



# The Prime Treatments, Testing, and Advancements Index: A Primer

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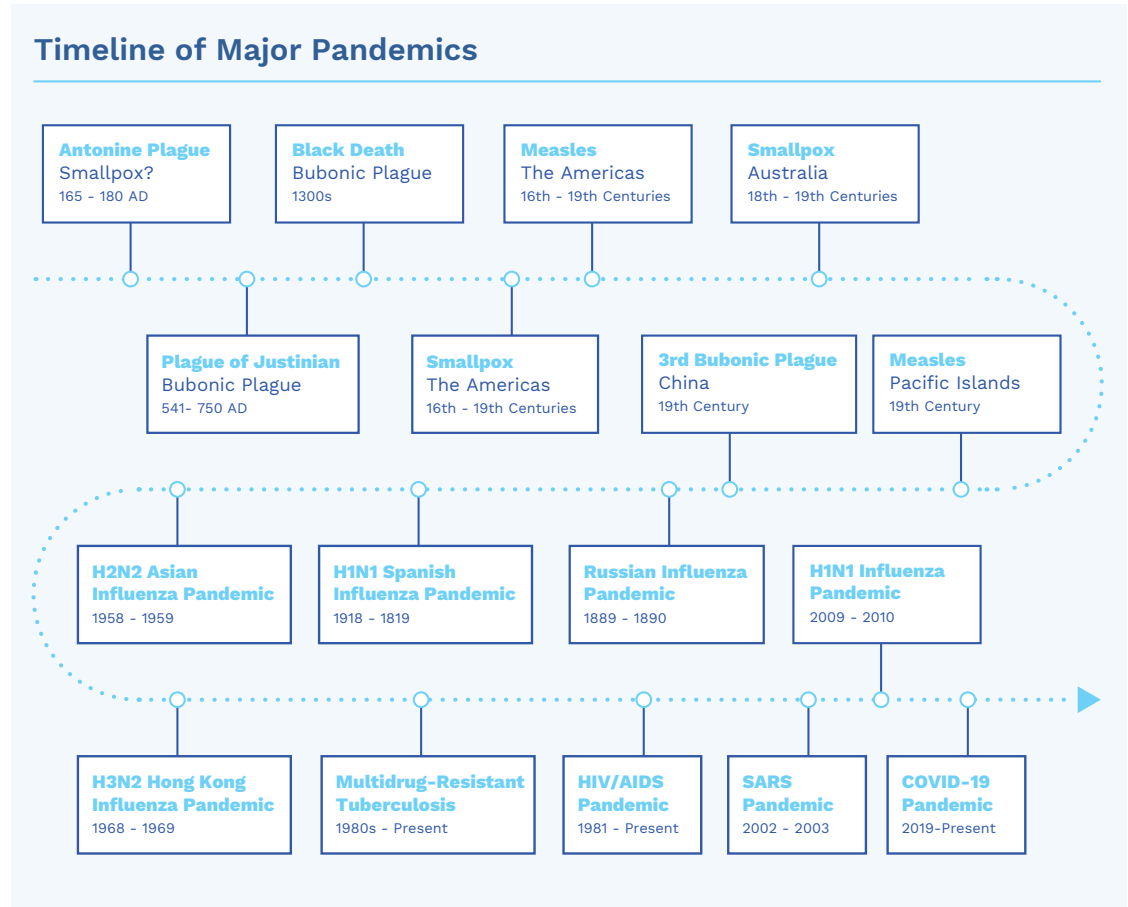
## Introduction

When a strange, new form of viral pneumonia first appeared in Wuhan, China at the end of 2019, few would have guessed that this new disease, eventually dubbed COVID-19, would become a global pandemic. It has upended the daily lives of billions of people around the world, infecting millions and killing hundreds of thousands. Although scientists have been sounding the alarm for decades about the risks of emerging infectious diseases, never before has the threat posed by infectious diseases been more readily apparent; never before have treatments, testing, and other medical advances appeared more critical.

