 doi:10.20944/preprints202005.0179.v1

The Timeline of A Pandemic: Have we learned anything in 102 years?

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No ethical approval was required

No funding was required

Word Count 2412

Disclosures: The author has any conflicts of interest to disclose

 doi:10.20944/preprints202005.0179.v1

Abstract

George Satayana stated that “those who do not learn from history are doomed to repeat it”. As our UK “good outcome” death toll of 20,000 from coronavirus (SARS CoV -2/ COVID -19) in 2020 has sadly been surpassed; never has a phrase been more pertinent.
The last major pandemic on a similar scale to COVID-19 is “Spanish Flu” from 1918. We aim to delineate the timeline of events in response to the 1918 Spanish flu pandemic and compare this to the timeline of COVID 19 response, given that the NHS and WHO have since both been long established. In the last 102 years many changes have occurred. Health services across the world have significantly improved, with the advent of mechanical ventilation and antimicrobial treatments. Vaccination programmes against common pathogens have prevented many large-scale disease threats, however novel illnesses have also emerged. Worldwide communication through the Internet and many agencies including the World Health Organisation has improved, and the awareness and surveillance of disease is more prominent. Despite advances in healthcare and communication, the national and international timeline for public health intervention in the current COVID pandemic in comparison to the Spanish flu pandemic of more than 100 years ago is virtually identical. The World Health Organisation operates to promote global health and prevent spread of disease, with this in mind; should the WHO have intervened earlier? We need to learn quickly from this pandemic and improve planning for the future.

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Introduction

The philosopher George Santayana stated that "those who do not learn from history are doomed to repeat it". As our UK estimated "good outcome" death toll of 20,000 from coronavirus disease 2019 (SARS CoV -2/ COVID -19) in 2020 has sadly been surpassed; never has a phrase been more pertinent.

As the world's population steadily increases, as does its population density and proximity to wildlife and therefore the likelihood of future infective and zoonotic pandemics [1].

In recent times there have been several epidemics and even pandemics. However, they have not gripped the hearts or minds of the people or media in the same way as the current coronavirus crisis. In 2018 the Middle Eastern Respiratory Syndrome was classed as an epidemic. It is a type of coronavirus (MERS-CoV) which is equal in virulence and twice as deadly as COVID-19 [2,3]. Prior to this in 2003 the Severe Acute Respiratory Syndrome (SARS) was identified in China; thought to have been transmitted from domestic fowl, this too had high virulence and mortality, although fortunately its spread outside China was limited [4]. Swine and Avian influenza (H1N1 and H5N1) have also swept across the world in 2009 however these were more like seasonal influenza. Non respiratory pathogens have also caused human pandemics, notably Human Immunodeficiency Virus (HIV) in the 1980's, thought to have been transmitted from primates in Africa; and Zika virus in 2015 -2016 which swept silently across the tropics, carried by mosquitos. Both these viruses cause long term effects on the human host, requiring lifelong treatment in the case of HIV, and causing congenital defects in Zika. However, these appear to be largely now accepted as part of society and ignored as the true destructive pandemics they were [5,6].

The last infamous pandemic on a similar scale to COVID 19 is "Spanish Flu" from 1918. This was a highly contagious respiratory illness unlike previous conditions, later discovered to be a type of Haemophilus influenza; and it travelled with the soldiers in trenches in World War I, and returned with them to their native lands, causing death and destruction on a large scale [7].

Following the World Wars the National Health Service was established by Aneurin Bevan in 1948, as a means of allowing all British citizens access to a free basic level of healthcare. Also established in 1948, The World Health Organisation, supported by the United Nations decided to set up a global health strategy and constitution. This was aimed at promoting the importance of health worldwide in adults and children, and not just in physical condition but in mind. It was designed to lessen out the inequalities in health provision worldwide by promoting health and control of diseases; and give each Government responsibility for the health of its people. One of the first and longest serving facilities established in the UK was the World Influenza centre for overall epidemiological surveillance [8,9].

