

# 1918 Spanish Flu Pandemic

A data driven study.

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# Introduction

The Spanish flu pandemic, often regarded as one of the deadliest in history, killed an almost 50 million people of the 500million it infected as it tore through Europe in 1918 and travelled to the US, killing 675,000 Americans.

By comparison, the First World War, which ended in 1918, had around 20million deaths.

The outbreak was in two waves. The first wave of the 1918 pandemic occurred in the spring and was generally mild with the sick experiencing typical flu symptoms such as chills, fever and fatigue then recovering after several days.

However, a second, highly contagious wave appeared with a vengeance in autumn of that same year and victims died within hours or days of developing symptoms, their skin turning blue and their lungs filling with fluid that caused them to suffocate.

In those times, there were no effective drugs or vaccines to treat it. Citizens were ordered to wear masks, schools, theatres and businesses were shuttered and bodies piled up in makeshift morgues with many having to dig graves for their own family members.

It had one difference from other similar diseases. Instead of just young and old people being severely affected, adults in their prime age of 18-40 were also highly affected. By the summer of 1919, the flu pandemic came to an end, as those that were infected either died or developed immunity.

# Contents

1. Methodology
2. Mortality due to Spanish Flu
3. Life Expectancy during the “Spanish Flu” pandemic
4. Economic Impact
5. Effects of Social Distancing
6. Relation to the Covid-19 Outbreak
7. References

# Methodology

We proceed on a model of data-driven analysis. We collected the relevant data and tried to understand and find patterns in data. We used Python as a Data Analysis tool. Python libraries like Seaborn, Matplotlib and Plotly have been used to create many of the visualizations in the report.

We researched through many papers and web content to find out accurately what happened in those times. We have tried to understand the pandemic in three ways, how it affected deaths and mortality rates, its economic impact on the world and how effective was social distancing in fighting this invisible enemy.

The reason of working on social distancing is that, it occurred in a time before antibiotics. Mankind did not have proper medication to fight against the pathogen. The best weapon in such conditions is social distancing. Hence, we tried to have a look at it.

# Mortality due to Spanish Flu

*"I had a little bird, its name was Enza*

*I opened the window and In-Flew-Enza.*

*Obey the laws and wear the gauze,*

*Protect your jaws from septic paws."*

*(Popular poem regarding the flu in those days)*

The Spanish flu of 1918 is believed to have caused a total death toll of about 50-70 million across the world, making it one of the deadliest pandemics in the history of mankind. The time also coincided with the last phase of World War I and thus to maintain morale many of the participating nations didn't report their deaths. Hence it's safe to assume that the deadly Flu has affected and resulted in lot more deaths than accounted for.

Country	Estimated Deaths(UpperLimit)	Country	Estimated Deaths(UpperLimit)
Australia	15000.0	Japan	390000.0
Brazil	300000.0	Korea	200000.0
Canada	50000.0	Mexico	230500.0
China	1280000.0	New Zeland	8900.0
Denmark	5000.0	Norway	15000.0
France	400000.0	Portugal	118065.0
Germany	426600.0	Spain	260000.0
Ghana	100000.0	Sweedeen	34500.0
India(British Republic)	13880000.0	Switzerland	25000.0
Indonesia	1500000.0	UK	250000.0
Iran	2431000.0	US	675000.0
Iraq	700000.0	USSR	450000.0
Italy	410000.0	Vietnam	33000.0

The above tables show the estimated deaths in major countries around the world. India has the highest number of reported deaths estimated to be about 14 million people. A comprehensive analysis on "Mortality in India during Spanish Flu of 1918" can be found later. The flu also caused lots of deaths around the world. The Spanish Flu of 1918 had a huge impact of several Asian countries. Countries like Indonesia, China, Iran and Iraq suffered over half a million people each.

**Impact on Iran-Iraq** - Iran and Iraq suffered heavy casualties primarily because they were employed as low class peasants and working end people. During the last year of the world war, Indian and British soldiers were stationed in Bushehr and Bandar-e Lengeh Ports while the Russian army held its ground near the Azerbaijan and Ghazvin Province. They were the people responsible for the heavy lifting for both the Russian and British army. The state of the country was also very poor. Famine and Cholera ravaged the countries. People died due to lack of food, proper shelter and drugs/medicines were a royalty that only the very high class people could afford. Mohammad Ali Jamalzadeh in his book Shiraz wrote that – “at the end of WWI, three lethal killers entered Shiraz; they were famine, cholera and the Spanish flu.” Many people died and corpses were seen everywhere in the city. The Bazaar and shops were closed. There was no doctor, no nurse, and no drug." (Reference - Majd MG. Ghahti Bozorg va Marg-o-mir Dar Iran, 1917,1919 [Translated into Persian by M. Jamshidi] Faslnameh Takhasosi Tarikh Moasere Iran. 2006).

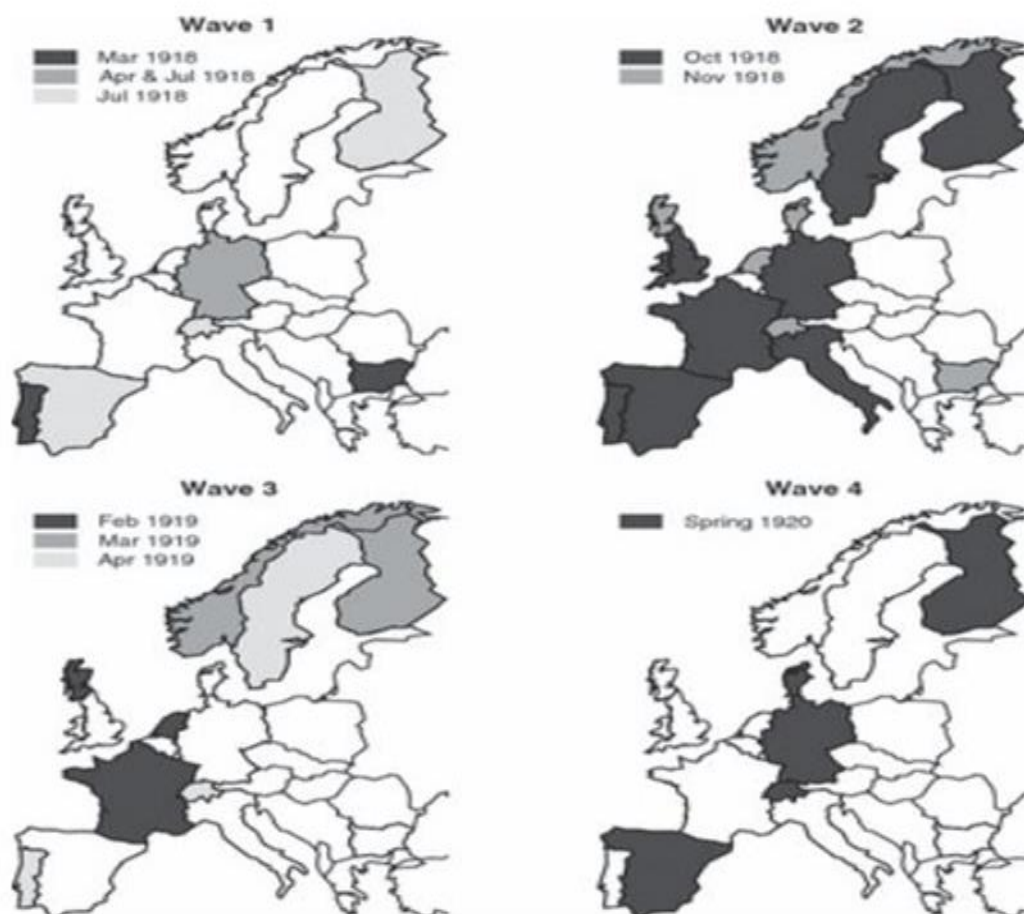
**Impact on Indonesia and neighboring islands** - In Indonesia formerly known as East Indies, the Spanish Flu hit in two waves the first in June to September 1918, while the second hit in mid to late October of 1918. The first case to be reported was in Pangkatan port, North Sumatra, in June 1918, and the source can be traced back to workers from Singaporean plantations. In a few weeks, the Spanish Flu had reached the interior of the country. By June, the virus is estimated to have infected 5 per cent of the total population. The second wave hit more firmly and spread rapidly to the east. By January of 1919 the disease covered the whole of the Dutch East Indies. A report by Burgerlijken Geneeskundigen Dienst, BGD mentions that no part of East Indies was left unscathed.

