History of Pandemics; how deadly were they? Where has COVID had the highest death rates?

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Introduction

The author makes no claim here that any of the material reported here is novel; it is more like a trade catalogue of pandemic 'goodies' than an academic analysis. It just seemed an appropriate point to bring together what is known about previous pandemics to put the current COVID-19 pandemic in context.

Bubonic Plague/ the Black Death

The most well-known historical plague is the Bubonic plague, commonly called the Black Death, caused by the plague bacterium (*Yersinia pestis*). One to seven days after exposure to the bacteria, flu-like symptoms develop. These symptoms include fever, headaches, and vomiting. Swollen and painful lymph nodes occur in the area closest to where the bacteria entered the skin. Occasionally, the swollen lymph nodes, known as "buboes" may break open.

The three types of plague are the result of the route of infection: bubonic plague, septicemic plague, and pneumonic plague. Bubonic plague is mainly spread by infected fleas from small animals. It may also result from exposure to the body fluids from a dead plague-infected animal. Mammals such as rabbits, hares, and some cat species are susceptible to bubonic plague, and typically die upon contraction. In the bubonic form of plague, the bacteria enter through the skin through a flea bite and travel via the lymphatic vessels to a lymph node, causing it to swell. Diagnosis is made by finding the bacteria in the blood, sputum, or fluid from lymph nodes.

Prevention is through public health measures such as not handling dead animals in areas where plague is common. Vaccines have not been found to be very useful for plague prevention. Without treatment, plague results in the death of 30% to 90% of those infected. Death, if it occurs, is typically within 10 days. With treatment (antibiotics), the risk of death is around 10%. Globally between 2010 and 2015 there were 3,248 documented cases, which resulted in 584

deaths. The countries with the greatest number of cases were the Democratic Republic of the Congo, Madagascar, and Peru.

The plague was the cause of the Black Death that swept through Asia, Europe, and Africa in the 14th century and killed an estimated 50 million people. This was about 25% to 60% of the European population. At the global level, there were estimated to be between 390 and 450 million so the death rate was approximately rate between 11% and 13%. Because the plague killed so many of the working population, wages rose due to the demand for labour. Some historians see this as a turning point in European economic development. The disease was also responsible for the Plague of Justinian, originating in the Eastern Roman Empire in the 6th century CE, as well as the third epidemic, affecting China, Mongolia, and India, originating in the Yunnan Province in 1855. The term *bubonic* is derived from the Greek word βουβών, meaning "groin".

Smallpox

Smallpox caused by the virus variola minor, is one of the deadliest known to humans, first recorded about 1520. It caused fluid-filled pustules to develop all over the body and at its height, about three out of every 10 people with the disease died. It could be spread via droplets from an infected person's nose or mouth or via their sores.

But, the disease has been completely erased thanks to a vaccine developed in 1796 by British doctor Edward Jenner and the efforts of the scientific community - although it took nearly two centuries to do so. Smallpox remains the only human disease to have been eradicated this way. Prof Riley regards this feat as one of the greatest achievements of mankind - rivalling the Moon landings: "It could be seen as the greatest return on a public investment ever," he says, referencing the annual savings the world has enjoyed thanks to the absence of the disease.

Like the bubonic plague, smallpox killed hundreds of millions of people - 300 million in the 20th Century alone – with total estimates up to 500 million. The average population in the 20th century was 3.8 billion, so the global death rate was about 13% during that century alone, although by then, most of Europe had been inoculated so most of those deaths took place in Africa, Asia or Latin America.

1918 flu pandemic

More commonly referred to as the **Spanish flu**, this was an unusually deadly influenza pandemic caused by the H1N1 influenza A virus. Lasting from February 1918 to April 1920, it infected 500 million people – about 30% of the world's population of 1.7 billion at the time – in four successive waves. The death toll is typically estimated to have been somewhere between 20 million (1.2%) and 50 million (3%) of the world's population, although estimates range from a conservative 17 million (1%) to a possible high of 100 million (6%) of the, making it one of the deadliest pandemics in human history.