Aims

We aim to delineate the timeline of events in response to the 1918 Spanish flu pandemic, and compare this to the timeline of COVID 19 response, given that health services have largely improved, worldwide connectivity and communication is easy and fast and the NHS and WHO have both been long established.

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Spanish Influenza

With around 21.5 million deaths worldwide, the influenza pandemic in 1918 was the deadliest pandemic seen at the time since the black death in the 1600's. The causative virus is thought to have been born out of the trenches of the First World War. It was first documented as the "*pneumonie des annamites"*- pneumonia of the Annamites, so named after the Indochinese soldiers from the old Annam region (now Laos, Cambodia and Vietnam). More than 50, 000 Indochinese soldiers were sent to France to fight, with 9000 nurses and 1000 lorry drivers. There were multiple documented reports from Military Doctors describing an epidemic starting 30th March 1918 amongst these soldiers. Symptoms recorded include the now ever familiar: high fever, barking cough and myalgia. However the main difference from current coronavirus symptoms was that the cough was often productive of bloodstained purulent sputum [10].

Around the same time 1,100 soldiers at Fort Riley military base in Kansas, USA developed similar symptoms, and were diagnosed with what was later called Spanish Flu.

There were 3 distinct waves in the 1918 pandemic flu. The first or Spring Wave was from April to July and carried high morbidity but low mortality, for example in the French Army in May 1918 there were 24,886 patients infected, of which 7 died. In June 12,304 with 24 deaths and July 2369 affected with 6 deaths. There was no reporting of these infections or deaths in the local media at the time [10,11] .

The first media reports arose when the virus reached Madrid in May to June 1918, as Spanish media at the time was under lighter censorship than the rest of Europe. Hence the misnomer of Spanish Flu. In Madrid the mortality was 0.42 per 1000 inhabitants; and from there spread rapidly across the whole Iberian Peninsula.

The Spring wave may have represented normal seasonal flu, however mutation of the virus within the millions of soldiers in WWII, cramped conditions in barracks and trenches and the transport back to home countries later in 1918 may have contributed to a more deadly second wave in the Autumn and a 3rd Winter wave in early 1919 in many countries. The first death from the newly mutated influenza virus in the Autumn wave was documented on the French/Spanish border on 10th September 1918, and within a month 1% of the local population had died of the respiratory illness or GI side effects. By November, the virus had spread far beyond France and Spain into the rest of Europe and the UK. There have been reports of crossover between waves, with infection in the spring wave conferring a degree of protection (between 50-80% reduced risk of death) in the Autumn wave [10-12].

Despite the high morbidity, with widespread reports of infection and mortality in Europe and the US, no public health protection measures were introduced in the UK until August 1918. At this point minor measures were introduced: Spanish flu became a notifiable illness and day-schools, boarding schools and barracks were placed under surveillance. No restrictions on gatherings or limitations on movement were put into place until some local authorities added measures such as closures of theatres but this was only commenced in October 1918 [10-12].

In October and November 1918, among other interventions, local health departments distributed free soap and clean water for the less wealthy, provided services for removal of human waste, regulation of toilets and organisation of inspection of food products. Spitting in the streets was banned. Surveillance and mandatory quarantine for affected people was used.

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In all, Spanish flu infected 1/3 of the world's population and caused 50-100 million deaths. This prompted increased awareness of pandemic planning and public health [10-12].

Coronavirus 2019 Pandemic

102 years later, a novel zoonotic respiratory pathogen was identified in patients in China. 4 index cases were identified on the 29th December 2019 with an atypical pneumonia, presenting with the now well recognised hallmarks of a high fever, dry persistent cough and myalgia. All 4 patients had connections to wet market trading in wild animals in Wuhan. After several more cases and a delay in political acknowledgment, this atypical pneumonia was demonstrated to arise from a novel type of coronavirus, named Coronaviral Disease-2019 (COVID-19). The 4 patients were initially identified using a surveillance mechanism for pneumonia of unknown aetiology prompted by the earlier SARS epidemic. This identifies patients with a temperature of greater than 38 degrees Celsius, radiographic findings consistent with pneumonia, low or normal leucocyte count and lyphocytopenia [13].

