

The Black Death

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This month marks the second anniversary of the first recorded case of COVID-19 in the United States. And, just in case you haven't heard or read enough about pandemics in the past year or two, I thought I'd speak tonight about the worst pandemic in history – the Black Death.

COVID-19 is the deadliest pandemic we've faced in our lifetime, but the deadliest pandemic in recorded history occurred in the mid-14th century. Known as the Great Mortality or the Great Pestilence, or the Second Plague Pandemic, it claimed the lives of a third to half or more of the population of Europe between 1346 and 1353. This disease, labeled the bubonic plague, swept from central Asia westward to the Mediterranean. From there, it spread to Northern Africa, the Middle East and in a clockwise direction into Europe causing the deaths of an estimated 75 to 200 million people across Asia, Europe and Africa. The Great Mortality resulted in prolonged and widespread social and economic upheaval, transforming Europe into an environment that was fertile for development of the Renaissance a century later. It wasn't until the 16th century that Europeans began to refer to the pandemic as the Black Death.

This paper briefly examines the Black Death in the historical context of major pandemics, circumstances in Europe leading up to the Black Death, the origin and spread of the Black Death, medieval theories regarding the Great Mortality, clinical manifestations and current science regarding plague transmission, descriptions of the mortality caused by the Black Death, medieval treatment and reactions to the plague, the recurrences and end of the pandemic, the economic, social and political consequences of the plague, the plague's impact on the Church, medicine and art, and finally a brief look at this pandemic in the context of our current COVID-19 pandemic.

But first, a few definitions...

Pandemic, Epidemic, and Endemic

A **pandemic** is a disease affecting a large number of people in multiple countries or regions around the world (e.g., COVID-19).

An **epidemic** is an outbreak of disease that spreads quickly and affects a disproportionately large number of individuals within a population or region at the same time (e.g., seasonal influenza). A **pandemic** is a type of **epidemic** but one with greater range and coverage.

A disease becomes **endemic** when it is present at baseline levels but is limited to a particular population or region (e.g., malaria).

COVID-19 was initially an *epidemic* that became a *pandemic*. Many experts believe COVID-19 will eventually become *endemic*.

Pandemics Through History

Throughout history there have been many pandemics. The following table lists major pandemics. The death toll numbers are estimates based on best available research. Note that there have been three plague pandemics, the Plague of Justinian in the 6th century, the Great Mortality or Black Death in the 14th century and the so-called Third Plague Pandemic affecting central and eastern Asia in the late 19th century.

Of all the pandemics, the Black Death was the most severe, causing more death and suffering than any other event in history.

Name	Date (CE)	Pathogen / Vectors	Death toll
Antonine (Galen's) Plague	165-180	<i>Variola?</i> (smallpox)	5M
Plague of Justinian	541-543	<i>Yersinia pestis</i> / Rats, fleas	30-50M
Black Death	1346-1353	<i>Yersinia pestis</i> / Rats, fleas	75-200M
New World Smallpox	1520 –	<i>Variola</i> (smallpox)	56M
Great Plague of London	1665	<i>Yersinia pestis</i> / Rats, fleas	100,000
Italian Plague	1629-1631	<i>Yersinia pestis</i> / Rats, fleas	1M
Cholera Pandemics 1-6	1817-1923	<i>Vibrio cholerae</i> / Infected water	1M+
Third Plague Pandemic	1855-1901	<i>Yersinia pestis</i> / Rats, fleas	12M (China/India)
Yellow Fever	late 1800s	Yellow Fever Virus / Mosquitoes	100,000-150,000 (US)
Russian Flu	1889-1890	H3N8 influenza virus? / Avian?	1M
Spanish Flu	1918-1919	H1N1 influenza virus / Avian	40-50M
Asian Flu	1957-1958	H2N2 influenza virus / Avian	1.1M
Hong Kong Flu	1968-1970	H3N2 influenza virus / Avian	1M
HIV/AIDS	1981-	HIV / Chimpanzees	25-35M
Swine Flu	2009-2010	H1N1 influenza virus / Pigs	200,000
SARS	2002-2003	Coronavirus / Bats, civets	770
Ebola	2014-2016	Ebolavirus / Bats, primates	11,000
MERS	2015-	Coronavirus / Bats, camels	850
COVID-19	2019-	Coronavirus / Bats, pangolins?	5.5 M*

*to date

The following table compares the death toll of some major pandemics as a percentage of the world population at the time the pandemic occurred:

Pandemic (Date)	Death Toll (% of Population)	Death Toll in Millions	Estimated Population in Millions (Date CE)
Black Death (1346-1353)	25-50	75-200	400 (1300)
Plague of Justinian (541-549)	19.1	40	210 (500)
New World Smallpox (1520-)	12.1	56	460 (1500)
Antonine Plague (165-180)	2.6	5	200 (200)
Spanish Flu (1918-1919)	2.5	45	1,820 (1919)
The Third Plague (1855-1901)	1.0	12	1,260 (1850)
HIV/AIDS (1981-)	0.7	30	4,460 (1981)
COVID-19 (2019-)	0.07	5.5	7,900 (2021)

Of note is that as bad as COVID-19 has been, less than 0.1% of the world's population has died from COVID-19. In contrast, the Black Death resulted in the deaths of between 25% and 50% of the world's population. **Today a pandemic disaster on the scale of the Black Death would claim 1.9 billion lives.**

Setting the Stage – On the Brink of the Black Death

After the fall of the Roman empire in the 5th century, the population of many urban centers declined with many city dwellers migrating to the country where they turned to subsistence farming. Rome itself experienced a dramatic decline in population from over 1,000,000 residents at the time of Christ to only 35,000 residents in 1000 CE. Other European cities also saw significant population declines during the first millennium. In 1000 CE, the population of Europe is estimated to have been 38 million and the population of the world, 250 million.