There is a vast, diverse ecosystem of companies dedicated to treatments, testing, and other medical advancements, that is rising to the challenge of combatting not just the coronavirus pandemic, but other emerging infectious diseases as well. Although COVID-19 may have brought the spotlight firmly to bear on infectious diseases, it is far from the first pandemic.

## Pandemics: A Brief Overview

The definition of a pandemic can be somewhat fluid, but in general the concept refers to an epidemic that becomes widespread in several areas.<sup>1</sup> There is evidence that infectious diseases and pandemics have dogged humankind for millennia.<sup>2</sup>



Source: Lancet [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(14\)70846-1/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(14)70846-1/fulltext)

### Smallpox

Before the advent of modern medicine, smallpox was a lethal scourge. The disease caused painful bumps and hemorrhagic fevers, killing around 30% of its victims and leaving many others permanently disfigured.<sup>3</sup> The disease was widely known and feared throughout China, the Middle East, and the Americas. In an effort to prevent people from contracting the disease, many cultures engaged in a practice known as variolation, an early form of inoculation, which involved blowing dried smallpox scab material up children's noses, which tended to give children a mild form of the disease, and thereafter immunity. The earliest known references to this technique, a precursor of modern vaccines, appears in a Chinese text dating to around 1549,<sup>4</sup> but there is evidence that the technique may date back to as early as the 10th century AD.<sup>5</sup>

The modern smallpox vaccine was developed in the 1950s, and shortly thereafter the world embarked on a program of eradication.<sup>6</sup> Although it took more than two decades, smallpox became one of the first diseases ever to be declared eradicated by the World Health Organization, in 1980—the last naturally acquired case of variola major (the virus that causes the more severe form of smallpox) occurred in Bangladesh in 1975.<sup>7</sup>

### ***The Spanish Flu of 1918-1919***

The Spanish Flu of 1918 triggered one of the most severe pandemics in modern memory. Caused by the H1N1 virus with genes of an avian origin, the virus was first identified in the United States in the spring of 1918 among U.S. military personnel that had returned from Europe. The virus would go on to kill 675,000 Americans, and at least 50 million people worldwide. Mortality was especially pronounced among those 5 years of age and younger, those aged 20-40, and those aged 65 and older. The virus's unusual lethality among healthy adults was one of its unique features. Without a vaccine or antiviral treatments, the public was forced to use non-pharmaceutical measures including lockdowns, quarantines, and isolation.<sup>8</sup>

### ***HIV/AIDS***

Human immunodeficiency virus, also known as HIV, the virus that causes acquired immune deficiency syndrome (AIDS), is an ongoing global pandemic that first emerged on the world scene in the late 80s. A sign of things to come, it is what's known as a zoonosis or zoonotic disease, a disease that "spills over" from an animal host (in this case, primates) and then establishes itself in humans.<sup>9</sup> A retrovirus, HIV was first recognized as a new disease in humans in 1981.<sup>10</sup> As of 2018, 75 million people had been infected with HIV worldwide, and there had been approximately 32 million deaths; some 38.9 million people were living with HIV.<sup>11</sup> Unfortunately, although great strides have been made in terms of antiretroviral treatments for HIV, an HIV vaccine has thus far proven beyond the reach of modern science, in part due to the ways the virus attacks the immune system itself, and the ability of the virus to "hide" in the body.<sup>12</sup>

