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Influenza pandemics throughout Brazilian history

Pandemias de influenza ao longo da história brasileira

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Abstract

Brazil has experienced several major epidemics of influenza, and the most destructive was in 1918-1919. This article focuses on mortality, mitigation policies, and the consequences of pandemic influenza during the national period. We provide the first mortality estimates for the 1890-1894 influenza pandemic and correct figures for later epidemics. The 1918-1919 episode cost more lives than assumed, although some cities suffered less, possibly because of public health actions. Influenza caused pandemics in 1957, 1968, 1976, and 2009, but these did not cause unusual outbreaks in Brazil.

Keywords: influenza; mortality;
pandemics; public health; covid-19.

Resumo

O Brasil passou por várias epidemias importantes de influenza, a mais letal em 1918-1919. O artigo focaliza a mortalidade, as políticas de mitigação e as consequências das pandemias de influenza no período nacional. Fornecemos as primeiras estimativas de mortalidade para a pandemia de 1890-1894 e corrigimos números de epidemias posteriores. O episódio de 1918-1919 custou mais vidas do que se considerou anteriormente, embora algumas cidades tenham sofrido menos, possivelmente devido a ações de saúde pública. A influenza gerou pandemias em 1957, 1968, 1976 e 2009, mas elas não causaram surtos incomuns no Brasil.

Palavras-chave: influenza; mortalidade;
pandemia; saúde pública; covid-19.



Brazil now faces the deadliest pandemic of acute respiratory disease experienced in this century. The cause, a coronavirus, has been part of human history for millennia, but a novel and dangerous viral strain, called SARS-CoV-2, was first detected in central China in 2019 (Wertheim et al., 2013). The covid-19 pandemic's trajectory is unique and the virus is highly virulent, prompting the secretary-general of the United Nations to call it "the most challenging crisis we have faced since the Second World War" (UNSG, 2020). Brazil has confronted pandemics before, including several deadly influenza episodes. Covid-19 and influenza should not be confused, but from what scientists know so far, these viral diseases share some characteristics, especially in their modes of transmission (CDC, 2018; Taubenberger, Morens, 2008; WHO, 2020).

Unfortunately, powerful leaders such as Brazilian President Jair Bolsonaro claim Brazilians have special resistance to diseases like covid-19, which he has called a "little flu" (Friedman, 2020). This seems to be based on a belief that acute respiratory diseases spare Brazil, perhaps because of the tropical climate or constitution of the Brazilian people, but these ideas are rooted in old myths and historical uncertainty (Read, 2022). In fact, epidemiologists and historians have rarely examined respiratory diseases like influenza over a period longer than a single epidemic. Usually, the focus is regional or on a single Brazilian city.

This is the first essay to document the history of influenza starting more than a century ago, when doctors and politicians first acknowledged the disease as a national problem through today. We present archival research – newspapers, government documents, and other original sources – and construct a national story of the 1918-1919 pandemic in Brazil. Our findings are surprising in three ways. First, influenza became a severe but diminishing problem only in the twentieth century, although thousands died across the nation from the flu in the late nineteenth century. Second, Brazil suffered with the rest of the world during the 1918-1919 pandemic, with a death toll higher than historians have estimated. By comparing several cities, we find that mitigation strategies likely saved lives. Third, influenza became pandemic for several years after 1950, killing from Bombay to Bangkok to Boston, but Brazilians were mostly spared during this period. Influenza has declined as a threat, but the greatest fall in mortality across Brazil occurred before widespread access to vaccination. Finally, influenza's reduced threat, but periodic morbid sensationalizing by the international media, has allowed politicians to underplay the deadly threat of viral respiratory diseases.

Influenza has killed Brazilians for centuries, but the historiography of influenza concentrates on the 1918-1919 pandemic. This focus is somewhat justified since regional and urban studies from the past two decades have helped us better understand the scale of the tragedy of one of Brazil's worst pandemics. Pioneering research conducted by prominent historians and graduate students describes the 1918-1919 influenza epidemic as it struck and evolved in Brazil's cities: São Paulo, Rio de Janeiro, Belo Horizonte, Porto Alegre, Recife, Salvador, and Manaus (Goulart, 2003, 2005; Bertolli Filho, 2003; Silveira, 2008; Abrão, 1998, 2009; Gama, 2013; Silva, 2017; Souza, 2007). The most recent of these studies comes from a team of international social scientists and shows that pandemic influenza was deadlier than the Brazilian government recognized (Guimbeau, Menon,

Musacchio, 2020). The present essay also builds on a research project that documents the history of epidemics in Brazil (Read, 28 Mar. 2020, 2022).