With urban depopulation in the Early Middle Ages, Europe became largely an agrarian, feudal society organized in terms of the three orders: those who fought – the nobles, those who prayed – the clergy, and those who worked – the peasants and townspeople. Comprising 90% of the population, the peasants were poor and largely illiterate and served as craftsman and farmers providing for the physical needs of the clergy and the nobles. The nobles, comprising 5% of the population provided protection for the rest of society. They grew wealthy from the labors of the peasant farmers. The remaining 5% of the population, the clergy, functioned to protect society from sin and evil. Christianity was the principal religion of medieval Europe.

During the twelfth and thirteenth centuries, Europe saw a level of economic prosperity not seen since before the fall of Rome. The three centuries between 1000 and 1300, known as the High Middle Ages, were characterized by significant demographic changes. Due to a combination of climatic, social and technological developments, the population of Europe nearly doubled between 1000 and 1300 from an estimated 38 million to 74 million people. With prosperity also came an increase in life expectancy from roughly 25 years in 1000 to 35 years in 1300. Favorable weather and agricultural advances such as the heavy plow, the three-field system, and the water mill contributed to the increased agricultural production. The period between 950 and 1250, known as the *Medieval Climate Optimum* was characterized by a period of climate warming resulting in prolonged growing seasons and a warming of the seas. The consequences of the increased harvests and a boom in fishing were improved nutrition and ultimately an increase in population and lifespan.

Simultaneously in Asia in the 13th century, Mongol conquests in central Asia have been theorized to have been ecologically disruptive forcing a closer association between rodents and humans.

The population growth in Europe led to increased urbanization and the consequential rise of the merchant class, as well as, a commercial revolution with expanded contacts between Europe and the rest of the known world. This was exemplified by Marco Polo who had made his way between Europe and China in the late 13th century. In 1340, just a few years prior to the outbreak of the Black Death, Paris, with over 200,000 population and Florence and Venice, both with over 100,000 population were the largest European cities.

The population growth of the High Middle Ages resulted in urban overcrowding and in the concentration of people, waste, garbage and animals into a few square miles within towns. Most towns had outdoor slaughterhouses from which animal parts and blood were discarded into street gutters or into local waterways. Chamber pots were typically emptied into the street gutters that, in turn, emptied into the local water supply. In some French cities, so much filth had accumulated that some streets were reportedly named after human waste, inspired by the French word *merde*. Individual hygiene was lacking with people typically going for long periods without bathing. Monks were admonished not to bathe more than two to three times per year. Many people believed that hot water from bathing opened the pores, leaving one more vulnerable to disease.

In much of medieval Europe, the public health code consisted of a single ordinance that required homeowners to shout, "Look out below!" three times before dumping a chamber pot into the street.

A Turn for the Worse

By 1300 the good fortune of the High Middle Ages had come to an end. The **Medieval Climate Optimum** had ended and the world entered what has been labeled the *Little Ice Age*. Winters became harsher and harvests were smaller. The population boom had created a land crunch and an increased demand for crops. More land could not be cultivated and the yield of existing farmland could not be increased. Due to the climatic downturn, harvests in 1315-1317 were disastrous and resulted in the Great Famine. Food shortages and soaring food prices led to widespread starvation and malnutrition, which led in turn, to a decline in health and an increased susceptibility to disease. It has been reported that the situation was so dire that clergy and nobles prayed for a pestilence to reduce the population of the lower class so that those who survived could live in more comfort. (Magner, Lois N (1992) *A History of Medicine*, pp118-119). Little did they know that within a few decades their prayers would be answered.

It was against this backdrop of increased population, climate change, decreased farm production, commercialization, and urban crowding with lack of sanitation and personal hygiene that the Black Death made its grand entrance.

Origin of the Plague

From genomic studies, it has been concluded that the Black Death most likely originated as a **zoonosis** from the steppe (grasslands) of central Asia (now west central China). A **zoonosis** is an animal disease that passes to humans. Ancient records indicate the Black Death struck China, India, Persia, Syria and Egypt in the 1330s and 1340s. From Asia, the plague spread by merchant caravans and Mongol armies via trade routes. Ships of the Italian states brought the plague to Western Europe in 1347 via Crimean ports in the Black Sea. The first recorded arrival of the plague in Western Europe was in Messina, Sicily in October, 1347. Thereafter, the plague spread throughout Europe.

Traditionally, the plague was believed to have been introduced to Europeans at the Crimean port city of Caffa (now Feodosiya, Ukraine). Caffa became a Genoese trade center in 1266 and by 1300, it had grown to 40,000 residents. In 1343, a skirmish between the Christian Italians and the Islamic Mongols prompted the Mongols to attack Caffa. For over two years the Mongols laid siege on and off to the port city. The traditional narrative relates that the siege ultimately ended soon after Mongol reinforcements from the east brought the plague to the Tatar-Mongol forces in 1346.

Gabriele de' Mussi, an Italian notary (ca.1280 - ca.1356), recorded what happened next (*Istoria de Morbo sive Mortalitate quae fuit Anno Dni MCCCXLVIII* ["The Great Dying of the Year of our Lord 1348"]): *The dying Tatars, stunned and stupefied by the immensity of the disaster brought about by the disease, and realizing that they had no hope of escape, lost interest in the siege. But they ordered corpses to be placed in catapults [trebuchets] and lobbed into the city in the hope that the intolerable stench would kill everyone inside. What seemed like mountains of dead were thrown into the city, and the Christians could not hide or flee or escape from them, although they dumped as many of the bodies as they could in the sea. And soon the rotting corpses tainted the air and poisoned the water supply...* The traditional narrative is that sailors and merchants fled from Caffa, and eventually (in October, 1347) brought the disease with them to ports in Europe



Recent research, based on other sources (Byzantine, Genoese, Venetian, and Mamluk) offered an alternative perspective, that plague transmission to Europe actually spread, not from Caffa, but from Tana, another Black Sea port. Though the Black Death reached Tana in 1346, it did not initially spread to Italian merchants. This was because the Venetians and Genoese had imposed trade embargoes against the Mongols and their ports in retaliation for their attacks against Caffa. The Mongols countered with their own embargoes against the Italians and trade was effectively cut off in 1346. These actions explain why the plague did not come to Europe until later in 1347, when the grain trade again opened up between the Italian merchants and the Black Sea ports. The Genoese ships delivering grain to Italian ports brought with them rats and fleas that harbored the *Y. pestis* bacteria.