Within 7 weeks of the first reported cases, there were around 80,000 confirmed cases with 2,250 deaths reported. Although the majority of these remained in China, the WHO confirmed around 80 cases in 18 countries outside China on 30th January 2020. At this point the WHO highlighted the disease as a Public Health Emergency of International Concern but did not classify as a pandemic or suggest state public health measures [14].

The World Health Organisation, upon reviewing the rapidity of spread of disease and severity of symptoms, even in the young and healthy, eventually classified the disease as a pandemic on 12th March 2020 [9].

The first major epidemic occurring outside China was in Lombardy, Northern Italy. The first 3 cases there occurred on 15th February 2020, and by the time the pandemic was announced they had recorded 15,113 cases [15]. In the UK similarly 1 case was recorded on 15th February in a patient returning from Italy. At the time of the pandemic announcement, we in the UK had already recorded 590 cases and 10 deaths. At this point there were no public health interventions imposed [16,17].

The UK Government reacted to the pandemic on the 23rd March 2018, 6 weeks after the first case, and nearly 3 weeks after the WHO highlighted the importance of the disease internationally. At this point there had been an exponential rise in cases with a total of 6650 confirmed infected and 200 deaths. Since the 23rd March the UK has been under an imposed Lockdown in which citizens are advised to leave the house only to work (if they cannot work from home), exercise once a day and to obtain essential food or medicine. By the 26th April 2020 there were more than 150,000 cases and 20,730 deaths [18].

Comparison between pandemic public health strategies and timelines

In the last 102 years many changes have occurred. The world population has increased in size and density and therefore encroaches on wildlife more regularly [1]. Health services across the world have significantly improved, with the advent of mechanical ventilation and antimicrobial treatments. Vaccination programmes against common pathogens have prevented many large scale disease threats, however novel illnesses have also emerged [1-3]. Spread of disease is made much easier by the relative ease of global travel for the general population, and this puts more vulnerable individuals at risk than may have been in the 20th century. Worldwide communication through the

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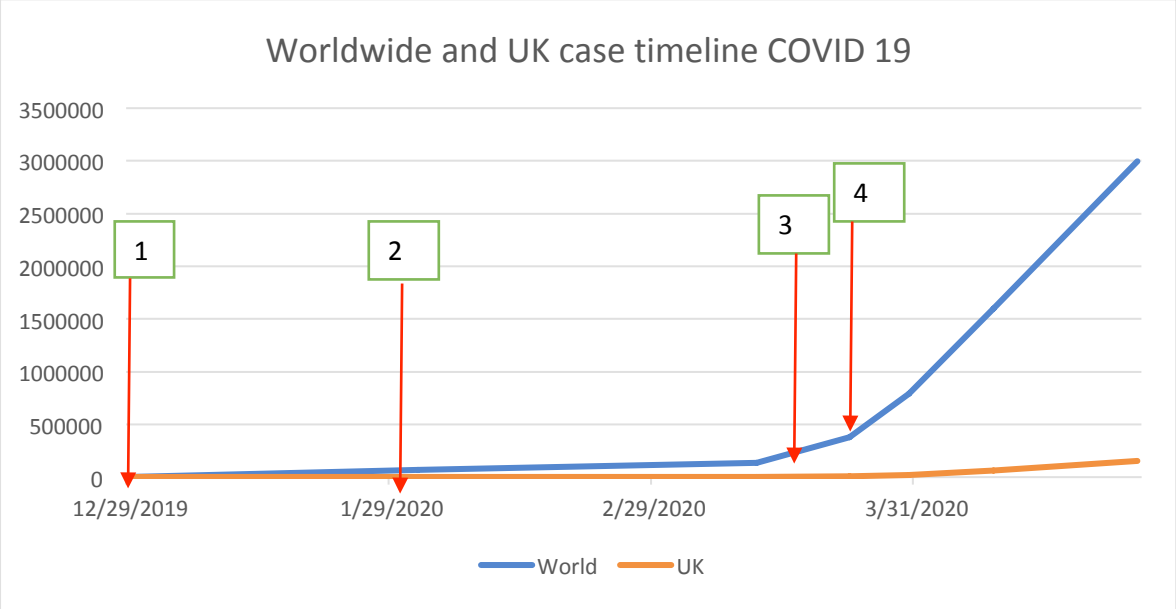
internet and many agencies including the World Health Organisation has improved and the awareness and surveillance of disease is more prominent [19].