**Impact on China** - China was hit in two waves. The first wave hit the country around June 1918 and had very less effect with the majority of young people being affected. The second wave was more devastating and hit the country hard around September. The spread started from South (Shanghai, Guangzhou) to remote parts of North. The country has no official records that show how much of people actually died. It's recorded that over 20% of the southern population was hit by the first wave and that number soared to over 70% by the end of the second wave which was in January 1919. Since China, at that time was very active in terms of trade specifically by the sea route, port cities like Dalian, Tianjin, Yochow, Wuhu, Zhenjiang, Ningbo, Santuao (Fujian), Shantou, Kowloon, Lappa, Pakhoi, Mengtsz, Heilongjiang, Jilin, Liaoling, Hebei, Shangdong, Jiangsu, Zhenjiang, Fujian, Guangxi, Hubei, Sichuan and Yunnan were hit in varying degrees.

There are several reasons that could have brought the virus to the country. Trade routes could have been a very potential and evident cause. Its close relation with Russia could also have been a cause. British army which took part in the World War could also have been a very potential cause. There are rumors however, that Spanish Flu 1918 could have also started from China itself by the working miners and spread to the rest of the world. However it is true that the first reported case of Spanish Flu was in Spain but since the media during those days was warped and in chaos, nothing could be said for sure.

**Prevention taken by Japan, Korea and Vietnam** - Japan and Korea also had their fair share of affected cases and mortality. However, understanding the gravity of the situation both countries decided to seal off their port routes. After the end of the world war by the late 1918, Japan sealed off most of its ports. Only a few were left open for Naval and military purposes. Japanese controlled Korea however sealed off its seaports way back. Japan and Korea have faced pandemics from the Heian era. Therefore, traditional medicines also helped to stop the spread of Spanish Flu. Vietnam on the other hand was a very inactive country during those times. The spread of the Flu was mainly attributed to the farming of Pigs and Cows. Vietnam sealed the sale and export of animal products in late September 1918. This greatly helped reduce the spread of the flu.

**Impact on European countries** – The exact death toll in Europe is not known. There was ban on media across Europe except for a very few countries, the war-ravaged lands couldn't distinguish between deaths due to war and the flu and other reasons accumulated together caused this uncertainty. Estimates suggest that, the number of deaths in Europe alone is somewhat around 8-10 million. Due to no media restrictions being imposed in Spain, it widely spread that King Alfonso XIII, was the first reported case of the flu. The flu then spread across the European continent and ravaged the already ravaged lands. Dense troop movement and very poor conditions of the rural areas helped the spread of the Flu. The following map shows the spread of the Flu in the continent.



**Impact on US and USSR** - The total deaths including both countries total up to about 1.2 million deaths. The Native Americans and frontline Russians were hit hard. In US, the flu is believed to have its roots at Haskell County, Kansas while in Russia the flu penetrated the war torn country through Belarus and Ukraine. It spread inwards hitting Kiev, Moscow and Petrograd. The economic condition of Russia and its vast army helped propagate the flu to the inlands. Due to cold weather conditions in East Russia, the number of cases in the east is quite low.

**Impact on Canada and Mexico** – The cold weather of Canada helped mitigate the effect of the flu in the country. The flu is believed to have caused about 50000 deaths. The spread of the flu was probably due to the active participation of Canada in the war. Inadequate quarantine measures, lack of coordinated efforts from health authorities and the poor condition of the rural regions helped the flu to spread. In Mexico, the flu entered through the US border and spread like wildfire causing about a quarter of a million deaths. Lack in proper medication and improper hygiene conditions further helped the spread of the flu.

**Impact on Australia and New Zealand** – One of the hardest hit countries due to the flu was New Zealand. Since both Australia and New Zealand mainly consisted of tribal Maoris and Pakeha, who lacked proper medication and hygiene, the flu hit them hard. Although the number of deaths might seem less because of the low population. The flu killed approximately 6500 Pakehas and 2500 Maoris.

### **Mortality in India during Spanish Flu of 1918 –**

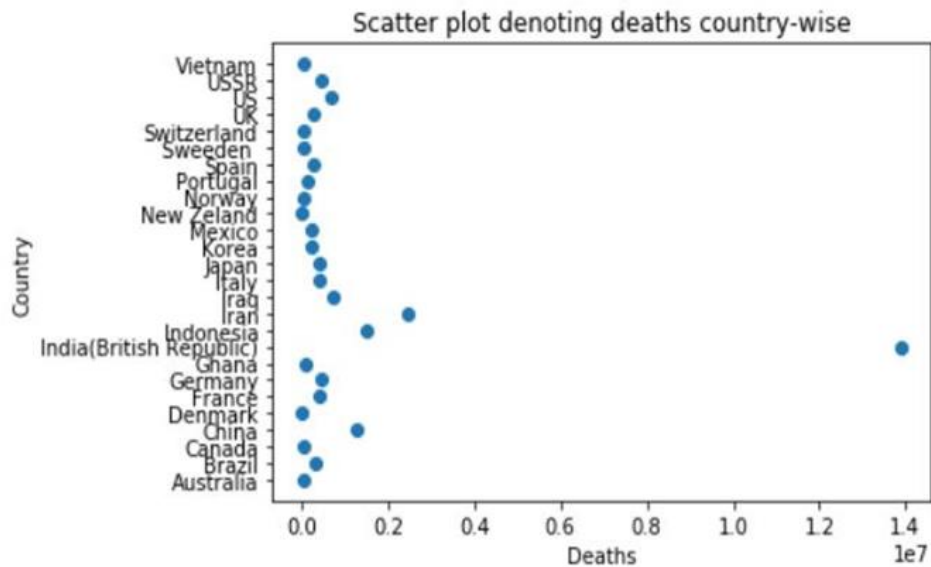
The Spanish Flu of 1918 (La Gripe Española), which lasted from January 1918 to December 1920 infected about 500 million people and is believed to have killed about 10% of the infected population and is considered among one of the deadliest pandemics of the world. The origin of the virus is believed to be in France but several other theories exist. Since it was an avian virus and had the ability to spread via air, it spread throughout the world very rapidly infecting and killing people on its way. The late stages of World War I and enormous troop movements to and from Europe helped the virus spread by leaps and bounds. India was no exception. The death toll of India was way larger than any other country.

**Start and Spread** – On 29th May 1918, a ship carrying Indian troops returning from the frontlines of the war reached the Bombay port. In those times, the war was at its final leg and thus there was continuous movement of ships in the Bombay port. Among this humdrum, the ship stayed docked for the next 48 hours. On June 10, seven police sepoy, few of whom were stationed in the docks were hospitalized with the influenza. In about a few weeks the virus spread like wildfire and soon engulfed the whole country.