Spread of the Black Death to Europe, Africa and the Middle East

The first record of the Black Death arriving in Western Europe was in October 1347 when twelve ships traveling from the Black Sea docked at the Sicilian port of Messina. Those who met the ships in Messina were confronted with the horror of finding most of the sailors dead and the rest gravely ill. Though the Sicilian authorities ordered the death ships to leave Messina's harbor, the ships had already infected the port. Other Italian ports of entry for the plague included Genoa, Pisa and Venice. Subsequently, ships brought the plague to various other European ports. The plague also traveled by land over trade routes and eventually spread through virtually all of Europe.

From Italy, the plague spread northwest across Europe, striking France, Portugal and England by mid-1348. The plague then turned and spread east through Germany and Scandinavia between 1348 to 1350. The plague arrived in Norway in 1349 and subsequently spread to Sweden and Denmark. Finally, in 1351, it spread into northwestern Russia. Traveling via trade routes, the plague also struck portions of northern Africa and the Middle East. Within five years, the plague had spread throughout nearly all of Europe and to Northern Africa and the Middle East. The following map illustrates the spread of the Black Death from 1346 through 1353:



1346 1347 1348 1349 1350 1351 1352 1353

Approximate border between the Principality of Kiev and the Golden Horde - passage prohibited for Christians.
 Land trade routes
 Maritime trade routes

Wikipedia Commons

Medieval Theories Regarding the Black Death

During the Middle Ages, the miasma theory of disease was the predominant theory of disease transmission. Appearing in antiquity, the miasma theory postulated that diseases were caused by bad or noxious air referred to as *miasma*. Identified by its foul smell, miasma was considered to be a poisonous vapor or mist filled with particles of decomposed matter. The miasma theory posited that diseases resulted from environmental factors such as contaminated water, foul air, and poor hygienic conditions. Diseases such as cholera and the Black Death were thought to be caused by miasma emanating from rotting organic matter.

Building on the miasma theory, the medical faculty of the University of Paris in 1348 authored the most academic attempt to explain why the great mortality had befallen society. In their lengthy narrative, the preeminent French medical specialists, discussed how earthquakes, floods, unusually hot and humid weather due to planetary conjunctions contributed to the plague outbreak. They explained that on March 20, 1345, there had been an unusual astrological event, a conjunction of Saturn Jupiter and Mars, which resulted in a deadly corruption of the air or miasma which in turn caused the spread of the plague.

Religious scholars believed the plague was God's punishment for man's sinfulness. Some linked the plague to the papacy's abandonment of Rome in 1309 when it was relocated to Avignon.

Many blamed the Jews for the plague accusing them of poisoning wells and other water sources.

Modern Science Regarding Transmission of the Plague

Some 500 years passed before the miasma theory was replaced by the germ theory and the true cause of the plague was discovered. During a plague outbreak in 1894 in Hong Kong, the actual plague bacillus was isolated in separate laboratories by Shibasaburo Kitasato and by Alexandre Yersin (1863-1943). Originally named *Pasteurella pestis*, the plague bacterium was later renamed *Yersinia pestis* in honor of Yersin. Later, Yersin identified rats as the primary carrier of the disease.



Alexandre Yersin

We now know that the plague is a **zoonosis**, i.e., a disease of animals that is passed to humans. Other examples of zoonoses include Influenza, HIV/AIDS, SARS, Ebola, MERS and COVID-19. In the case of the plague, the vector transmitting the plague from rodents to man is the Oriental rat flea (*Xenopsylla cheopis*). Upon biting an infected rodent, the flea becomes infected. The foregut (proventriculus) of the flea becomes blocked by a *Y. pestis* biofilm. When the flea feeds on an uninfected host, the flea regurgitates the bacteria into the wound site thereby infecting the rodent or human. Because of the blockage in the flea's gut, the flea receives no sustenance and feeds aggressively in an attempt to stave off starvation.

Of the 2,000 species of fleas worldwide, eight species are known to transmit the *Y. pestis* bacteria to humans. Though the plague is most commonly associated with the black rat or "ship rat" (*Rattus rattus*), at least 200 species of rodents have been identified as potential reservoirs for *Y. pestis*. The rats that carry the *Y. pestis* infected fleas evolved in south Asia some 5,000 years ago. The adult rat flea is approximately 1/8" long, is wingless and moves from place to place by jumping or being transported upon hosts. The lifespan of the rat flea is up to a year.

Although 1347 marks the first recorded arrival of the plague in Western Europe, recent research suggests that the *Y. pestis* bacteria may have been in Europe as early as 3000 B.C. In 2018, 3,800-year-old (Bronze Age) skeletons unearthed in Mikhaylovka, Russia contained traces of the *Y. pestis* bacteria thus providing evidence that the bubonic plague has been infecting humans for at least four millennia.

As carriers of the plague, fleas have claimed more victims than all the wars ever fought.

Clinical Manifestations of the Plague

The plague presents in different clinical forms, bubonic, pneumonic or septicemic depending upon how the infection was contracted.

Bubonic plague is characterized by the development of one or more swollen, abscessed lymph nodes called *buboes*. Generally, five to six days after being bitten by an infected flea or having contact with an infected animal, a person will develop fever, headache, chills, and weakness and one or more golf ball size buboes. Plague bacteria multiply in the lymph nodes closest to where the bacteria entered a person's body. In the absence of antibiotic treatment, the bacteria spreads to other parts of the body. In the final stages, neurologic symptoms of headaches, restlessness, anxiety, delirium, and hallucinations typically progress to coma and finally death, usually within three days of the onset of symptoms. In the absence of antibiotic treatment, the mortality rate from bubonic plague approaches 80%.