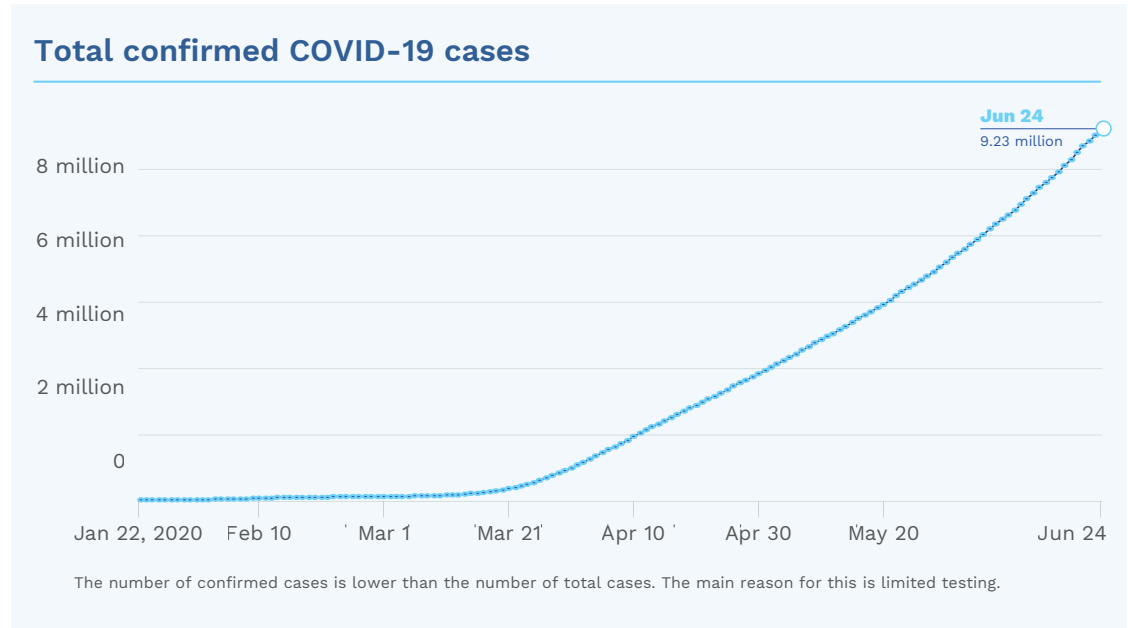
### ***SARS***

Another zoonotic disease and a close relative of SARS-CoV-2, the virus that causes COVID-19, SARS (also referred to as SARS-CoV) first emerged in China in 2002 and resulted in two explosive outbreaks that were eventually brought under control. During the outbreak, there were 8,098 reported cases and 774 deaths, with a case fatality rate of 10%.<sup>13</sup> Similar to COVID-19, patients suffered a severe viral pneumonia, and the virus proved to be extremely infectious.

## **The Coronavirus (COVID-19) Pandemic**

In December 2019, cases of a mysterious, deadly viral pneumonia began cropping up in the city of Wuhan, the capital city of China's Hubei province.<sup>14</sup> Many cases were eventually traced back to a wholesale live animal market in Wuhan.<sup>15</sup> Further genetic analysis suggested the virus had jumped to humans from an animal host, constituting yet another zoonotic spillover event.<sup>16</sup> As the gravity of the situation became apparent and the outbreak began spreading explosively in Hubei and beyond, China issued the largest quarantine order in human history, locking down some 45 million people.<sup>17</sup> The U.S. temporarily barred foreign nationals from entering the U.S. from China but it was too late: the contagion was already spreading undetected throughout the U.S. population. In five major cities around the country, while there were only 23 confirmed cases of COVID-19, evidence suggests that there were already as many as 28,000 active infections by that time.<sup>18</sup>

In the absence of an effective vaccine or other treatment for COVID-19, and as infections and deaths began to mount around the world, many countries, states, and municipalities resorted to nonpharmaceutical interventions in the form of lockdowns to prevent the spread of the virus. By late March 2020, nearly three billion people around the world were living under some form of lockdown.<sup>19</sup> In the United States, lockdowns and other economic costs associated with the ongoing pandemic resulted in mass unemployment and a pullback in the stock market.<sup>20</sup>



Source: European CDC as cited in Our World in Data <https://ourworldindata.org/covid-cases>

In response to this unprecedented global pandemic, the treatment, testing, and medical advancements ecosystem has gone into overdrive. A return to pre-pandemic life without social distancing will be out of reach without effective treatments and, ultimately, a vaccine. Although COVID-19 only emerged six months previously, as of June 15th, 2020 there were already more than 135 COVID-19 vaccines under development, with eight candidates in Phase I clinical trials, eight in Phase II trials, and two in Phase III.<sup>21</sup> Never before has the importance of the infectious disease treatment, testing, and medical advancements ecosystem been more readily apparent.