### **Why no precautions were taken?**

During the 1st World War, the media of the participating nations were kept under wraps. This was done so as to keep the morale of the soldiers high. Since there was very little information about the virus, no one predicted that it would reach India.





The above horizontal scatter plot shows that, India had a death toll of 13.38 million, the highest among all the countries. A comprehensive analysis of Mortality in India is made below.

**No containment or confinement** – The state of the country during those times were very unstable. The British government ruled with a very firm hand and there were revolts going on every few days. Among this hotchpotch, the working class and lower middle class Indians still needed to work to earn their daily wages. Moreover the famine in 1918 further helped the spread of the flu. There were not enough medicines in hospitals, absence of skilled doctors and nurses and the poor condition of the country meant that the flu was neither contained nor checked.

**Results of the outbreak** – The country suffered heavy losses both in terms of human lives and money. Teenagers and adult people comprised majority of deaths. As compared to other nations, India had a very high female mortality rate. This could be because women in those days were mostly malnourished and very poor. India lost about 6% of their total population and Bombay lost about 27% of its population. The absolute inability and blunder caused by the British government in curbing the problem, added fuel to the fire. As an aftermath, the National movement became very strong and led by Gandhi, it gained immense support.

The Spanish flu taught the world that humanity still had a long way to go. Development in medicines, improve in healthcare and hygiene and proper facilities to treat ill people are the need of the hour.

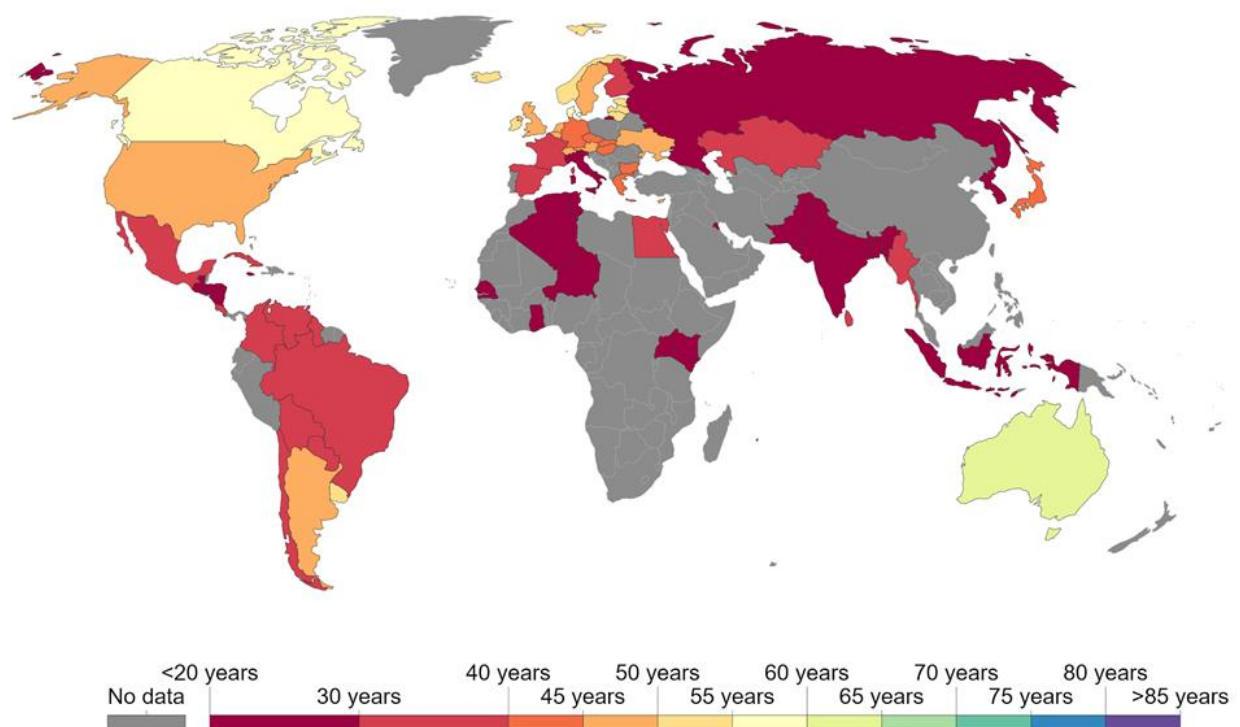
# Life Expectancy during the “Spanish Flu” pandemic.

The flu took place in three waves. The first wave (took place during the spring of 1918) being mild and the patients took a few days to a few weeks to recover depending on their immunity levels. It was during the second wave (broke out during Sep-Nov 1918) that the flu claimed the most number of victims. The virus by now had mutated and had enhanced virulence. It affected healthy people who were also immune to the first wave. This the deadliest phase of the flu. At the beginning of 1919, some places reported a “third” wave.

## What is Life Expectancy?

Life expectancy is basically a calculated figure that tells how long an organism is supposed to live. It is measured using historical data and statistical methods. During measuring the life expectancy of a person, analysts have to take several factors into consideration such as demographics, the economic stability of the region, etc.

## Life expectancy, 1918



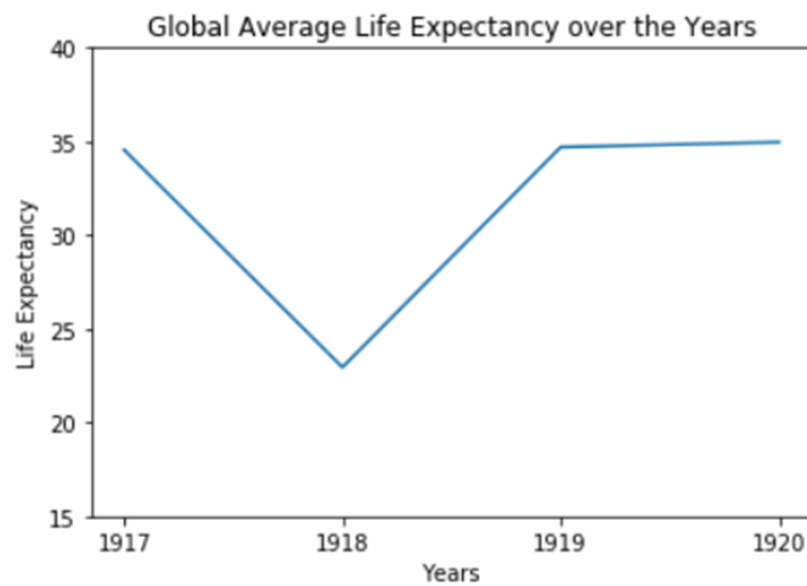
Source: Riley (2005), Clio Infra (2015), and UN Population Division (2019)

OurWorldInData.org/life-expectancy • CC BY

Note: Shown is period life expectancy at birth, the average number of years a newborn would live if the pattern of mortality in the given year were to stay the same throughout its life.

Now with the jargons out of the way let us take a look at what was the life expectancy during the “Spanish” flu pandemic(1918-1920) and draw some conclusions from the data.