Pneumonic plague: Pneumonic plague develops after a person inhales infectious droplets or after the bacteria from bubonic or septicemic plague spread to the lungs. The person develops pneumonia which rapidly progresses to respiratory failure, shock and death. Pneumonic plague is more deadly and progresses more quickly to death (2 days) than the bubonic form and kills nearly 100% of those infected.

Septicemic plague: Septicemic plague, like the bubonic form, typically results from flea bite exposure or from handling an infected animal. Septicemic plague can occur initially or may develop from untreated bubonic plague, whereby the bacteria gain entry into the bloodstream. This infection commonly results in a clotting disorder called disseminated intravascular coagulation (DIC) manifested by pinpoint hemorrhages occurring all over the body. In medieval times these skin changes became known as a sign of the plague. Skin and other tissues may turn black and die, especially on fingers, toes, and the nose. Septicemic plague kills at least 95% of those infected.

Person to person spread of the plague still occurs with some frequency in developing countries, but has not been documented in the U.S. in the past century. Cats are particularly susceptible to plague, and can become infected by eating plague-infected rodents. In recent decades, several cases of human plague have occurred in the U.S. as a result of contact with infected cats.

The Mortality Caused by the Black Death

An estimated fifty percent of Europeans died from the plague. In some areas, the plague wiped out entire families and entire towns. Stories were told of the plague killing off crews of ships leaving the ghost ships to float directionless on the seas. It was common for cemeteries in Europe to run out of graves. According to Marchione di Coppo Stefani of Florence, where over 50% of the population of 100,000 was wiped out, plague victims were commonly buried in large pits "layer upon layer like layers of cheese in lasagna." In the absence of gravesites, bodies were floated down rivers into the seas. In the summer of 1348, London with a population of 70,000, averaged 290 deaths per day equating to a burial every 2.4 minutes based on 12 hours of daylight. To put this in perspective, in 2018, the population of Holland City plus the population of Holland Township was ~72,000. Imagine nearly 300 deaths day after day in these two municipalities!

Parents refused to care for their sick children for fear they too would come down with the plague. In some towns, houses of the sick were walled off leaving the inhabitants to die inside. Friends abandoned dying neighbors leaving their corpses without proper burial. Even thieves were afraid to enter the houses of the wealthy who had died.

In some towns, there were no clerics left to administer last rights or to officiate at funerals. Magistrates and notaries refused to come and make out wills for the dying. There was a widespread shortage of grave diggers. Corpses were allowed to rot in homes or in the streets. The plague also infected livestock and so many sheep died from the plague that one of the consequences was a European wool shortage. Surviving livestock, whose owners had died from the plague, roamed open fields unattended.

The plague so depopulated the Danish/Norwegian communities on Greenland that the Vikings completely abandoned the island before they were able to establish a foothold on North America. This left the way open for Christopher Columbus to “discover” America more than a century later.

Following the worst of the plague’s devastation, it would take at least 150 years for the population of Europe to reach pre-plague levels.

Medieval Treatment of the Plague

Many people believed that the plague was divine punishment for sins. This belief led to ineffective remedies that were grounded in mysticism.

Medieval medical practitioners, believing in the miasma theory -- that bad air caused the plague -- recommended neutralizing the noxious or bad air with good air scented with the aroma of spices, herbs and flowers. Especially in the 17th century, but also in the 14th century, plague doctors donned masks that looked like beaked bird heads, full-length coats, gloves and boots. In the beak of the mask was placed spices, herbs and flowers to help the doctor ward off the bad air. Hoping to protect themselves from the plague, people would hold similar odiferous items near their noses. The plague doctor’s garb functioned to some degree like modern day personal protective equipment, protecting the doctors from the deadly fleas. Additionally, the plague doctor would carry a 2-meter-long pole which protected the doctor from having to be in direct contact with the patient – a kind of a medieval social distancing.



Medical practitioners who treated the infected used a variety of mostly harmful and ineffective medicinal treatments. Surgeons treated the plague with procedures including blood-letting and bubo-lancing and drainage. The failure of these treatments only served to increase the desperation of already tormented people.

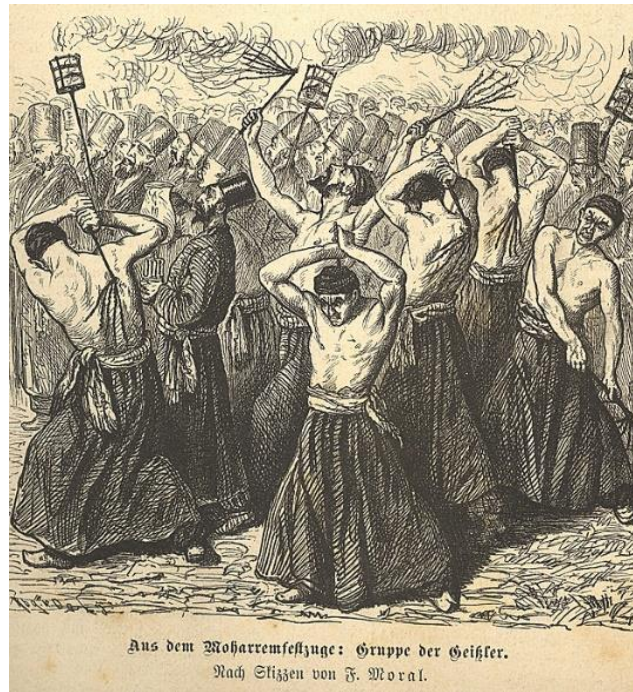
Some people attempted to counter bad air with other bad air. Some gathered around public latrines for hours at a time, inhaling the noxious latrine odors hoping this would ward off the plague. Others countered the bad air with fires. Pope Clement VI was advised by his doctors to confine himself to his chambers and maintain a large bonfire at both ends of his room. These measures helped prevent him from contracting the plague -- he died of other medical causes in 1352 -- but they also isolated him from the Church at a time when the people were desperate for the Pope's support.