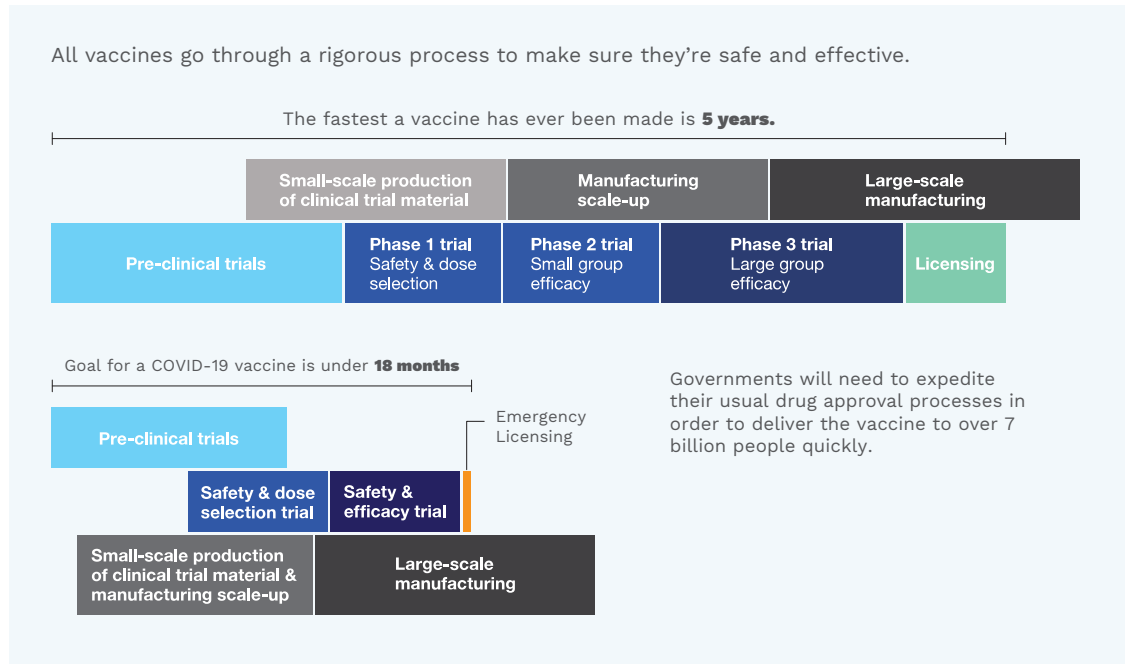
## The Treatment, Testing, and Advancements Ecosystem

The treatments, testing, and medical advancements ecosystem consists of a web of companies and organizations dedicated to developing new, effective treatments for infectious diseases.

### Vaccine Development

Vaccines are some of the most effective tools in humanity's arsenal when it comes to combatting and preventing infections. Although they can use a number of different technologies including DNA, RNA, mRNA, or gene therapy, the goal is the same: to help a body's immune system identify and combat pathogens.<sup>22</sup>

Moderna, a component in the Prime Treatments, Testing, and Advancements Index, uses mRNA technology to create unique medical therapies, treatments, and vaccines.<sup>23</sup> While DNA is the chemical substrate that stores instructions for cells, mRNA is the “software” that translates those instruction and tells cells how to build proteins.<sup>24</sup> A part of the White House’s Operation Warp Speed, which aims to help accelerate vaccine development, the company’s mRNA-based COVID-19 vaccine candidate is set to begin Phase III human clinical trials in July 2020.<sup>25</sup>



Source: NEJM as cited in GatesNotes <https://www.gatesnotes.com/Health/What-you-need-to-know-about-the-COVID-19-vaccine>

### Therapy Development

Unlike vaccines, disease therapies focus on helping infected patients recover more quickly, and/or lessening the severity of a disease.