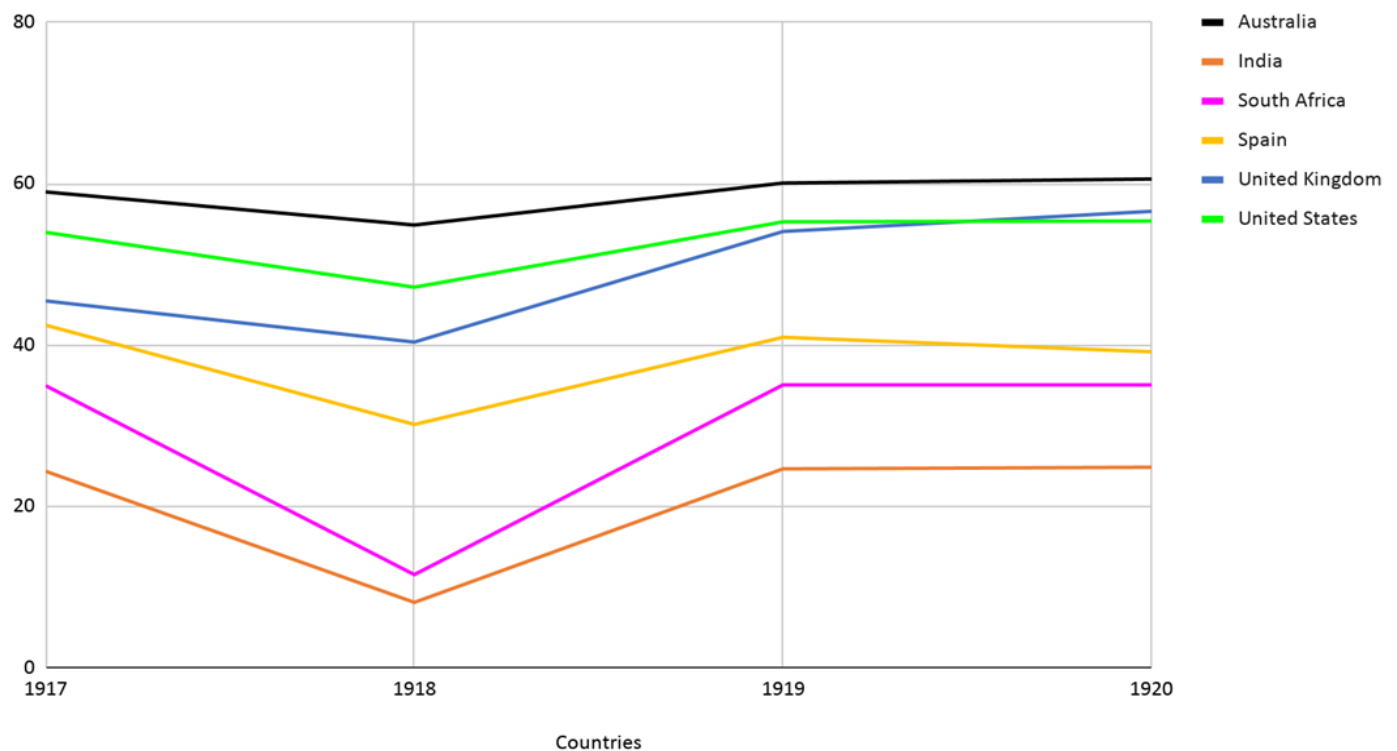
## Global Average



- From the plot above we see that there's a dip in the life expectancy with an all-time low of 22.5 years globally with the onset of the pandemic,
- Within a year, after the pandemic had passed, the life expectancy was back on track with an average of 35 years
- During 1918, people most vulnerable to the flu was between the ages of 17- 40.

## Around the World

### Life Expectancy During "Spanish" Flu Pandemic



### **Australia:**

Australia had the highest life expectancy amongst all the countries both before and after the pandemic. Their maritime policy failed to protect them from the virus and the it entered Australia in early 1919. But maritime quarantine definitely helped in slowing down the spread. Within a span of six months 12,000 people were dead and nearly 200,000 Australians were infected.

### **India:**

During the pandemic, India had the lowest life expectancy of around 8 years. In India, the flu had its root from Bombay. In the first wave the flu was confined to Bombay, however during the second wave, the flu spread throughout whole of India with a staggering death toll of 15 million.

### **South Africa:**

South Africa saw a staggering drop from 35 years to 11 years. The flu was transmitted by the homecoming World War 1 soldiers. They stopped at Sierra Leone where the flu was already prominent. Before they could reach home, some soldiers started showing symptoms of the flu onboard. On arriving at Table Bay, the medical officer in charge advised the soldiers be tested for influenza. Within the next 72 hours, soldiers were tested thrice in haste and dispatched. Even before they could reach home, they started showing symptoms of the flu thus transmitting to the entire country.

### **Spain:**

Unlike other countries, Spain's life expectancy did recover after the pandemic but slowly started going downhill thereafter. The first reported case of the flu was in Madrid. Because of Madrid's yearly local holidays people gathered which further helped in spreading the virus. Spaniards observed the same situation we people (in CoVID-19) are in now. All services except communication, financial institutions were suspended until further notice.

### **United Kingdom:**

United Kingdom on the other hand had the least drop in life expectancy, but it was observed that young adults were most vulnerable to the flu in 1918 and the elderly people aged more than 75 had the least death rate of all. Some experts opinioned that the elderly were already subjected to the Russian Flu (1889-1890) and as a result had developed a slight immunity towards the new flu.

### **United States:**

After the pandemic passed, the life expectancy in United States rose to 55 years. State officials were trying to control the outbreak, but Philadelphia hosted the Liberty Loan Parade which is estimated to have exposed 200,000 people to the Spanish flu. Within a span of few days 12,000 deaths were recorded in the city. On the other hand, New York came up with measures to avoid overcrowding and thus lessen transmission.

### How the Life Expectancy drop and rose again

- **Aftermath of WW1:** The pandemic hit immediately after the end of the World War 1. Industries, public health centers were disrupted. Millions were getting infected and the medical professionals had no idea on how to treat the patients. On top of that the homebound soldiers took the virus to different parts of the world.
- **Public health measures:** Governments of most countries shut down public community places, schools, offices, etc. Disinfecting the streets were now a common sight. For the financially backward, officials arranged for soap and water and banned anybody to spit on the streets. They also set up centers for checking milk and other food products. These measures helped in curbing the spread of the virus to some extent.
- **Back to Normalcy:** Reports suggest after the virus died out in early 1919, there was an increase in 50% of market value which lasted until the end of 1919. From this we can infer that industries were getting back on track and thus people could now find jobs. This in turn let them provide for their families which drastically brought up the life expectancies in countries around the world.

### Takeaway

The Spanish Flu was one of the deadliest pandemics in modern history. With no vaccines or medicines, the only viable way people could protect themselves was by avoiding transmission. We can't control the outbreak of pandemics in the future but with the lessons learnt from the "Spanish" flu we can model a better pandemic preparedness plan - which we are doing currently in the case of COVID-19.

## Economic Impact

The Spanish flu outbreak of 1918 had far reaching economic effects. Offices, theatres, businesses were shut down, to contain the outbreak. Important fact worth noting is that males aged 18 to 40 were highly affected, and had serious economic impact, both in the businesses and factories they worked for, and also for their own families.

Important thing to understand, in case of trying to assess the economic situation in those days is that, there is not adequate data for those times. Economic data is highly lacking.

### In United States of America

The Spanish flu pandemic had killed almost 675,000 people in the United States (nearly 0.8 percent of the 1910 population). In 1918 and 1919, the USA was highly involved in the war (World War I). Although the pandemic outbreak occurred almost 100 years ago, lessons from it can have high relevance even in today's world. The high involvement of USA towards the end of the war meant large troop movements. These men lived very close to each other, and often proper hygiene was not practiced in wartime. These men (mainly aged 18-40) thus became highly susceptible to flu infection. The war cost the government a lot, large part of the national budget was being spent in war. The US, already burdened with the war was ill-prepared for the pandemic outbreak.