Taking a broader approach to the history of influenza, we divide this essay into three sections. The first is a historic examination of flu pandemics, including 1890-1891, 1918-1919, and subsequent pandemics, to show that seasonal flu transformed from a common killer to a much rarer risk, at least until now. Special attention is paid to different municipal governments' varied and often desperate responses during the 1918-1919 pandemic. We then globally contextualize Brazil's experience and compare it to subsequent pandemics in Brazil, noting that Brazilian epidemics after 1919 did not coincide with global pandemics. The final section compares the government's reaction to the 1918-1919 pandemic with the current covid-19 response, identifying what historical lessons could be learned and applied to contemporary Brazil.

The “excess deaths” of the 1890-1891 pandemic

In December 1889, fear gripped many Brazilians as a strange malady spread from Russia to western Europe and across the Atlantic to North America (A Influenza, 6 Feb. 1890, p.1; *Retrospecto...*, 18 Feb. 1890). By January 1890, as the capitals of Argentina and Uruguay reported hundreds of deaths, the disease was poised to strike Brazil. Oddly, over the next two years, Brazilian doctors attributed a tiny number of deaths to influenza, and medical experts denied influenza existed in Brazil (*Sessão...*, 22 Mar. 1890; Rodrigues, 1891). Even the newly installed republican president, Marshall Deodoro da Fonseca, refused to acknowledge the disease, despite becoming deathly sick (*Affairs in Brazil*, 20 Dec. 1889). In Brazil's capital, Rio de Janeiro, the Head of Municipal Statistics reported only five deaths from the disease, in Recife 48, in Porto Alegre one, and in Salvador six. In Salvador, Nina Rodrigues' interviewed medical colleagues and reviewed newspapers and encountered a common opinion that influenza was “very benign” and took on a local character in Brazil (Rodrigues, 1891, p.556; *Academia...*, 15 Aug. 1891; Souza, 2007, p.143, 174).

In determining influenza's impact, we must count “excess deaths,” but also acknowledge mortality from other epidemic diseases and seasonal fluctuations in endemic diseases. Brazilians suffered from many other contagious and epidemic diseases in this time period: tuberculosis, smallpox, yellow fever, bubonic plague, malaria, and typhoid fever. These caused higher death rates and received more attention. In addition, doctors usually attributed the cause of death to comorbid, pre-existing conditions, such as tuberculosis. Some officials, such as Rio's medical demographer Aureliano Souza Portugal noticed this tendency after looking back at mortality statistics. In the Interior Minister's 1892 report, he enumerated exceptional levels of deaths from comorbid diseases and concluded “it is well known that influenza does not cause many deaths, but increases the lethality of certain other diseases” (Ministério do Interior, 1892, p.85). Souza Portugal's findings show how influenza “hid” behind comorbid diseases during the colder months of 1891.

Brazil's first discernable influenza epidemic appears to have been worse in the South. In Porto Alegre, there were around three deaths per thousand in 1891, while São Paulo and Rio de Janeiro counted two and one death per thousand, respectively.¹ Recife's rate

was similar to Rio de Janeiro, but influenza struck later, in 1894 (Ponzo, 1976). In Salvador and Recife, between 1890 and 1893, we have no evidence of excess deaths from influenza. Insufficient data hinders the analysis of Salvador; as Rodrigues noted, “we do not have [a] demographic office in this city to evaluate any type of epidemic” (Rodrigues, 1891, p.556). In total, though our estimates are tenuous, we apply the 1-2 per thousand (i.e., 0.1-0.2%) death rate and estimate 14,000-28,000 Brazilians died from influenza during the first recorded pandemic in Brazil (Maia, 1836; A Influenza..., 4 Sep. 1890; Influenza..., 14 July 1890; Leal, 1892). An awful death toll, but one dwarfed by other epidemic diseases. For example, nearly 9,000 people died from yellow fever and smallpox in the city of Rio de Janeiro between July 1891 and June 1892 (Boletim da Semana, 22 Aug. 1892). Rio de Janeiro residents may have been more resigned to infectious diseases before the pandemic arrived. In mid-1889, the *Rio News* derisively wrote, “After the mortal fear [of yellow fever] into which this whole city was thrown only four short months ago, it is incomprehensible that there could be so much apathy now [to the influenza pandemic] ... The Brazilian is a tropical creature who easily forgets today what he mortally feared yesterday” (Rio..., 15 July 1889).

Recognition, not apathy, is evident among most doctors. More recognized and diagnosed seasonal influenza after the pandemic. Doctors switched from older categories such as “catarrhal fevers,” and most cities reported influenza deaths after 1890. Nonetheless, few believed that influenza was pandemic in Brazil in 1890-1892, and hardly any doctors worried that a disease associated with colder northern countries could cause a much worse catastrophe.