The first observations of illness and mortality were documented in the United States (in Kansas) in March 1918 and then in April in France, Germany and the United Kingdom. To maintain morale, World War I censors minimized these early reports. Newspapers were free to report the epidemic's effects in neutral Spain, such as the grave illness of King Alfonso XIII, and these stories created a false impression of Spain as especially hard hit. This gave rise to the name "Spanish" flu. Historical and epidemiological data are inadequate to identify with certainty the pandemic's geographic origin, with varying views as to its location.

Most influenza outbreaks disproportionately kill the very young and the very old, with a higher survival rate for those in between, but the Spanish flu pandemic resulted in a higher-than-expected mortality rate for young adults. Scientists offer several possible explanations for the high mortality rate of the 1918 influenza pandemic, including a severe 6-year climate anomaly that affected the migration of disease vectors and increased the likelihood of the spread of the disease through bodies of water. Some analyses have shown the virus to be particularly deadly because it triggers a cytokine storm, which ravages the stronger immune system of young adults. In contrast, a 2007 analysis of medical journals from the period of the pandemic found that the viral infection was no more aggressive than previous influenza strains. Instead, malnourishment, overcrowded medical camps and hospitals, and poor hygiene, all exacerbated by the recent war, promoted bacterial superinfection. This superinfection killed most of the victims, typically after a somewhat prolonged death bed.

How did the Spanish flu pandemic end and what lessons can we learn from a century ago?

History repeating itself

"It feels like a time machine, everything we had investigated is becoming a reality day by day," Spanish historians Laura and María Lara Martínez told Euronews. The sisters have been studying the

1918 flu for the past two years and the parallels between today's coronavirus outbreak and the 1918 Spanish flu were clear to them from the start. The remainder of this section is based on the transcript of that broadcast.

In the spring of 1918, the disease emerged in pockets across the globe and at first seemed as benign as the common cold. Soldiers in the trenches in France became ill with what was known as la grippe. They complained of sore throats, headaches and a loss of appetite. Although the illness was highly infectious, and the primitive, crowded conditions made rapid spread inevitable, recovery was swift and doctors at first called it "three-day fever".

But it was swiftly realised this was no ordinary flu. Glasgow was the first British city to be affected, in May 1918, and within weeks the illness had spread south, reaching London by June. During the next few months, 228,000 people died in Britain.

Characteristics of Spanish Flu Pandemic

About a fifth of those infected developed pneumonia or septicaemia. Often this progressed to heliotrope cyanosis, a lavender hue of the skin that signalled shortage of oxygen and imminent death. Onset was devastatingly quick. Those hale and hearty at breakfast could be dead by tea-time. There was no available or known cure.

In 1920, a UK Ministry of Health report noted that unlike ordinary seasonal flu, which was worst in the elderly, weak and sick, the new illness disproportionately struck those aged 20 to 30. Young adults with the strongest immune systems were, unexpectedly, the most vulnerable. It is speculated this is because the older generation lived with the so-called Russian flu in 1889 and 1890.

London, like other British cities, was ill-equipped to cope with the epidemic. The war had cost the country most of its fortune, industry was disrupted, there was damage to public services and millions were dead, missing or wounded. And ships were bringing soldiers back from the front carrying the virus to their homes and communities. Hospitals were overwhelmed, and doctors and nurses worked to breaking point, although there was little they could do. Medical schools closed their third- and fourth-year classes and students helped in the wards. There were no treatments against the flu and no antibiotics to treat complications such as pneumonia.

In many towns, theatres, dance halls, churches and other public-gathering places were shut, some for months. Streets were sprayed with chemicals and people wore anti-germ masks. Some factories relaxed no-smoking rules believing that cigarettes would help prevent infection.

Spread of Spanish Flu

The pandemic circled the globe. No country was spared, except Australia which imposed strict quarantine rules. Entire Alaskan villages were overcome by the virus and Western Samoa, a small island in the Pacific, lost 20 per cent of its population. Worst-hit was India where an estimated 12 million people died. By the end of the pandemic, a fifth of the world's population had fallen sick.

In the US, the first case was recorded on Monday, 11 March, 1918, at Fort Riley in Kansas, a military training camp. A cook, Albert Gitchell, reported to the hospital with a "bad cold". He was feverish, and complained of a sore throat, headache and muscular pains. By noon that day, 107 patients had been admitted with similar symptoms. Within five weeks, 1,127 men out of 26,000 in the camp, were infected.