Also, worth noting is that, the healthcare measures must be ensured to remain in action during in health crisis. Even if good healthcare measures are in place, if the pandemic knocks out the provisions, then it does no good.

For example, in Philadelphia during 1918, the city healthcare system was overwhelmed by the number of cases. In the data given ahead, it can also be seen that Philadelphia had a mortality rate of 932.5 (per 100,000 people), which is among the highest in the data. In Philadelphia during the 1918 pandemic, "the city morgue had as many as ten times as many bodies as coffins."

As, stated earlier the lack of data makes understanding the economic situation very hard. But in a 2007 research paper by Thomas A. Garrett, Federal Reserve Bank of St. Louis; "Economic Effects of the 1918 Influenza Pandemic", he has tried to understand the effects from newspaper articles of that time.

For example, "Influenza Crippling Memphis Industries." *The Commercial Appeal*, Oct. 5, 1918, page 7.

Industrial plants are running at limited capacity. Out of a total of about 400 men in the transportation department of the Memphis Street Railway, 124 men were incapacitated the day before due to the pandemic. This led to limitations on the Street Railway service. The Cumberland Telephone Co. reported that more than 100 operators were absent from duty.

The telephone company hence asked that unnecessary calls be eliminated.

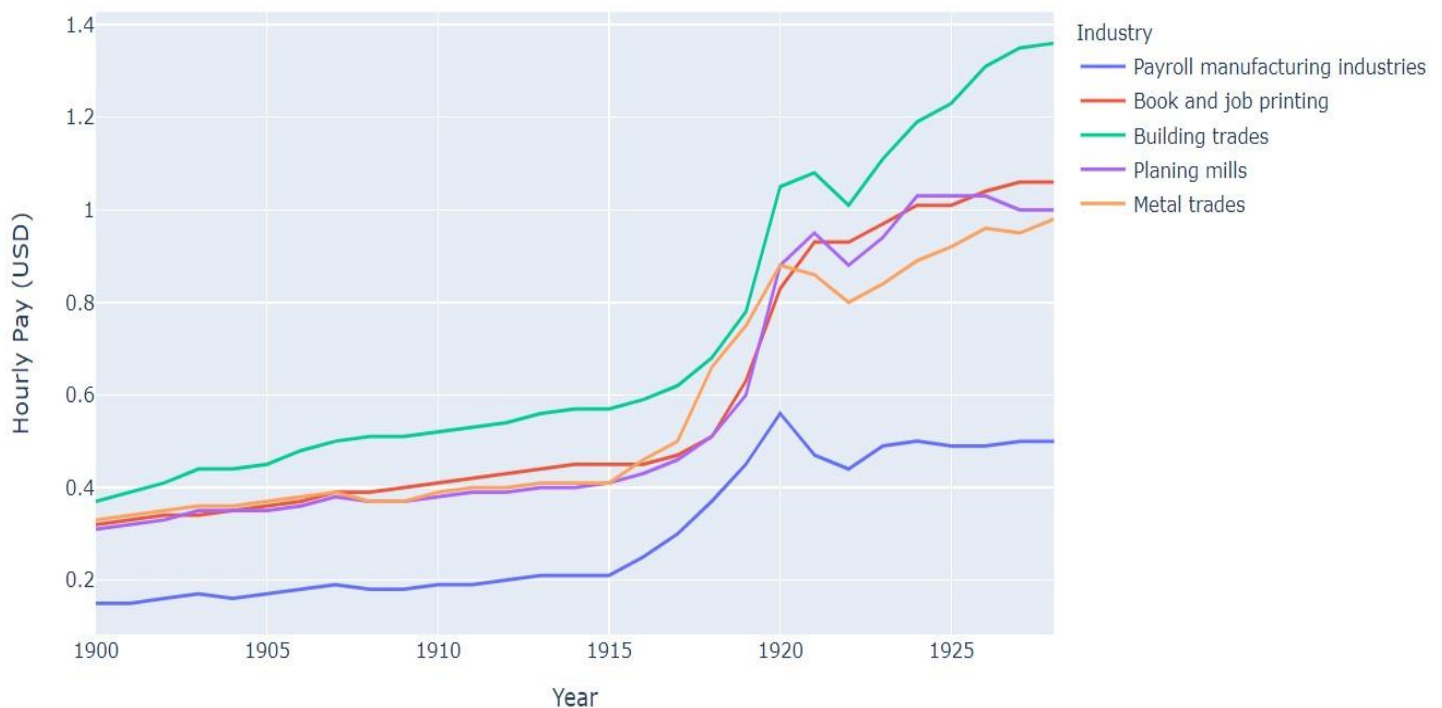
<i>City</i>	<i>1910 Population</i>	<i>1915 Mortality rate</i>	<i>1918 Mortality rate</i>	<i>1919 Mortality rate</i>	<i>Ratio of 1918 and 1915 rates</i>
<i>Birmingham, Alabama</i>	1,32,685	158.1	843.6	319.1	5.3
<i>Los Angeles, California</i>	3,19,198	87.4	484.5	186.8	5.5
<i>Oakland, California</i>	1,50,174	98.6	496.6	238.2	5.0
<i>San Francisco, California</i>	4,16,912	130.6	647.7	283.3	5.0
<i>Denver, Colorado</i>	2,13,381	184.8	727.7	228.5	3.9
<i>Bridgeport, Connecticut</i>	1,02,054	206.0	825.4	272.3	4.0
<i>New Haven, Connecticut</i>	1,33,605	207.9	768.0	212.3	3.7
<i>Washington, D.C.</i>	3,31,069	189.8	758.8	225.9	4.0
<i>Atlanta, Georgia</i>	1,54,839	165.7	478.4	291.4	2.9
<i>Chicago, Illinois</i>	21,85,283	172.7	516.6	191.5	3.0
<i>Indianapolis, Indiana</i>	2,33,650	146.7	459.4	240.6	3.1
<i>New Orleans, Louisiana</i>	3,39,075	245.8	768.6	333.7	3.1
<i>Baltimore, Maryland</i>	5,58,485	207.1	836.5	230.6	4.0
<i>Boston, Massachusetts</i>	6,70,585	214.6	844.7	256.3	3.9
<i>Cambridge, Massachusetts</i>	1,04,839	157.3	676.5	180.0	4.3
<i>Fall River, Massachusetts</i>	1,19,295	213.5	799.7	216.8	3.7
<i>Lowell, Massachusetts</i>	1,06,294	191.3	696.1	198.4	3.6
<i>Worcester, Massachusetts</i>	1,45,986	188.9	727.1	248.9	3.8
<i>Detroit, Michigan</i>	4,65,766	148.1	413.4	242.4	2.8
<i>Grand Rapids, Michigan</i>	1,12,571	100.0	282.7	93.8	2.8
<i>Minneapolis, Minnesota</i>	3,01,408	121.6	387.7	169.4	3.2
<i>St. Paul, Minnesota</i>	2,14,744	127.8	480.6	145.9	3.8
<i>Kansas City, Missouri</i>	2,48,381	176.1	718.1	301.1	4.1
<i>St. Louis, Missouri</i>	6,87,029	156.7	536.5	202.3	3.4
<i>Omaha, Nebraska</i>	1,24,096	150.9	660.8	191.8	4.4
<i>Jersey City, New Jersey</i>	2,67,779	211.2	756.6	317.0	3.6
<i>Newark, New Jersey</i>	3,47,469	146.6	680.4	213.3	4.6
<i>Paterson, New Jersey</i>	1,25,600	159.4	683.6	235.7	4.3
<i>Albany, New York</i>	1,00,253	187.1	679.1	244.8	3.6
<i>Buffalo, New York</i>	4,23,715	168.7	637.5	206.2	3.8
<i>New York, New York</i>	47,66,883	212.1	582.5	265.8	2.7
<i>Rochester, New York</i>	2,18,149	121.8	522.7	152.8	4.3
<i>Syracuse, New York</i>	1,37,249	120.5	704.6	155.9	5.8
<i>Cincinnati, Ohio</i>	3,53,591	163.4	605.4	253.2	3.7
<i>Cleveland, Ohio</i>	5,60,663	155.1	590.9	260.5	3.8
<i>Columbus, Ohio</i>	1,81,511	136.5	451.9	213.5	3.3
<i>Dayton, Ohio</i>	1,16,577	142.7	525.2	154.6	3.7
<i>Toledo, Ohio</i>	1,68,497	126.8	401.0	181.9	3.2
<i>Portland, Oregon</i>	2,07,214	69.6	448.2	246.4	6.4
<i>Philadelphia, Pennsylvania</i>	15,49,008	189.2	932.5	222.9	4.9
<i>Pittsburgh, Pennsylvania</i>	5,33,905	260.1	1243.6	431.8	4.8
<i>Scranton, Pennsylvania</i>	1,29,867	223.7	985.7	247.5	4.4
<i>Providence, Rhode Island</i>	2,24,326	191.4	737.4	253.3	3.9
<i>Memphis, Tennessee</i>	1,31,105	179.3	666.1	340.6	3.7
<i>Nashville, Tennessee</i>	1,10,364	179.9	910.2	301.0	5.1
<i>Richmond, Virginia</i>	1,27,628	209.9	661.0	269.5	3.1
<i>Seattle, Washington</i>	2,37,194	74.7	425.5	189.8	5.7
<i>Spokane, Washington</i>	1,04,402	91.9	487.4	210.7	5.3
<i>Milwaukee, Wisconsin</i>	3,73,857	158.9	474.1	187.7	3.0