In a panic, noninfected people did all they could to avoid the sick. Some doctors refused to see the sick. Priests refused to administer last rites. Notaries refused to write wills for the dying. Shopkeepers closed their stores. Those who were able, fled the cities for the countryside.

Medieval Reactions to the Plague

Many people believed that the plague was divine punishment for man's sins. Some Christians, who did not want to go against God's will, stood by idly as the disease ravaged their homes and communities. Some became hyper-religious, and others abandoned the Church altogether.

More radical Christians, pursued more desperate measures. Small groups of flagellants, people who whipped themselves, had arisen in the 13th century, but they became much more prevalent during the mid-14th century in response to the plague. Flagellants, also referred to as *cross-bearers*, believed that the plague's curse could be lifted through self-abuse and the elimination of Jews.



A large number of flagellants hailed from what is today Germany and the Netherlands. The flagellants would parade in large groups through towns and cities whipping themselves until their bodies were bruised and bleeding. Just as Christ had been whipped prior to his crucifixion, the flagellants, by whipping themselves, believed they were joining with Christ. Through this self-abuse, flagellants sought to pay penance for the sins of the masses, hoping thereby to save the world.

Chroniclers of the time described the procession of a singing group of hooded flagellants who would parade to the local church, lock themselves inside and strip themselves almost naked. They then

would burst out of the church and lie on the ground assuming crucifixion postures or various other postures depicting different sins. One of the flagellants would then make the rounds, whipping all of those on the ground. When he was finished, another would take over. Individuals would also whip themselves. At times they would preach to the surrounding crowds and some reportedly carried out pogroms against Jews.

Initially the Church tolerated the flagellants, but after a short time, Clement VI issued a papal bull threatening the flagellants with excommunication. By 1350, the flagellant movement had largely died out.

In contrast to the flagellants, others reacted to the Great Mortality with hedonistic behavior – if our destiny is to die from this horror, we may as well die doing something pleasurable. Giovanni Boccaccio in the *Decameron* describing the impact of the plague on Florence, wrote, “Others... maintained that an infallible way of warding off this appalling evil was to drink heavily, enjoy life to the full, go round singing and merrymaking, gratify all of one’s cravings whenever the opportunity offered, and shrug the whole thing off as one enormous ... joke.”

Choreomania or dance mania was another cultural trend seen during the Great Mortality. This trend of collective, wild dancing appears to have been concentrated in the Rhineland and Flanders. Townspeople would leave their occupations and dance frenetically in the streets to the extent that at times they were accused of demon possession. The intent of these collective dances was to attempt to ward off or lessen the effects of the plague or, in some cases, to attempt to lift the spirits of the despairing townspeople.

Others reacted to the plague by seeking scapegoats to blame for the misery and death brought by the plague. Once again, Jews became the convenient scapegoats. By the time the Black Death arrived in Europe, non-Christians, including Jews, had been persecuted by the Church for well over a century. Resentment against the Jews was strong throughout Europe and the Black Death provided another opportunity for the masses to target the Jews. In Spain, Germany and Italy, Jews were marked with distinctive clothing and marginalized. Jews in some communities were segregated into walled-off ghettos, Jews were subjected to oppressive regulations that limited them to certain occupations.

In some communities, Jews appeared to be dying from the plague in smaller numbers than their Christian neighbors. This was likely due to the isolation of Jewish communities and to their good sanitary practices based on Mosaic law. Jews were accused of deliberately poisoning wells and other water sources as part of an organized conspiracy by the Jews to achieve world domination. In most communities, however, the mortality rate among Jews was as great as that of Christians. In some communities, Jews were arrested, tortured and forced, in some cases, to confess that they were guilty as accused.

Once the well poisoning conspiracy theory caught on, a wave of pogroms ensued. Pogroms against the Jews were especially common in Germanic regions but also occurred in French and Spanish regions of western Europe. In January 1349, the entire Jewish community in the city of Basel was burned at the stake. On February 14, St. Valentine’s Day, 1349, even before the plague had arrived, a reported 900 Jews were rounded up, placed on stakes and burned alive in Strasbourg. Those Jews who survived were expelled from the city and no Jew was to enter the city for a hundred years. In July, months after all the Jews had been expelled, the plague arrived in Strasbourg and killed 16,000 people.

The Jewish communities of Cologne, Freiburg, Augsburg, Nurnberg, Munich, Konigsberg, Regensburg, and other centers, all were either exiled or burned. In Worms, in March 1349, the entire Jewish community committed suicide.

In Mainz, which had the largest Jewish community in Europe, Jews were also accused of spreading the plague. Defending themselves against the mob, the Jews killed over 200 Christians. The Christians retaliated, killing 6,000 Jews on August 24, 1349. Other massacres of Jews occurred in Toulon, Erfurt, Aragon, Frankfurt, Speier, and Flanders.

Despite Pope Clement's issuance of two papal bulls in 1348 denouncing the persecution of Jews, violence against Jewish communities did not diminish until the plague waned in 1351. By this time, in German speaking regions, there had been 350 anti-Jewish pogroms and the total extermination of an estimated 60 major and 150 minor Jewish communities. By 1351, there were almost no Jews left in Germany or the Low Countries.