Despite these improvements in health and connectivity, the timeline of the current pandemic and that of Spanish flu are worryingly similar as shown in the graphs below.



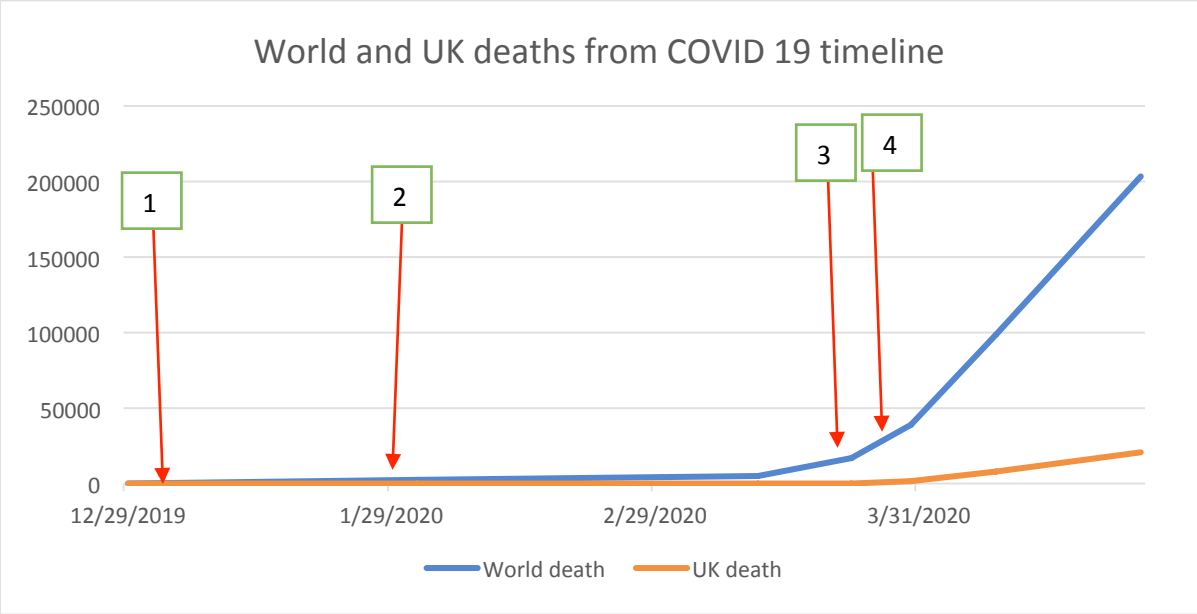


Figure i. World and UK cases COVID 19. B. World and UK deaths from COVID 19 (data from worldometers.com}

Figure ii. World and UK deaths from COVID 19

1: 1st case in Wuhan, China, 2: WHO designates Public Health Emergency of International Concern. 3: Pandemic Announced, 4: UK government announces lockdown

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The graph below show the waves and timeline of the Spanish flu pandemic of 1918; with the first wave being widely considered as seasonal influenza, the comparative timeline is with the Autumn wave as this is the "novel" mutated agent which became a worldwide problem.