This data is from “Garrett, Thomas A. Pandemic Economics: The 1918 Influenza and Its Modern-Day Implications.” The rate is per 100,000 people.

The data shows the population and mortality rates of select US cities. The population from the 1910 census, the 1915, 1918 and 1919 mortality rates are given. The mortality rate is given per 100,000 people. The data suggests that influenza mortalities in U.S. cities during the pandemic were three to five times higher, on an average, than during a non-pandemic year (1915). This highly crippled the financial and economic machinery in the US cities. Almost all large industrial and financial centers were hit. Manufacturing, construction, iron and steel, automobile industries were highly impacted. The pharmaceutical and medical supplies industry were the only industries that thrived at that time.

Influenza mortalities had a direct impact on the worker wages in the US industries. It is based on a simple economic model; large number of deaths in the age group of 18-40 in males led to decrease in number of workers for the industrial sector. This reduced the labor supply, thus increasing the marginal product of labor and capital per worker and led to increased wages. In fact, data also supports this assumption.

#### USA Pay over time



(Data published on Statista by Aaron O'Neill, Mar 17, 2020)

There was already a demand for labor in US, as due to the war many men were drafted into the armed forces. And after the pandemic outbreak of 1918, the demand and pay rate also increased. Let us try to understand this labor hourly pay data.



### **Payroll manufacturing industries.**

Manufacturing is one industry that holds a high proportion of unionized labor. Manufacturing pay scales usually come with different pay cycles as well for workers, and this can make payroll administration for manufacturing quite challenging. Here it relates to the manufacturing sector working as workers working in assembly work, machine operation, packaging, shipping, or supervising. This indicates that this sector had high need of labor and hence an increase in hourly wages.

### **Book and job printing**

Job Printing is printing that uses display type and no more than a sheet or two of paper. Short as that definition is, it encompasses a world of paper items—tickets, letterheads, notices, invoices, vouchers, coupons, cards, labels, posters, receipts, and timetables, to name only a very few. Book Printing refers to the mainstream printing industry.

### **Building trades**

Related to the building and construction industry, trades (as carpentry, bricklaying, plumbing) that are essential to and chiefly practiced in connection with building construction. This sector saw a high increase in the hourly wages, indicating a large increase in demand in this sector.

### **Planing mills**

Related to the timber and woodwork industry, a planing mill is a facility that takes cut and seasoned boards from a sawmill and turns them into finished dimensional lumber.

### **Metal trades**

Related to the metal industry. Jobs like blacksmith, foundry workers, metal mine workers, Steel erector, Welder, Boilermaker and so on.

## **What we can understand.**

The influenza pandemic caused a lot of economic and financial problems for the United States. Coupled with wartime expenditure, this led to various issues in those times. Businesses in entertainment and service sectors faced huge losses. Businesses in the healthcare industry experienced an increase in revenue.

Urban areas and cities, with most of the business and offices were highly affected by the flu, with death rates increase to many times of death rates. These lead to breakdown in the civil infrastructure of the cities and caused economic and financial problems.

Overall, it hampered the economic growth and led to closure of many businesses and firms. Labor hourly pay rates increased due to increase in demand.

## Effects of Social Distancing

The pandemic is thought to have begun in crowded army training camps on the Western Front. The unhygienic conditions especially in the trenches along the French border – helped it to spread and have a far-reaching impact. The war ended in November 1918, but as the soldiers returned home, bringing the virus with them, an even greater loss of life was just around the corner; between 50 million and 100 million people are thought to have died. The virus infected 500 million people worldwide and killed an estimated 20 million to 50 million victims— that's more than all the soldiers and civilians killed during World War I combined.

### Why was the 1918 flu so deadly?

Most deaths in the 1918 influenza pandemic were not due to the virus alone but due to the opportunistic bacterial infections that took advantage of the weakened immune system of the affected individuals. Most of the bacteria recovered from patients, dead or alive, are common colonizers of the noses and throats of healthy people. According to the researchers, the 1918 virus did induce severe immune reactions, particularly among young adults but what made the reaction so deadly was that it destroyed the lining of the respiratory system, making it easier for bacteria to infect the lungs. When the Spanish flu first appeared in early March 1918, it had all the symptoms of a seasonal flu like high fever that lasted only three days, and mortality rates were similar to seasonal flu. Luckily, the first wave of the virus wasn't particularly deadly. In late August 1918, in Europe, a mutated strain of the Spanish flu virus had emerged that had the power to kill a perfectly healthy young man or woman within 24 hours of showing the first signs of infection. The military ships that departed from the English port city of Plymouth carried troops unknowingly who were infected with this new, far deadlier strain of Spanish flu. As these ships arrived in cities like Brest in France, Boston in the United States and Freetown in west Africa, the second wave of the global pandemic began. The entire military industrial complex of moving lots of men and material in crowded conditions was certainly a huge contributing factor in the ways the pandemic spread was indeed a major contributing factor in the outbreak of the pandemic.

### **Implementation of Social Distancing and its Effects: -**

Back in 1918, states and cities across the country told people to stay home. Schools and restaurants were shut down. Public events and community gatherings were canceled. People were told to isolate and quarantine. In some places which lasted for months. All of these led to a huge disruption in American life. Although it worked, things were not so smooth as people didn't always obey what experts and followed Social Distancing. But studies show that the social distancing efforts helped slow the spread of the 1918 flu and reduce the mortality rate overall.