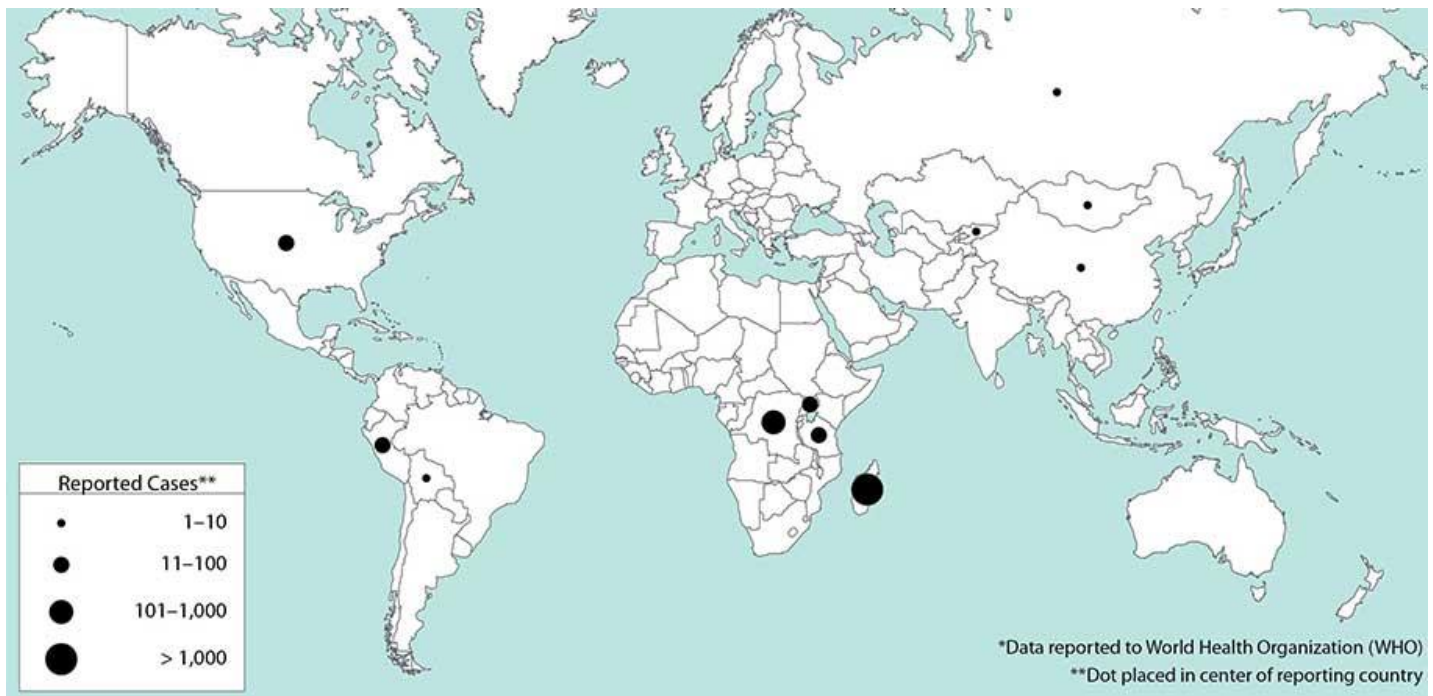
How Did the Pandemic End?

By the time the plague eventually subsided sometime around 1353, the world's population had been reduced from 450 million to less than 300 million. The plague continued to appear in isolated pockets in Europe every 10-20 years until the 18th century. The Great Plague of London in 1665–1666 is generally recognized the last major plague outbreak in Europe. Outbreaks of the plague occurred in Western Europe as late as 1721 and the plague continued to infect Russia and the Ottoman Empire well into the 19th century.

To this day, nobody knows exactly why or how the Black Death finally came to an end, but it appears most plausible that the plague subsided due to mutation and attenuation of the bacteria, the development of some degree of host immunity, and the massive die-off of hosts (rats and humans). Other factors contributing to its decline included decreased population density, improved sanitation and hygiene, and improved public health measures including isolation of the infected and quarantining those at significant risk of being infected. Ultimately, the development of antibiotics led to a decline in the threat that the plague posed to society.

Parts of the world still experience the plague, but with the availability of antibiotics, deaths from the plague are uncommon. The World Health Organization (WHO) reports 1,000 to 3,000 worldwide cases of the plague annually. If suspected and treated promptly with antibiotics, the Black Death has a survival rate of over 90%. Roughly seven (1-17) cases of the plague are reported annually in the U.S., principally in the western U.S. Three vaccines for preventing plague have been developed during the 20th century, but knowledge regarding the efficacy and safety of these vaccines are limited and the vaccines have remained largely unused.

Africa has been hit the hardest by the plague in modern times. In 2017-2018, Madagascar experienced a devastating outbreak of pneumonic plague resulting in thousands of infections and hundreds of deaths. The following map depicts the reported plague cases by country, 2013-2018:



Economic, Social and Political Consequences of the Black Death

The Black Death dramatically affected every aspect of life in virtually every village, town, and region of Europe. Some scholars believe that the Black Death was the most important turning point in the Middle Ages. Without the Black Death, the Renaissance, the Protestant Reformation and the Scientific Revolution might have been delayed.

While depopulating Europe, the plague disproportionately impacted the poor and disadvantaged. The massive loss of life had a significant impact on Western Europe's feudal society. Caregivers such as doctors and clerics experienced higher death rates due to their exposure to infected patients. A large percentage of the peasant class, those who work, was wiped-out. The result was fewer laborers and craftsmen and a concomitant loss of skills and trade secrets. The workers who did survive the Black Death, however, emerged with new opportunities.

The Black Death left many farms unattended and houses vacant. With the loss of large numbers of agricultural laborers, much of the farmland in Europe was left uncultivated. There was a glut of livestock as many owners either had died from the plague or were left without money or workers to care for their herds. Moreover, with many fewer consumers, the consumption of milk and meat also declined. Livestock wandered unattended and prices plummeted. With fields uncultivated and fewer workers, there was a scarcity of produce and grain giving rise to skyrocketing prices. The shortage of farm workers resulted in an increase in wages and economic power of the working class and at least a partial breakdown of class boundaries. The shortage of farm workers allowed workers more freedom. Not only could they be more mobile, leaving one farm and moving to another where the wages were higher, but they also saw opportunities to abandon farm work altogether and move to cities to pursue opportunities as tradesmen and merchants. People tended to concentrate in cities. Smaller towns, left without vital services, became more interdependent.

