from delivery and unsafe abortions.[6]

Without past public health initiatives, people in Europe, North and South America, Asia and Australia would be facing similar rates of death as women in parts of Africa, even adjusted for lower fertility rates.

Smallpox

In The Speckled Monster, author Jennifer Lee Carrell describes the impact of smallpox in devastating detail, including swollen throats, blisters over the entire body that swelled and oozed, and excruciating pain.

While the development of the smallpox vaccine was a medical and scientific breakthrough, the decision to inoculate every person on the planet was a public health effort by the WHO. The WHO began global mass vaccination efforts in 1966 and then started identifying cases to track and contain the spread of the virus. In 1980, the WHO declared smallpox eradicated worldwide—a public health triumph.

Disease Control

Disease control is part of public health. Identifying and responding to emerging infectious diseases is one component of disease control. But disease control means more than responding to epidemics. Disease control organizations also try to reduce the rates of common infectious diseases (the flu, sexually transmitted diseases), chronic diseases (diabetes, heart disease, mental health), and environmental conditions and injuries (workplace accidents, pollution).

While COVID-19 is foremost in our thoughts the past few months, it is important to remember that public health takes the long view: what people are sick from and dying of and how systems can be changed (government regulations; physical infrastructure; knowledge) and both individual and community behaviors altered to reduce deaths that can be avoided.

Mortality rates – answers
1.a 2.b 3.c 4.d 5.e 6.f 7.g 8.h

[5] Ritchie, H. "Where are women most at risk of dying in childbirth?" (201) (2020) Published online at OurWorldInData.org. Retrieved from: https://ourworldindata.org/risk-of-dying-in-childbirth. Data taken from Gapminder (2010) and World Bank (2015).
[6] WHO. "Maternal Mortality". https://www.who.int/news-room/fact-sheets/detail/maternal-mortality (2019)