Sustained, Layered and Early actions saved lives which was perhaps the most important takeaway from the 1918 flu. The people acted quickly particularly before the flu got to an inflection point in which the virus infected a certain amount of people and spread rapidly. They sustained interventions until the virus truly went away and quickly redeployed if the virus came back. The best thing was that the approaches were layered. Placing restriction on top helped a lot which meant advising against or prohibiting just about every aspect of public life, from schools to restaurants to entertainment venues (with some exceptions for grocery store and medical shops). Cities in which multiple interventions were implemented at an early phase of the epidemic also showed a trend toward lower cumulative excess mortality, but the difference was smaller approximately 20% which was less statistically significant than that for peak death rates.

The chart on next page from the PNAS study, which shows that Philadelphia had a much bigger spike in deaths, while St. Louis kept its death toll down overall due to social distancing measures. Philadelphia waited eight days after their death rate began to take off before banning gatherings and closing schools. They endured the highest peak death rate of all cities studied. Philadelphia, as just one example, didn't cancel a World War I parade as the 1918 flu picked up, which likely led to thousands of infections.

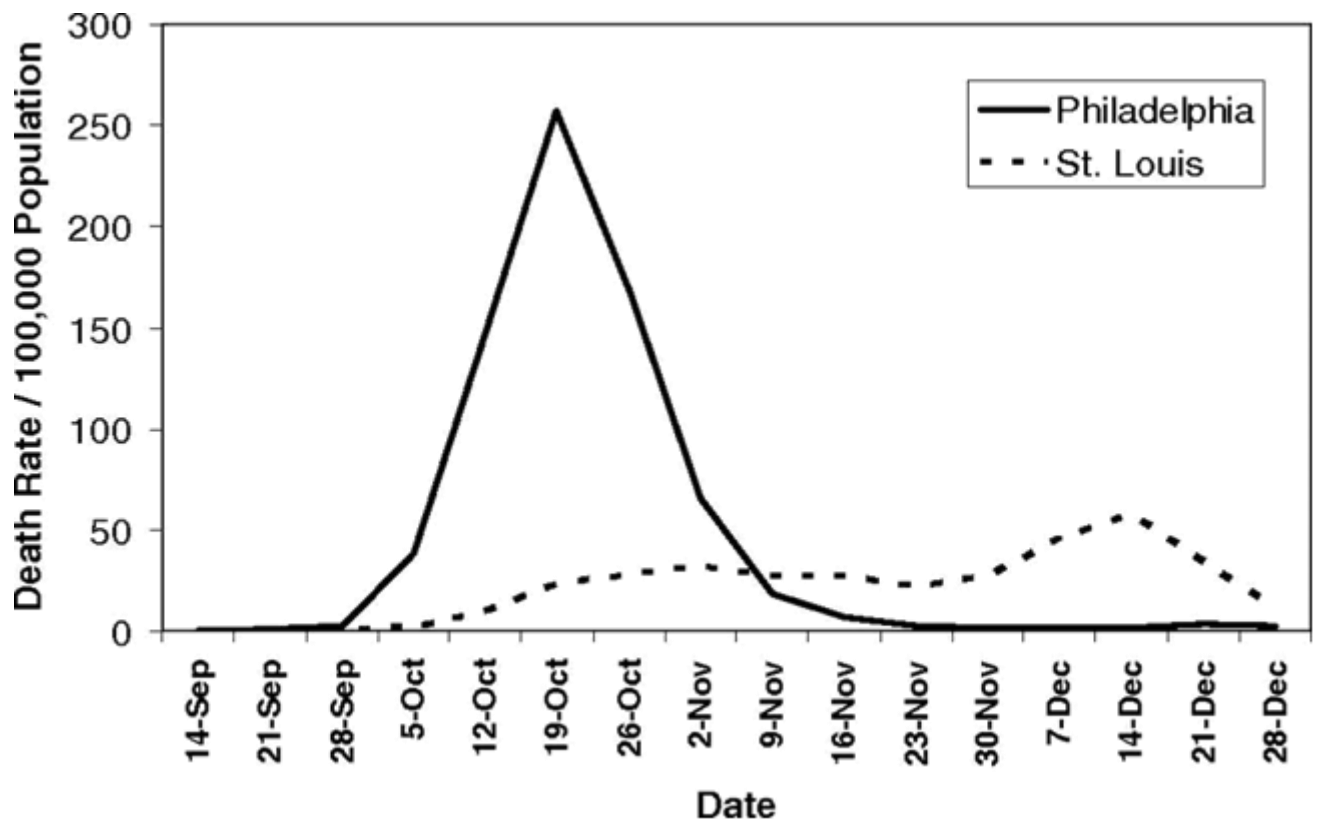


Fig: Comparative analysis of Weekly deaths per 1,00,000 in Philadelphia & St. Louis.

As the pandemic appeared to subside, St. Louis pulled back its social distancing measures. But it turned out that the pullback was premature — and flu deaths started to rise once again. This graph shows that, with the line chart tracking flu deaths over time and the black and gray bars below showing when key social distancing measures were in place. Thus, we can conclude that St. Louis had strong social distancing measures and a low total death rate. The city successfully delayed its peak in deaths, but faced a sharp increase when restrictions were temporarily relaxed.

Notably, the second spike in deaths only appeared when cities removed social distancing measures. The PNAS study, which looked at 17 US cities, reported similar findings that no city experienced a second wave while its main battery of nonpharmaceutical interventions was in place. Second waves occurred only after the relaxation of interventions. In a lot of cities, similar premature pullbacks produced a lot of “double-humped epi curves”. Officials instituted social distancing measures, saw flu cases fall, then pulled back the measures, saw flu cases rise again, and reactivated the measures.