The 1918 influenza pandemic

It is not clear how the “Spanish flu” (*grippe hispaniola*) arrived in Brazil. There were no major increases in flu-related symptoms or deaths through most of 1918. The first cases of influenza among Brazilians were reported in early September. They first appeared aboard several ships carrying Brazilians or docked in Brazil, and soon after cases were reported in several Brazilian ports (Bertolli Filho, 2003). Doctors heard the first complaints of influenza-related symptoms in Rio de Janeiro in late September. The Director of Public Health Carlos Seidl, worried about the spread of the disease, thus, opened Ilha do Governador as a quarantine station for arrivals from Africa, though the deadly strain likely came from Europe. On September 14, when The Demerara, a British ship, sailed into Guanabara bay, with stops in Recife and Salvador, some crew members were already sick (Bertolli Filho, 2003, p.74). From these imported cases, or from elsewhere, the disease spread to the interior of Brazil and caused the worst nationwide epidemic of the twentieth century (Cooper, 1975).

In this section, we use published and archival sources to examine the steps taken by state and city authorities in 1918 across Brazil. Our archival sources include newspapers, provincial reports, Health Department publications, and photographs, which are further supported by the groundbreaking research of published Brazilian scholars. We find that most sanitary and social distancing measures were lenient and may not explain the virus’s trajectory. Leniency can be attributed to two causes. First, most people were unaware of the

risk of influenza transmission through respiratory droplets and aerosol spread. Second, even if such knowledge had been widespread, most Brazilians were unable to isolate themselves when their survival depended on entering public spaces for work and daily necessities like food and fuel. City and state governments across the nation took steps to reduce crowds, disinfect public spaces and homes, and treat the infirm. Some large cities, like São Paulo, attempted to isolate the sick in hospitals and clinics, many of which were built for the emergency. Although influenza caused remarkably few deaths in some cities like Belém, Salvador, and Campinas, there is no strong evidence to suggest that lower mortality rates were caused by specific mitigation efforts.

Canceling public events and public gatherings was an obvious policy to slow down the propagation of the 1918 influenza. Most health authorities knew from past experiences with epidemics that isolating the sick, disinfecting the homes of the deceased, and increasing case monitoring were crucial for reducing infection (Bertolli Filho, 2003, p.156). Yet, in Brazil, various municipal governments did not effectively limit crowds in churches, factories, and schools and did not restrict army officers or sailors from leaving quartered barracks and docks. Street markets partially justified the government's reluctance to reduce gathering – since many relied on markets for food, closing them would have caused enormous hardship.

Journalists in Recife and São Paulo pleaded with readers to avoid agglomerations – the term used then for social distancing – but state and city authorities published no official position, even as daily deaths doubled, then quadrupled. On October 15, Artur Neiva, director of the São Paulo Sanitary Service, declared a “state of pandemic” and sent all public employees home, furloughed or on vacation. The next day he closed all schools and announced penalties to pharmacies that increased prices for necessary remedies. Neiva promoted self-isolation as a key measure to prevent the spread of influenza, asking the community to stay at home: “All individuals have to avoid agglomerations, mainly at night; avoid attending theatres and cinemas; avoid visiting other people.” He also recommended not visiting sick people as this was the primary way of spreading the disease (Bertolli Filho, 2003, p.157). Perhaps because they were considered “essential,” factories continued to operate, and the São Paulo Sanitary Service used them as case studies for morbidity rates. In Sorocaba, a town about 100km from São Paulo, one large textile factory defied a request by the town's government to close (Dall'Ava, Mota, 2017, p.439-444). At the end of October, at the pandemic's peak, Neiva prohibited sports competitions, street performances, and the sale of fruits and candy on the street. Critics saw these efforts as too little, too late.

When alarming reports arrived in Salvador, the city canceled all events and improvised multiple hospitals to isolate the sick (Souza, 2009, p.179). At that time, Salvador's residents commonly visited docked ships for entertainment. Officials prohibited this pastime, as “almost all ships had been turned into hospitals ... as they had a significant number of sick on board” (p.180). Also, in the first weeks of October, when the epidemic was spreading rapidly, health inspectors visited homes and businesses throughout the city, ultimately inspecting 12,311 people with or suspected to have the disease. Inspectors also examined churches, where many Bahians sought refuge and protection, despite warnings from health authorities to avoid crowds (Souza, 2009). During these visits, health inspectors in Salvador found 40% of people had influenza (p.181-182). City authorities asked sick individuals to

stay home and sent medical corps to their homes, thus avoiding hospital crowds and further contagion. Among the sick, the incidence was highest in sailors (99%), prisoners (82%), and government officials (76%), while factories, schools, and army barracks had morbidity rates of 42-45%. This provides anecdotal evidence regarding why Salvador, which had been strongly affected by previous epidemics of infectious diseases, was relatively spared by the influenza pandemic.