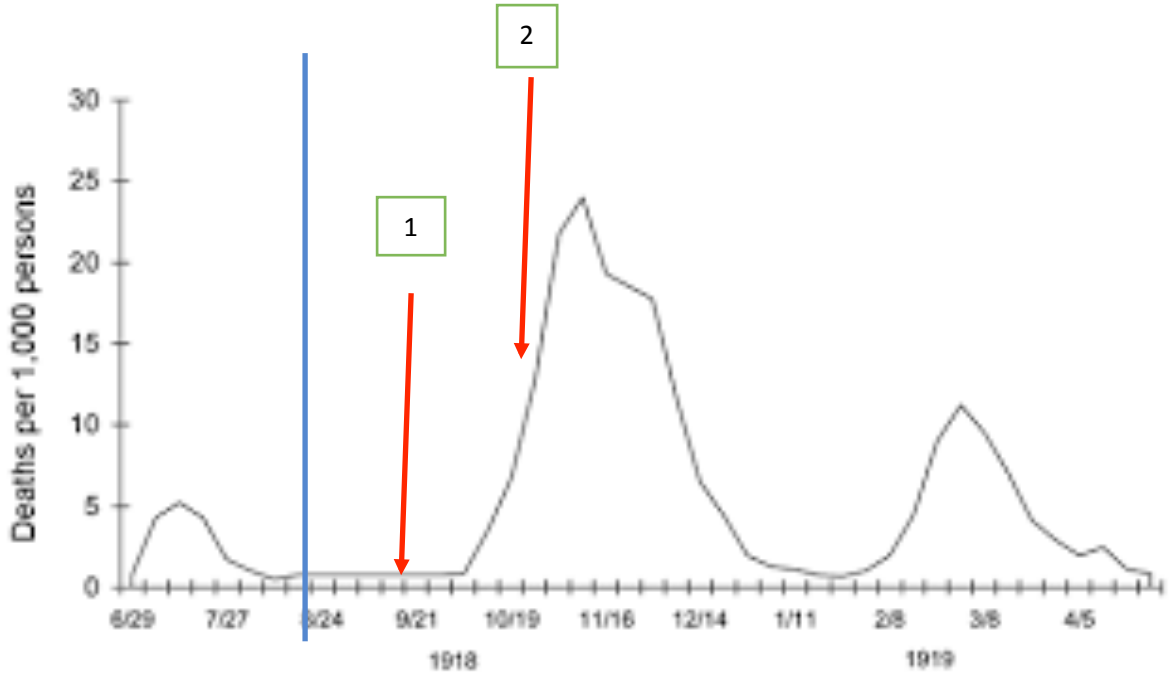

Figure iii. Spanish Flu waves and timeline [20]

1: Introduction of cleaner streets and basic public health. 2: Social distancing implemented.

The timelines seen show that even with current technology and surveillance, the curves produced in mortality are almost identical. Even more disturbingly, the public health interventions appear to have a similar lag, despite the introduction of global healthcare.

	Spanish Flu (mutated wave)	Coronavirus
1st case	1st August 1918	29th Dec 2019
Declared pandemic	Mid- October 1918	12th March 2020
Public health interventions	October 1918 (UK)	23rd March 2020 (UK)
Delay	8-10 weeks	10 weeks
Worldwide mortality	50-100 million	280,000

Reassuringly, health systems and technology are thankfully more advanced in the current outbreak and therefore so far mortality figures are lower. However, it does raise the question: Have we learned anything about pandemic planning, and should the World Health Organisation have been more interventional in the early stages. A potential concern to consider from the 1918 flu pandemic is the worry of a further wave in cases. In 1918 this occurred despite formal lockdown. With the stringent measures taken by many of the now 209 countries affected, this may prove important and a huge cause of morbidity and mortality once measures are lifted, and especially after borders re-open.

Conclusions

Despite advances in healthcare and communication, the national and international timeline for public health intervention in the current COVID pandemic in comparison to the Spanish flu pandemic of more than 100 years ago is virtually identical. The World Health Organisation operates to promote global health and prevent spread of disease, with this in mind; should the WHO have intervened earlier? Also given the 1918 pandemic had multiple waves we should be cautious when releasing public health measures in order to learn from previous experience and prevent further mortality. "Those who do not learn from the past are doomed to repeat it" – we need to learn, and fast.

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