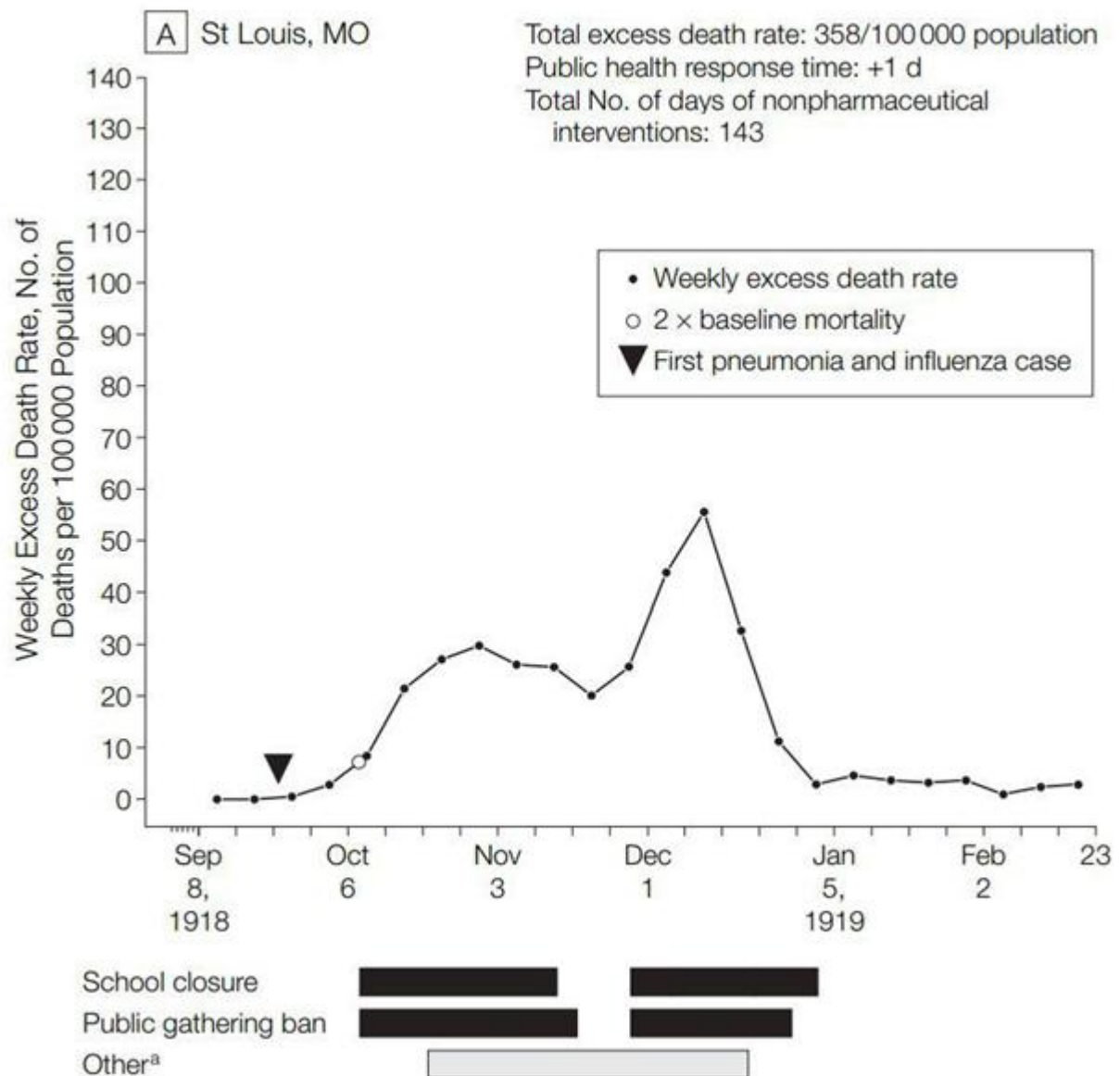


Fig: Weekly Excess Death Rate & Death Rates per 1,00,000 population

Seeing the effects of outbreaks drove people to serious action. But people did do social distancing for weeks and months during the 1918 flu pandemic.

New York City began quarantine measures very early—11 days before the death rate spiked. The city had the lowest death rate on the Eastern Seaboard. After relaxing social distancing measures, San Francisco faced a long second wave of deaths.

The visual on the next page shows a comparison of death rate per 100,000 population in 1918, based on their strict or lenient lockdown policy.

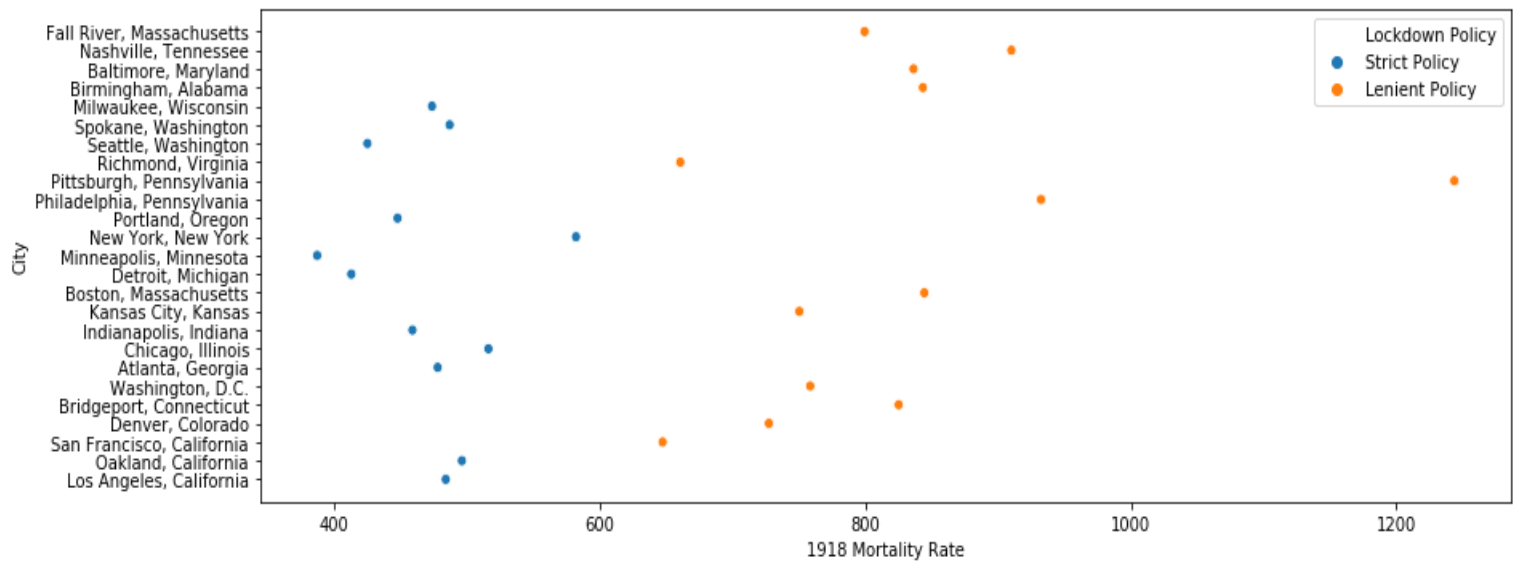


Fig- US Cities based on strict vs lenient lockdown policies (per 100,00 people)

The rise of globalization, urbanization, and larger, more densely populated cities facilitated the virus' spread across a continent in a few hours—while the tools available to respond have remained nearly the same. Public health interventions were the first line of defense against an epidemic in the absence of a vaccine. These measures include closing schools, shops, and restaurants; placing restrictions on transportation; mandating social distancing and banning public gatherings. This is how small groups saved lives during a pandemic. Thus, we can conclude that the cities that ordered Social Distancing measures for shorter periods tended to have spikes in death and higher death rates as compared to the cities that had longer social distancing measures.

## Relation to the Covid-19 Outbreak

In comparing the two outbreaks, there are a number of things to be considered. The COVID-19 is caused by a coronavirus, whereas the Spanish Flu was caused by an influenza virus. There also seems to be a difference in age specific mortality. Spanish flu was seen to be dangerous to young and old alike, but the COVID-19 seems to be more lethal towards the elderly.

In case of the Spanish flu, railroads and ships were the only means to carry people over long distances. Hence spread of the virus was gradual. In today's modern world, with planes and shorter ship travel times, the virus was carried to many corners of the world in a short time.

Spanish flu hit the world in a time before Sir Alexander Fleming had discovered Penicillin. Without antibiotics, many deaths were perhaps, not caused by virus itself, but by secondary bacterial infections.

Spanish Flu reminds us how large can be, the impact of a pandemic. A new unknown pathogen can cause terrible devastation and numerous deaths. It served as a motivation, to prepare for such large pandemic outbreaks.

The Spanish Flu pandemic did teach us important things. It showed us that, in battles such outbreaks, the most important tool we have is social distancing and lockdowns. Back in 1918, US cities with strict lockdown policies recorded lower deaths. A similar attitude is to be followed in case of the COVID-19 outbreak.

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