In Recife, Pernambuco, the death toll was more severe, perhaps because public events restarted too early. Initially, authorities responded but did not explicitly impose stringent isolation measures. By October 9, newspapers described how the influenza epidemic “slowed down movement on the streets, cinemas, cafes, and commercial establishments ... due to the fact that of the businesses’ employees are sick” (quoted in Silva, 2017, p.60). Residents could also request medical attention at their home by leaving their address at (or calling) the Department of Public Health. The municipal government also established temporary hospitals in several districts of the city. By October 15, public offices and businesses operated with limited hours, the postal service restricted operations, most educational institutions closed, and sporting activities also stopped due to the high morbidity rates among athletes. The director of the Department of Public Health, doctor Abelardo Baltar, succumbed to the flu on October 13, before he or any other government official announced stringent measures to mitigate the disease’s spread. Baltar’s successor, doctor Octavio de Freitas, took another approach and imposed social distancing measures. He required cinemas, churches, hospitals, and schools to close (quoted in Silva, 2017, p.154). Yet, these measures ended quickly; cinemas reopened on October 28. Death rates and public pharmacy visits decreased significantly per day by late October (p.116-117).

In Manaus, the capital of Amazonas, in the North, the first case of influenza was confirmed later than most state capitals, on October 24, 1918. Residents had followed the alarming news for weeks, and city officials were aware of the measures their counterparts had taken. Most businesses closed by early November, and on November 4 all soccer games were canceled. Nevertheless, the flu quickly became an awful risk for residents. For example, the city lacked the personnel to bury all corpses even with the aid of the state police. In some of the poorest neighborhoods, bodies were found abandoned (Silva, Costa, 2011, p.9-11). Similarly, the general director of Hygiene in Fortaleza, the capital of Ceará, called on residents to avoid dancehalls in late October, but these recommendations may not have been immediately followed (No Ceará..., 29 Oct. 1918).

All major cities restricted funeral gatherings and passed regulations to expedite burials to avoid contagion. In Recife, the Health Department ruled that corpses should not sit in the public morgue, as was traditionally done, but rather should be taken directly to the cemetery (Silva, 2017, p.101). In São Paulo, the Sanitary Service centralized funerals to public buildings to prevent gatherings in homes (Bertolli Filho, 2003, p.146). Still, photographs from the time show crowds in cemeteries and funeral processions with agglomerations of people not wearing facial protection (Figure 1).



Figure 1: Funeral procession of José Paulino Nogueira Filho in São Paulo, without social distancing, 1918 (Nascimento, 2020)

Brazil's previous epidemics had somewhat prepared authorities. They quickly mobilized public service employees to clean and disinfect public spaces and provide sterilization services for homes afflicted by contagious diseases. In Recife, the Department of Health provided free sterilization services for families with flu deaths (Silva, 2017, p.75). The city of São Paulo mobilized the Central Disinfecting Department to sanitize homes with two or more deaths (Bertolli Filho, 2003). By late October, in Salvador, the Central Disinfecting Unit of the State Secretary of Health began disinfecting spaces where people clustered. In Amazonas, the Health inspector of the Port of Manaus, doctor Madureira de Pinho, identified sick sailors and used a powerful pump to spray and disinfect the ships (Silva, Costa, 2011, p.4).

Previous epidemics also taught public health officials how to deal with large, sudden waves of sick people. Thus, all major cities developed capabilities to rapidly build improvised hospitals and *ad hoc* clinics (*pontos de socorro*). Moreover, the different health departments or sanitary services quickly created teams of doctors to staff hospitals and home visitation services. In Manaus, authorities set up a floating hospital, called the Santa Barbara, to treat the poor and homeless. They also converted schools, police barracks, and a detention center into hospitals (Silva, Costa, 2011, p.7-8). Across Brazil, doctors provided home visits to avoid crowding at hospitals. In Salvador, because doctors treated patients in their homes, only about 15% of individuals died in the city's hospitals and asylums (Souza, 2009, p.235-241).

São Paulo was unique because it relied less on house calls. The municipal chamber passed a rule in mid-October 1918 to convert public buildings into clinics. By November, the Sanitary Service opened 38 improvised hospitals and 44 clinics to provide free treatment, though there were only ten thousand beds for the thirty thousand sick patients. Neiva initially recommended the ill stay at home, but by early November, he urged the sick to hospitalize to avoid delays caused by traveling doctors and nurses (Bertolli Filho, 2003, p.166-168). Health officials in Porto Alegre took the opposite strategy by keeping the sick at home. The municipal government divided the city and its residents into 25 "sanitary

districts" (*quateirões sanitários*) (Abrão, 2009). One doctor and a small team of medical students were assigned to each district or neighborhood. The government required health teams to make daily visits, provide free supplies, and only remove patients who could not receive home care. The Hygiene director received a report of cases each day at noon in October and November 1918. This approach mirrored Salvador's aggressive and widespread medical house-calls strategy and differed from the attempt to hospitalize the infirm in São Paulo, Recife, and Manaus.