The death rate was relatively low in this first outbreak but the second wave which started in Boston in the early autumn was much more severe. The virus appeared to have mutated over the summer. Philadelphia, hardest-hit of all US cities, was struck in October with 700 deaths in the first week, 2,600 by the second week and 12,162 by 2 November. Churches and schools were closed but the newspapers, as did those in Boston and other US cities, continued to devote their front pages to news from the battle front in Europe.

As flu deaths rose, cemetery keepers could not keep up. Families had to dig their own graves and there was a shortage of coffins. Louise Abruchezze, an Italian immigrant, said a neighbour became distressed at how the corpse of a family member was being treated and begged the undertaker: "Please, please, let me put him in a macaroni box." Wooden boxes were used then to hold 20lb of pasta.

The effect of the epidemic on the US was so severe that the average lifespan was cut by a decade. Some towns tried to restrict travellers or impose quarantine, with limited success. One banned shaking hands. Funerals were limited to 15 minutes and bodies piled up in

warehouses. The pandemic peaked in the summer and autumn of 1918, as crops were ripening, but there were no field-hands to get the harvest in. "It was an agricultural disaster," one report said.

As the illness swept Europe, Spain was hardest hit, with an estimated eight million dead which led the BMJ to label the disease "Spanish flu", though it is thought to have originated in China. One of the earliest casualties was the King of Spain. A third wave of the pandemic struck in early 1919 but it died away swiftly.

The disease that had wreaked such havoc disappeared almost as quickly as it had come. Forty million people had lost their lives. The death rate was 25 times higher than in a normal flu epidemic (2.5 per cent compared with 0.1 per cent).

On 3 November 1918, the News of the World suggested ways to combat the epidemic which are equally relevant today:
"Wash inside nose with soap and water each night and morning; force yourself to sneeze night and morning, then breathe deeply. Do not wear a muffler; take sharp walks regularly and walk home from work; eat plenty of porridge." Possibly, the porridge may be optional.

Armistice Day on 11 November, called to mark the end of the war, set off a second wave of infection. As people gathered to celebrate, the virus swept through them. Parties and parades turned to disaster.
Rich and poor were at risk; the virus spared no one. Cristina Garvin, wife of the editor of The Observer during the First World War, was reported by her daughter to have cried through all the rejoicing and saying, 'It is too late for me'. Nearly [two] months later she died.

Death Rates

There were 228,000 deaths reported in Britain, which puts the death rate then at 0.54% or 0.49%. Our current UK death rate from COVID-19 is 0.19%.

It's also worth noting that, globally the ***lowest*** estimate of deaths from the pandemic is 17 million, which was 1.0% of the global population then of 1.7 billion, compared to the current 4 million COVID-19 deaths which is 0.05% of the current global population of 8 billion. The more widely promulgated higher estimate of 50 million deaths puts the death rate at nearly 3% of the global population,

And Today

The lockdown measures put in place over a century ago sound familiar today: theatres, schools and borders were all closed. Public spaces, including telephones, were disinfected, historians say and in the United States, people could be fined up to $100 for not wearing a mask. In 1918, it was quickly understood that crowds could cause further transmission.

"Lockdowns were put in place and progress was made in the application of preventive measures that had historically proven effective," historian Jaume Claret Miranda told Euronews. This included hygiene measures and quarantining those suspected of being contaminated. At the same time, people did have "to fight against superstitions," Claret added. "For example, in Zamora the bishop called for mass that contributed to the effects of the pandemic and in Madrid, authorities did not cancel the San Isidro festivities."

Indeed, the first wave of the outbreak in Spain took place just after the celebrations of the patron saint of the Spanish capital. A week later, around May 22, newspapers said that everyone was falling ill with the flu. This fuelled the naming of the new flu as "Spanish" even though patient zero was at a US military training centre in Kansas.

Historians Laura and María Lara Martínez say that the 1918 flu could have originated even earlier in China or in France in 1917. However, Spain's neutrality in the First World War meant that the journalism coverage of the new disease was more extensive.