This new disposable income of workers afforded them the opportunity to buy previously unavailable goods and services including education and apprenticeships in careers and professions previously closed to them. With increasing demand for goods, the expanding merchant class became a more

important part of medieval society. Much of the wealth of those who had died was passed on to the survivors. All of this led to social unrest and the development of a new social group -- the middle class -- with more social and economic power and status than workers had enjoyed prior to the pandemic.

In England, with their new disposable income following the plague, people decided the best thing to buy with their additional wages was ale. According to one historian, Professor Robert Tombs of Cambridge University, the culture of the English pub can be traced directly back to the Black Death. Wages rose and ale prices fell following the plague, allowing working people ready access to beer. Pubs sprang up to accommodate the demand, sparking the English pub culture.

So much of the population had died off during the plague, that the tax base shrank dramatically. Tax revenues post-pandemic were estimated to be 50% or less of pre-pandemic levels. And this was at a time when municipalities were being faced with markedly increased needs for public assistance and increased infrastructure (e.g., regulations, enforcement, new cemeteries, etc.).

Additionally, whereas, before the Black Death the Middle East had been the fulcrum of world trade, after the Black Death, Western Europe became the center of seaborne trade.

A European society previously built on class separation, service, dependency, loyalty, and protection had now become mobile, disloyal, and more independent and self-serving. As a result of the Black Death, wages rose, inequality decreased, feudalism ended and a middle class was born.

The Black Death's Impact on the Medieval Church

When the Black Death struck Europe, the Church was the largest landowner and most powerful institution in society. Its impact was felt on politics, education, economics, and social structures. Early in the Black Death, clerics used the plague to remind parishioners of their sin and need for repentance. The plague was perceived as God's punishment for man's transgressions.

Initially, many clerics did their best to provide care and comfort and to administer the last rites to those dying from the plague. Many parishioners responded to the plague with increased religiosity, turning to the Church for guidance and deliverance and comfort from the plague. This heightened religiosity inspired some of the wealthy to generously fund new colleges and universities.

Eventually significant numbers of clergy died of the plague. Those clerics who survived were perceived as being ineffective and powerless in dealing with the plague. Many clerics, fearful of the plague, abandoned their posts or distanced themselves from their parishioners. Many parishioners felt abandoned as the Church was unable and/or unwilling to minister to them and their families in their final days. Christians believed that if people who were dying did not confess their sins and receive last rites, they were destined for hell. This belief made the plague even more terrifying. In some regions, so few clerics survived that dying people were advised, in the absence of priests, to make confession to any man who happened to be present, or even a woman if a man is not available (Bishop Ralph Shrewsbury)! The church, already in poor standing due to recent papal scandals, lost much respect and credibility in the eyes of plague survivors.

Faced with a serious shortage of clerics, the Church relaxed its requirements for ordination. Previously only allowing members of nobility to become ordained, they were forced to allow virtually any man to become ordained. This resulted in the ordination of many unsuitable, uneducated, and generally unqualified individuals at a time when society was looking for answers and religious guidance. This decline in the quality of the clerics further diminished the credibility of the Church.

In addition, the Church was unable to provide sufficient burial grounds for the dead. Between 1309 and 1377, the seat of the papacy was relocated from Rome to Avignon. In the spring of 1348, with all the cemeteries in Avignon overflowing with corpses, Pope Clement consecrated the Rhone River to make the river a holy burial ground. Each morning hundreds of corpses would float down the river to commune in the Mediterranean.

The loss of credibility and respect for the Church arising out of the Black Death, as well as the establishment of new, higher institutions of learning helped set the stage for religious change which was to come in the Protestant Reformation a century and a half later.

The Black Death's Influence on Medicine and Public Health

The plague became an impetus for significant developments in medicine and public health. Some cities established new regulations regarding waste disposal and butchery.

Prior to the Black Death the medical dissection of cadavers was banned by a papal bull issued by Pope Boniface VIII in 1300. This decree denied medical students the chance to learn about anatomy and to practice surgical skills, leaving most students ignorant of the inner workings of the human body.

Then the Black Death hit Europe and corpses piled up faster than they could be buried. In 1348, Pope Clement VI began requiring autopsies and dissections of plague victims hoping thereby to gain a better understanding of the cause and course of the plague. Though it exposed many practitioners to the plague, this decree resulted in a significant expansion of medical knowledge.

The plague led to the institution of isolation and quarantine measures. In 1374, Viscount Bernabo of Reggio, Italy, declared that every person with plague be taken out of the city into the fields, there to die or to recover. In the Venetian-controlled port of Ragusa (modern day Dubrovnik, Croatia), the city's chief physician, Jacob of Padua, advised establishing a place outside the city walls for treatment of ill townspeople and outsiders who came to town seeking treatment.

In 1377, the Great Council of Ragusa passed a law establishing a *trentino*, or thirty-day period of isolation for ships arriving from plague-affected areas. No one was allowed to visit ships under *trentino*, and if someone did, they too would be isolated for the mandatory 30 days. During the next 80 years, similar laws were introduced in Marseilles, Venice, Pisa, and Genoa. In Venice, in the early 15th century, the period of isolation was extended from 30 days to 40 days, thus establishing the *quarantena*. The fundamental concept of quarantine has survived to modern times.

With these advances in medicine and public health, some scientists and doctors became committed to a new empiric approach to the treatment of disease. This empiric approach to disease helped set the stage for the Scientific Revolution.

The Black Death's Influence on Art and Literature

The pervasiveness of death and dying greatly influenced art and literature during the Black Death. Art produced during the Black Death reflected the fragility of life and the grim reality of death.

A widespread form of artistic expression that emerged during the Black Death was the *danse macabre* or *Dance of Death*. In *danse macabre* paintings, drawings and woodcuts, skeletons represent death. The skeletons are depicted as dancing with other skeletons and with living people reminding the observer that all will ultimately die and that all should repent and do good before death

overtakes them. A key detail in *danse macabre* works was that each member of society was shown to participate, the message being that death is democratic and the great equalizer.