Across Brazil's cities, governments monitored pharmacies to prevent price hikes and reimbursed the cost of medicines and remedies to the sick. In the state of Espírito Santo, the government distributed free treatments to towns inland (Franco et al., 2016, p.416). Improvised new pharmacies were operated by the Sanitary Services, usually located near makeshift clinics or hospitals. For instance, on October 15, the Department of Health in Recife began providing free medicines to the local population using five improvised clinics (Silva, 2017, p.75). The government also provided small cash transfers to those who could not sustain their families.

Treatments the Sanitary Services recommended and prescribed were ineffective and likely provided false security, which was often recognized: "Doctors themselves admit it is difficult to treat the flu ... no drug had the power to stop the flu's inevitable course" (Silva, Costa, 2011, p.13). In São Paulo, the Sanitary Service officially recommended regular "cleaning of the nasopharynx with inhalations of menthol Vaseline, or regular gargles of saltwater, iodine water, or citric acid." One very old drug, quinine, was popular, and stocks quickly dwindled, even though it was never proven effective against influenza. In Rio de Janeiro, the government regulated its price, but some pharmacies sold it for upwards of ten times its regular price (Bertolli Filho, 2003, p.157; O Crack, 22 Oct. 1918).² In Recife, the director of Public Health promoted the smallpox vaccine (*vacina jeneriana*) as a remedy, even though there was no scientific evidence to support the vaccine's effectiveness (Freitas, 1918, p.18). Newspapers even wrote that the smallpox vaccine provided "immunity" against influenza (Silva, 2017, p.110). These newspapers, and others across the country, show how an older paradigm of miasma or "corrupted air" continued to hold ground. In the Minas Gerais countryside, newspapers indicate a total lack of knowledge about disease transmission, associating the flu with cholera: "The terrible disease is contaminated with the greatest ease, through the air, emanations from the earth, dust and water ... [so] one must be extremely careful with stagnant waters" (Sales, 2005, p.40). Another newspaper, *Carioca*, promised a cure with "peculiar recipes" invented by journalists. Clearly, "fake news" circulated throughout the 1918 epidemic (Albuquerque, 2020). In response to this discourse, the medical profession sought to differentiate and establish itself as an authority. While newspapers announced various "cures" based on homeopathic and popular knowledge, the Sanitary Service of São Paulo sought to discover, classify, and control scientific knowledge concerning the flu (Bertucci, 2004, p.173-283). Unfortunately, scientific medicine had little impact on society's response to the epidemic. Without effective, scientifically-backed treatments, the government distributed quinine to the population (Souza, 2009, p.245-246).

Across many Brazilian cities, markets and shops remained open, following an old, institutionalized response to avoid famine. Without electricity and refrigerators, Brazilians

visited the market most days for essentials, but in mid-October, 1918, the municipal government decreed a three-day “holiday” and fined shops found open (Do Rio, 1 Dec. 1918; O Comércio..., 22 Oct. 1918). By this point, hundreds of people were dying each day from influenza in Rio de Janeiro, and health officials hoped keeping people home would slow infection. However, the measure backfired: influenza continued to spread while food and basic goods became scarcer. Residents in the poor outskirts may have suffered the most (Jacarepaguá..., 30 Oct. 1918; Uma Obra..., 6 Nov. 1918). On October 22, one day after the “holiday,” the *Correio de Manhã* reported, “where food establishments are not closed, there is a shortage of goods. ... Public authorities opened the city for the plague to invade and allowed it to proliferate. They should know now how to relieve their guilt over so many irremediable misfortunes by avoiding even more terrible evils” (O Comércio..., 22 Oct. 1918). That same day, the president of the Republic responded to the famine by calling on stores in Rio de Janeiro to reopen, and food distribution slowly expanded. City officials mandated the procurement of chickens (Brazilians widely view chicken soup as the best palliative for flu and colds) and opened soup kitchens in police stations and other public spaces. The wives of the Brazilian president and a prominent federal minister directed two large food distribution centers. These served more than a thousand people per day (Na Capital... 28 Oct. 1918). Unfortunately, government efforts and philanthropy were not enough to stave off hunger and malnutrition (Bertucci, 2004, 118).