'The mother of all pandemics'

Without hope of a vaccine or test, those fighting the 1918 pandemic faced different challenges and some expected summer temperatures to slow the virus' transmission. The second wave of the epidemic, however, was more deadly than the first. In Spain it coincided with harvests and celebrations in September as well as the relaxation of lockdown measures, the Lara Martínez sisters said.

Outbreaks occurred the following winter, said Jaume Claret Miranda, who added that in some areas there was a third wave in the early 1920s. "The end of the pandemic depended on each country: on the information and training of its specialists and the interests of its political class," says Claret. But historians' "knowledge is very limited

to the 'western world' and we do not know how this epidemic played out in many other parts of the world," he added.

Academics agree that the end of the pandemic occurred in 1920, when society ended up developing a collective immunity to the Spanish flu, although the virus never completely disappeared.

"Traces of the same virus have been found in other flu viruses," said Dr Benito Almirante, head of infectious diseases at the Vall d'Hebron hospital in Barcelona. "The Spanish flu continued to appear, mutating and acquiring genetic material from other viruses." For example, the 2009 flu had genetic elements from earlier viruses, so older individuals were better protected than the young, he said. This also occurred in 1918-20 with the 'Spanish' flu, with those over the age of 30 having better survival rates, said Laura Lara Martínez.

When does a pandemic end?

A pandemic ends when there is no uncontrolled community transmission, and cases are at a very low level, said Dr Almirante. This is the current situation [with the coronavirus] because the cases are easily identified and they can be tracked. If this continues in the coming weeks, the pandemic can be considered controlled." But, when people ask, 'When will this end?,' they are asking about the social ending," Dr Jeremy Greene told the New York Times.

Social fear varied according to the degree of information available and how countries were affected by the war, explains Claret. For example, England's field hospitals stayed up past the end of the war due to the outbreak

Post-pandemic euphoria

The roaring 20s followed the Spanish flu pandemic and World War I. "The population that ... survive(d) entered a phase of euphoria" including economically. The Lara Martinez sisters compared it to "the dances of death" during the fourteenth century Black Plague. "Living with death, because it can appear at any time." But in this optimistic post-flu phase, totalitarian regimes began to emerge as the breeding ground for border control and the (misplaced) desire for security.

"People's memory is short," Claret said. "However, it did leave a certain legacy at the scientific level and among specialists, confirming

and adding knowledge to how these epidemics should be treated." The main lesson, was that "any measure" before the pandemic that was described as "exaggerated [is] later considered insufficient."

COVID19

Current (18th June 2021) global infection cases and death numbers are approaching 180 million and 4 million respectively. With an 8 billion (global) population this translates into 2.25% infection rates and 0.05% death rate. It is difficult to believe the infection numbers and rates because that would depend on the accuracy and reliability of reporting systems around the world. Death numbers and rates should be more reliable; nearly all countries have mandatory systems of reporting deaths and there is often an incentive for descendants to report the deaths for financial reasons. But, of course, it is also crucial to use the rates rather than the numbers in order to understand the severity of the pandemic. For all of these reasons, the comment focuses on the death rates rather than on the infection rates.

CURRENT DEATH RATES

Figures in the table are from *World-o-Meter 16th June*, but the death rates have been rounded up (by guesswork) to account for publication delay. Only countries reported to have death rates greater than 1,500 per million are included. The discordance between cases per million and deaths per million are striking.

The country with the highest death rate is not India (280 per million) nor Mexico (1,780 per million); neither is it USA (1,850 per million), UK (1,880) nor Italy (2,100); but instead it is Peru (5,680). And, in Europe Hungary (3,100) has the highest rate and in Western Europe Belgium (2,150 per million) the highest. I don't think you will find a single mention of Belgium in the media!

Perhaps more interesting is that more than half of those countries with death rates of 2 per thousand or higher were part of the former Soviet Union or Yugoslavia which is surprising given that their medical systems were acknowledged to be very good at the time.