Gilead, a component in the Prime Treatments, Testing, and Advancements Index, developed Remdesivir, the first drug that has been demonstrated as effective against COVID-19 in human trials. While large-scale blinded trials are still ongoing, the drug has also been shown to prevent lung damage in monkeys infected with COVID-19.<sup>26</sup> Originally developed as an Ebola treatment, Remdesivir works by mimicking the shape of adenosine, fooling viral polymerase and inhibiting viral replication.<sup>27</sup>

### Testing Development

Quick, reliable tests have proven absolutely essential in the efforts to contain the spread of COVID-19. Quidel, a component in the Prime Treatments, Testing, and Advancements Index, developed a rapid COVID-19 test that uses antigen detection rather than relying on polymerase chain reaction (PCR). The new method, although slightly less accurate, delivers results in as little as 15 minutes, rather than the several days that original polymerase chain reaction (PCR) tests utilize.<sup>28</sup> The ability to rapidly identify infected people and isolate them from the general population is critical to enabling businesses to reopen, and allowing employees to return to work.<sup>29</sup>

## Market Outlook: Infectious Disease Treatments, Testing and Advances

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In 2017, the global market for infectious disease treatments was worth at least \$65 billion, and is expected to reach \$99 billion by 2022, with a compound annual growth rate (CAGR) of 8.9%. Of that \$65 billion total, vaccines accounted for \$8.5 billion in 2017, expected to grow to \$14.4 billion by 2022, while therapeutics accounted for \$48.9 billion, expected to grow to \$74.4 billion over the same period.<sup>30</sup>

### Growth Drivers

There are a number of factors that could contribute to an increase in emerging infectious diseases in the coming years, and ultimately, growth in the investment needed to prepare for them. Due to habitat loss, intensive over-farming, and close species-to-species contact, zoonotic disease spillover events that fueled recent outbreaks such as SARS, Zika, Nipah, Hendra, HIV, and COVID-19<sup>31</sup> appear likely to increase in frequency over the coming years.<sup>32</sup> The evidence is all around us. As biodiversity decreases and habitats are destroyed, there are signs that zoonotic diseases have greater opportunities to spill over into humans, with disastrous effects.<sup>33</sup> Many scientists are sounding the alarm that the risks of the next pandemic are already rising as forests are cleared to make way for farmland, drawing wild animals and increasing human-to-animal contact.<sup>34</sup>

Another factor that could influence the spread of infectious diseases is the rapid growth in worldwide travel. The UN World Tourism Organization (UNWTO) sees international tourist arrivals to reaching 1.8 billion annual arrivals by 2030.<sup>35</sup> The increase in international travel has been driven by income growth in emerging economies, as well as technological advancements and competition among providers in the travel tech industry. This growth in mobility also creates the possibility for spreading infectious diseases before travel bans can be implemented. This issue becomes particularly acute in scenarios where infected travelers exhibit symptoms well after initial infection, or if they are asymptomatic, and have already begun their trip.

### Conclusion

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From smallpox to HIV, infectious diseases and pandemics have been with human beings since time immemorial. The COVID-19 pandemic has served as a forceful reminder of our vulnerability to new infectious diseases, as well as the importance of infectious disease treatments, testing, and advancements. As biodiversity loss, habitat destruction, and species-to-species contacts accelerate, the potential for new pandemics and infectious diseases to emerge appears set to accelerate as well. Thankfully, with new vaccines and therapies, humanity has a fighting chance to face these new threats.

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## The Prime Treatments, Testing, and Advancements Index

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The Prime Treatments, Testing and Advancements Index was created to provide investors with a reference measure that enables them to track both event-driven news and long-term trends of companies engaged in developing vaccines, therapies, or diagnostic technology in the fight against infectious diseases.

The Index includes companies from the following two areas: 1) companies that produce treatments, such as vaccines or therapies for infectious diseases in preclinical research, clinical trials, or that are commercially available, and 2.) companies that derive more than 50% of their revenue from research, development, manufacturing, or provisions of biological tests for patients.

Please visit [www.PrimeIndexes.com](http://www.PrimeIndexes.com) today to learn more.

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