Newspaper correspondents throughout the Brazilian Republic reported that the proud capital of Brazil, Rio de Janeiro, suffered from plague “and” hunger. Officials in other cities acted aggressively to avoid a similar fate. São Paulo’s municipal president reassured residents that the city had a three-month supply of essential foods, perhaps to prevent a run on the stores. Private residents quickly mobilized “food cooperatives” to collect donations, monitor neighbors, and distribute food to the needy. By the end of October, São Paulo’s Catholic archdiocese oversaw around twenty soup kitchens across its parishes, serving nearly three thousand meals per day (O Fornecimento... 30 Oct. 1918). In Porto Alegre, milk, chicken, lime, castor oil, quinine, firewood, kerosene, and gasoline became hard to purchase, except for those with the connections and money to afford exorbitant prices. In late November, one popular magazine reported that “the smallest households” – referring to the city’s poor – “were infected and without fuel for light” and families “without the slightest hope for better days” were “multiplying” (Abrão, 1998, p.71). Malnutrition probably added to the number of influenza deaths across Brazil. In northeastern Brazil, thousands went hungry in the inland towns of Alagoas, Ceará, and Recife (Garanhuns..., 29 Oct. 1918; A epidemia..., 30 Oct. 1918; A influenza..., 31 Dec. 1918; O Jornal..., 10 Nov. 1918; Fome..., 23 Oct. 1918). When 1918 finally ended, a Pernambucan poet described the year as: “Unrelenting, cruel, tyrannical, / From hunger, from epidemics, / – Bitter, terrible days” (Na ordem..., 31 Dec. 1918).

Problems with famine reveal the thin line the government walked. Many poor Brazilians lacked reliable food supplies before influenza struck, and because most families bought the foods they needed daily, government officials were careful not to impede commerce, transportation, and production. Any attempt to “limit agglomerations” ran the risk of the “more terrible evil:” hunger, unemployment, and destitution of whole

families. This helps us better understand why (1) public officials took few steps to enforce social distancing and (2) why the pandemic struck so rapidly and caused a sharp mortality curve in many places.

Besides social distancing, masks and face-coverings were other measures used in the 1918-1919 pandemic, though rare (Taylor, 10 Apr. 2018; Canales, 10 May 2020; Burgess, Horii, 2012). Cloth or gauze face coverings were first promoted to prevent disease transmission in the late nineteenth century but were not employed widely by surgeons in the United States and Germany until the 1920s (Spooner, 1967). During the 1918-1919 pandemic, government officials promoted face coverings in a few parts of the world, but no evidence suggests widespread usage. Additionally, many people in the United States resisted mask mandates, arguing that they were uncomfortable, unnecessary, or infringed on civil liberties (Dalgarno, 13 May 2013; Canales, 10 May 2020). In Brazil, we found no evidence of mask mandates or use. One São Paulo newspaper, *O Combate*, wrote, "In the United States and France, mainly in the battlefield hospitals, the doctors are using masks. This is not the case with us, which is why 38 doctors have already died in Rio" (A pandemia..., 30 Oct. 1918). In numerous photographs taken in Brazil in 1918 and 1919, we find no images of people wearing masks.

Reviewing the many steps taken by governments and individuals, a puzzle remains. Some large cities, like Salvador and Belém, and many smaller towns in São Paulo suffered from influenza at much lower rates. Perhaps historians will find an explanation in mitigation strategies, although influenza, like other viral diseases, may have been influenced by environmental and other factors less dependent on human behavior.

Reassessing the mortality of the 1918-1919 influenza pandemic

A few cities mostly avoided the flu, but it took a terrible toll in most parts of the country. As shown in Figure 2, historical and updated accounts of mortality rates by epidemiologists in the *Bulletin of the History of Medicine* show rates of 6.8 per thousand in Brazil, comparatively low compared to Mexico, Chile, countries in Africa, and nations in Southern Europe (most above 12 deaths per thousand; cf. Johnson, Mueller, 2002; Patterson, Pyle, 1991). In developing countries, influenza killed at highly varying rates, according to the statistics assembled. Nations and colonies in Africa and the South Pacific had the highest death rates (between 20 and 60 per thousand). Other countries like Mexico (20 per thousand), China (14.2 per thousand), or Chile (11 per thousand) also had double-digit figures, but none as high as South Africa (44 per thousand) or Indonesia (30.4 per thousand). Mortality estimates of influenza in Brazil from 1918-1919 also look low compared to the rates of densely populated cities in the United States, such as Boston (7.93), New Orleans (8.79), New York (10.38), and Pittsburg (10.04) (Crosby, 2003). The data may have conveyed the message that even during the worst of pandemics, Brazil, with its relatively underfinanced health and sanitation system, somehow avoided the worst.