Another common artistic theme that emerged from the Black Death was the triumph of death over life. In these artistic works, death, again portrayed as a skeleton, is shown thrusting a sword into the living. The c. 1362 painting, *The Triumph of Death*, (Museo del Prado, Madrid) by Peter Bruegel the elder reflects this theme as well as any painting from the period. The painting shows an army of skeletons wreaking havoc across a scorched, barren landscape. Fires burn in the distance, and the sea is littered with shipwrecks. A few leafless trees stud hills otherwise bare of vegetation; fish lie rotting on the shores of a corpse-choked pond. In this setting, legions of skeletons advance on the living, who either flee in terror or try in vain to fight back. In the foreground, skeletons haul a wagon full of skulls; in the upper left corner, others ring the bell that signifies the death knell of the world. The painting depicts people of different social backgrounds – from peasants and soldiers to nobles as well as a king and a cardinal – being taken by death indiscriminately. Death became personified in the form of the scythe-toting Grim Reaper, a menacing figure that preyed upon the rich and the poor equally.



As a direct result of the plague some of the world's best literature came into existence including William Langeland's *Piers Plowman*, Giovanni Boccaccio's, *Decameron*, and Geoffrey Chaucer's, *The Canterbury Tales*.

In the poem, *Piers Plowman*, Langeland mixed theological allegory and social satire in his story of the narrator/dreamer's quest for the true Christian life in the context of medieval Catholicism. Boccaccio's *Decameron* is a collection of 100 tales told by a group of seven young women and three young men who sheltered in a secluded villa just outside Florence in order to escape the Black Death.

Decameron is considered a masterpiece of classical early Italian prose. Chaucer's *The Canterbury Tales*, written in the late 14th century, is a collection of 24 tales describing a group of pilgrims who are traveling to the town of Canterbury to a shrine for the martyr Saint Thomas Beckett. The religious figures in *The Canterbury Tales* highlighted many of the problems corrupting the medieval Church.

Aftermath of the Black Death

The Black Death shocked the European economy and impacted society resulting in technological breakthroughs. The labor shortage spawned by the Black Death resulted in an increase in wages. The newfound economic power of medieval workers created increased markets for goods. The middle class was born.

After the plague, eyeglasses, horse collars and crossbows were produced in significantly greater quantities allowing for more efficient workers and creating an environment ripe for innovation.

Breakthroughs such as the fulling mill to clean cloth addressed both the labor shortage and the increased demand for cloth. The biggest breakthrough of the post-plague era was arguably the Gutenberg printing press which enabled books to become accessible to the common man.

All of this socioeconomic upheaval set the stage for the Renaissance which came a century later.

The Black Death and COVID-19: Parallels and Lessons

The plague and COVID-19 are very different diseases. Both pandemics, however, shaped society and individual behavior and show some parallels:

	Black Death	COVID-19
Origin	Central Asia, China	China
Infectious agent	<i>Yersinia pestis</i> bacterium	SARS-CoV-2 virus
Transmission	Rat to flea to human; human to human	Human to human
European epicenter	Italian peninsula	Italy
Spread	Via trade routes	Via transportation routes
Symptoms	Fever, headache, swollen lymph nodes, cough, shortness of breath	Fever, cough, shortness of breath, loss of taste and/or smell, rash, GI symptoms, headache, sweats
Treatment	Supportive care; Ineffective and harmful medical and surgical treatments	Supportive care; Assisted ventilation; Supplemental oxygen; Monoclonal antibodies; Medications (Remdesivir, Paxlovid, Molnupiravir)
Prevention	Social distancing; Isolation of sick; Quarantine	Social distancing; Isolation of sick; Quarantine; Masks; Vaccines
Unconventional treatments	Countering “bad” air with good or bad air; Blood-letting; Flagellation; Choreomania, etc. – anything was on the table	Hydroxychloroquine; Oleandrin; Ivermectin; Betadine gargles
Misinformation/Conspiracy theories	Jews poisoned the water supply	Just the “flu”; Media invented hoax; Vaccines are harmful (decrease fertility, alter DNA, cause deaths); Vaccinations implant microchips; 5G causes COVID
Scapegoating	Jews targeted	Asians and immigrants targeted
Pandemic victims	All affected but poor, weak and disadvantaged affected disproportionately	All affected but poor, weak and disadvantaged affected disproportionately
Medical professionals	Ineffective; Untrusted	Untrusted by many; Vaccine opposition; Medical workers under attack
Political attitudes	Distrust of authorities	Distrust of authorities
Short-term socioeconomic impact	Increased pay and opportunities for workers; Societal disruption	Increased pay and opportunities for workers; Societal disruption
Long-term socioeconomic impact	Peasant gains did not survive the following centuries – elites reclaimed a greater share of	???

	wealth/income and workers saw a decline in power/status	
End game	Plague continued to sputter and recur for centuries with sporadic cases occurring even today	Low level of endemicity occurs (a certain acceptable number of COVID-19 cases occurs annually (like seasonal influenza)
Lasting effects	Inequality decreased; Feudalism ended; The middle class was born; Seeds were sown for the Renaissance, the Protestant Reformation and the Scientific Revolution	???

With both the Black Death and COVID-19 pandemics, contributing factors include global connections between human societies. In both pandemics, people learned about the disease during its spread, seeking easy answers and drawing on prejudices such as scapegoating to explain the pandemic's occurrence.

In both pandemics, the impact of the disease was heavily influenced by socioeconomic differences and inequities. With the Black Death and with COVID-19, individuals and communities have gone to extraordinary lengths to help others.

Scientific research has helped cure or at least mitigate epidemics and pandemics, from smallpox to polio to influenza to HIV to COVID-19. But in comparing the people's response to the Black Death and COVID-19, one wonders how much we have learned and how much our behavior has changed in response to history.

The Black Death changed the world. After researching this topic, I couldn't help but be left with the question: **What lasting effects will result from the COVID-19 pandemic?**

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