	Country	Total Cases	Total Deaths	Tot Cases/ 1M pop	Deaths/ 1M pop
1	Peru	2,023.179	189,933	60,551	5.680
2	Hungary	804,538	29,733	83,476	3,110
3	Bosnia and Herzegovina	204,012	9,253	62,539	2,960
4	Czechia	1,661,272	30,108	154,867	2,830
5	Gibraltar	4,295	94	127,516	2,800
6	San Marino	5,089	90	149,694	2,650
7	North Macedonia	155,272	5,413	74,532	2,630
8	Bulgaria	418,274	17,662	60,614	2,610
9	Montenegro	99,623	1,584	158,600	2,560
10	Brazil	16,515,120	462,092	77,197	2,340
11	Slovakia	389,721	12,343	71,351	2,290
12	Belgium	1,061,200	24,940	91,203	2,170
13	Slovenia	253,722	4,375	122,029	2,130
14	Italy	4,217,821	126,128	69,854	2,110
15	Croatia	356,181	8,026	87,253	2,001
16	Poland	2,872,283	73,745	75,969	1,980
17	Argentina	4,242,763	88,247	93054	1,950
18	Colombia	3,383,279	88,282	65,853	1,930
19	UK	4,487,339	127,782	65,786	1,880

20	USA	34,043,582	609,556	102,304	1,855
21	Mexico	2,412,810	223,507	18,537	1,780
22	Spain	3,678,390	79,953	78,646	1,730
23	France	5,667,324	109,528	86,649	1,700
24	Portugal	849,093	17,025	83,493	1,680
25	Chile	1,384,346	29,300	71,856	1,630
26	Romania	1,077,737	30,312	56,366	1,700
27	Moldova	255,186	6,107	63,394	1,540
28	Armenia	222,670	4,438	75,016	1,520
29	Panama	377,776	6,370	86,320	1,480
30	Sweden	1,068,473	14,413	105,200	1,440
31	Andorra	13,727	127	177,402	1,650
32	Liechtenstein	3,012	58	78,790	1,550
	Total:	**171,269,263**	**3,561,732**	**21,972.2**	**470**

2	India	28,171,955	331,882	20,233	280
5	Turkey	5,249,404	47,527	61,639	580
6	Russia	5,071,917	121,501	34,741	890

Comparing global death rates across pandemics

Bubonic plague 11%-13%; smallpox (20th century) 13% (nearly all deaths outside Europe or America); Spanish flue (between 1% and 3%); with COVID-19 trailing at 0.05%. Economies suffered badly with the Bubonic plague, Smallpox and Covid 19 but rebounded with the first two; what will happen with COVID-19?

Inequalities of Impact in the UK

The higher rates for the elderly and Black and Ethnic Minority communities are well known. Perhaps less well publicised are that insecure and gig-economy workers are twice as likely to die from Covid-19 as those in more secure work (TUC, 2021).

Lack of sick pay, fewer rights and endemic low wages, combined with occupations that frequently expose people to the virus, have contributed to a mortality rate among insecure workers double that among others, according to the TUC. Among male workers without guaranteed regular hours or income, or in low-paid self-employment, the Covid-19 death rate between March and December last year was 51 per 100,000, compared with 24 for those in more secure work. Women in similarly insecure work faced a mortality rate of 25 per 100,000, compared with 13 per 100,000 for those with less job insecurity. Moreover, insecure workers are almost 10 times more likely than others to receive no sick pay at all.

The TUC called for sick pay to be raised to the level of the real Living Wage and available to all workers, and zero-hours contracts and false self-employment banned. One worker in nine is in insecure work, and that women, disabled workers and black and minority ethnic (BME) workers are far more likely to be in precarious work — almost half of workers on zero-hours contracts are from ethnic minorities.

Those in insecure occupations have largely continued to work outside the home during the pandemic, many being key workers whose undervalued role has been thrown into relief by the crisis. In Britain nearly two million workers do not earn enough to qualify for sick pay. This reduces the prospect of a safe return to work and forces many to choose between doing the right thing and putting food on the table.

Katie Schmuecker of the Joseph Rowntree Foundation said: “The risks of the pandemic have not been borne equally, with women, disabled and BME workers the most likely to be in precarious work.”. The foundation’s research has shown that people on zero-hours or temporary contracts were four times more likely to lose their job during the first lockdown, while self-employed people were three times more likely to stop working than permanent workers.

Based on the report in GUARDIAN 16th April; **Zero-hours contracts**