Figure 2: 1918-1920 estimates of influenza death rates per thousand people, by country (Johnson, Mueller, 2002)

Although these figures are highly cited, particularly those of Johnson and Mueller, these calculations are unexplained and likely underestimates. We suspect the figures were extrapolated from only a few of Brazil's largest cities. According to the official mortality rates, 4.5 per thousand died from influenza in Rio de Janeiro (12,388 deaths), and only 2.69 in the state of São Paulo (12,386 deaths) (Bertolli Filho, 2003, p.74). These rates are relatively low compared to Brazil's regional neighbors and countries with similar rates of development, but they are calculated using urban rates and at that time Brazil was a predominantly rural country. This is problematic as it misses the severity of the epidemic in the inland towns of Brazil.

In fact, the 1918-1919 pandemic was deadlier than previously assumed. We compile new estimates of mortality rates for 1918 in Brazil's largest cities. Our estimates of average deaths per thousand in cities with more than thirty thousand people fluctuate between 8.7 and 9.2 per thousand (Table 1). Additionally, previously published mortality rates often exclude the majority of the country's population. In 1920, about 80% of Brazil's population lived in small towns and rural municipalities.³ Outside of the big cities, we discover higher mortality rates. Hundreds of towns and rural municipalities in São Paulo and Mato Grosso with accessible data show a weighted average death rate of 20.4 per thousand, an alarmingly large number. Our refined estimates of death rates, based on a broader base of historical sources that include urban populations and the higher toll of rural areas, demonstrate that only the most conservative estimates of total deaths align with our calculations. Thus, based on mortality rates, we calculate that in 1918, influenza killed 23,000-31,000 in the largest cities. At that time, Brazil's total population was about thirty million. In smaller towns and rural municipalities, another 183,000-556,000 died from the Spanish flu. In sum, we posit 266,000-587,000 deaths during this pandemic.⁴ This was Brazil's deadliest pandemic yet. But when measured by the percentage of deaths, Brazil's battles with cholera and smallpox were likely worse (Cooper, 1975).

Table 1: Average death rates due to influenza in various cities in Brazil, 1918

Geographical unit	Deaths per thousand people
Average for large cities (population over 30,000)	8.7
Median for large cities (population over 30,000)	6.7
Weighted* average, large cities (if data is available)	9.2
Weighted* average including small towns and rural municipalities in São Paulo and Mato Grosso (if data is available)	20.4
Average for cities for which we have excess deaths	4.6
Weighted* average for cities for which we have excess deaths	8.0

* Weighted averages are calculated adding all deaths and all the population figures of the cities included in each calculation.

Source: deaths for Porto Alegre, see Abrão (1998); for Ceará, see Ceará (1917, 1918); for Recife, see Freitas (1918); for Florianópolis, see Alonso (July 2011); for Espírito Santo, see Franco et al. (2016); for Rio de Janeiro, see Goulart (2003); for São Paulo and its municipalities, see São Paulo (1918). Population figures from the 1920 census, see (IBGE, 2011).

Influenza in the twentieth and twenty-first centuries

By 1921, Brazilians were looking toward a new decade, one free of pandemics. They got their wish, temporarily. Though influenza no longer killed hundreds or thousands daily, it remained a serious problem. It was a top cause of death until the 1950s, especially for young children and the elderly. However, by 1977, mortality rates had fallen and deaths from influenza became so rare that the federal government stopped reporting them (Pantoja, 1969, p.123). More surprisingly, as the world suffered other influenza pandemics, these did not align with Brazilian epidemics.

We turn first to mortality rates in the 1920s across Brazil. In twelve cities, in 1921 and 1922, doctors recorded about 0.7 death per a thousand residents. Rates were also lower in Rio de Janeiro (0.6), Curitiba (0.4), and São Paulo (0.28) (Rio de Janeiro, 1923). Though less prevalent than years before, the disease remained dangerous.

São Paulo's experience with influenza reflects national trends in wealthier regions, as shown in Table 2. Death rates from seasonal flu were reasonably stable in the 1920s and 1930s but fell quickly in southern and southeastern Brazil. The poorer northern and western regions also saw lower rates, but with a decade lag. The reason for lower rates is unapparent, but with the rise of chronic and degenerative diseases, influenza and other infectious diseases declined in Brazil and other parts of the world. Historians debate the primary cause of this transition (the "third epidemiological transition"), including nutrition, sanitation, and public health measures (Omran, 1971; Colgrove, 2002; Armelagos, Harper, 2005). For influenza, the discovery of penicillin in 1945 likely caused a sharp decline in the 1940s and 1950s. While flu is unaffected by antibiotics like penicillin, some of its common comorbid diseases, like bacterial pneumonia, could be treated. Indeed, pneumonia also killed far fewer residents of the state of São Paulo after 1950 than just a decade before (Taxa..., July 1960).

Table 2: Mortality rates of influenza and pneumonia in São Paulo, 1894-1979 (per 1,000)

Years	Influenza	Pneumonia
1894-1899	0.02	1.84
1900-1909	0.11	1.26
1910-1919	1.20	1.71
1920-1929	0.29	2.11
1930-1939	0.29	1.69
1940-1949	0.16	1.00
1950-1959	0.07	0.62
1960-1969	0.03	0.66
1970-1979	0.10	0.81

Source: for 1898-1930, *Anuário estatístico do estado de São Paulo*; for 1894-1957, see Schmid (1959, p.280-289, 332), and for 1962-1984, see Brasil (1962-1984)

Influenza also became less lethal in Brazil's cities, but rates fluctuated year to year. For example, influenza appeared to be epidemic in Natal from 1963-1964, then spread to Recife, Maceió, and Cuiabá in 1965. These patterns do not align well with the two pandemics that historians often describe during this period, including the 1957-1958 "Asian flu," and 1968-1969 "Hong Kong Flu." Brazilians were well aware of the pandemics during these years, and they caused public fear (*A asiática...*, 20 Aug. 1957; Viana, 30 Aug. 1957; Cantarino da Costa, Merchan-Hamann, 2016, p.16-17). Nonetheless, the mortality patterns of influenza did not follow the global trends, except in the nation's capital (by then, Brasília) in 1968. In some cases, journalists frightened their readers with news of the flu's "inevitable" arrival, only to report several months later that the disease caused no unusual increase in deaths (*O surto...*, 4 Feb. 1933; *Medidas...*, 11 Aug. 1957; *Vigilância...*, 15 Jan. 1960; *Previna-se...*, 2 Dec. 1968; *Gripe...*, 28 Mar. 1976). In Rio de Janeiro, some journalists speculated that the warmer climate prevented the disease from becoming epidemic (*Gripe...*, 11 Dec. 1969).

By the late 1970s, the government recorded relatively few influenza deaths in Brazil. Vaccination helped, as safer "split" vaccines were mass-produced and distributed by the end of the 1970s (Barberis et al., 2016). In 1978, the *Anuário Estatístico do Brasil*, which published regional and municipal mortality rates from across Brazil for much of the twentieth century, stopped publishing influenza death rates (Brasil, 1962-1984).

After 1970, influenza's ferocity declined, though journalists continued to sensationalize the disease. In 2009, newspapers warned of an influenza pandemic rumored to have emerged among drifts of pigs in Mexico (Cantarino da Costa, Merchan-Hamann, 2016, p.17-19). Again, headlines suggested inevitable mass casualties, claiming the disease could affect 67 million Brazilians in only eight weeks (Schwartzman, 2009). Many Brazilians braced for the worst, some pharmacies sold out of hand sanitizer, and hospitals prepared contingency plans. Yet, once again, mortality from the 2009 "Swine Flu" in Brazil was only slightly worse than the general flu. Experts estimated influenza killed about 0.011 people per a thousand, a rate similar to that of Argentina (0.0153), Uruguay (0.010), Costa Rica

(0.029), and Chile (0.006) (Balanat et al., 2012; Confirmam 33..., 9 Sep. 2013; Saborío et al., 2014; Maquilón et al., 2018).

The decline of influenza in the late twentieth century and Brazil's misalignment with other infamous pandemics help explain why covid-19 was discounted and derided. The Brazilian media reported the risk of influenza pandemics with high alarm in 1957, 1968, 1976, and 2009, but like the old fable of the boy who cried wolf, Brazil was not struck by destructive epidemics those years.

Final considerations

Our research shows that Brazil periodically experiences influenza pandemics and epidemics. During the 1890-1891 and 1918-1919 pandemics, death rates were high, and the authorities were often unwilling to recognize the scale of the problem. During the 1918 influenza pandemic, death rates in Brazil's cities varied based on whether treatment was centralized in public and emergency hospitals or if the infirm were treated by visiting doctors. Politicians were concerned about the economic impact, hunger, mass unemployment, and a loss of individual autonomy. Face masks and coverings were only beginning to be used in some parts of the world, but we found no evidence of their use in Brazil. After 1919, the world's pandemics did not align well with Brazil's mortality rates. By the middle of the twentieth century, antibiotics, vaccines, and antiviral medications considerably lowered the risk of influenza among Brazilians. The perception that a new and very deadly pandemic would arrive appears to have faded more than the actual risk of infectious, acute, and viral respiratory disorders.

While influenza and covid-19 are different diseases, their impact and lethality may be compared. During the 1918-1919 influenza pandemic, Brazil battled twin problems: infection and hunger. More than a century later, covid-19 again brought forth these unconnected problems. Though Brazil is now a dramatically different country – notably being more urban, educated, and wealthy – the government's reaction is eerily similar to that of twentieth century Brazil. In this new epidemic, the Brazilian government continues to struggle to balance disease mitigation policies with efforts to avoid destitution and hunger. Millions of Brazilians depend on daily work and living conditions that are not conducive to social distancing, work-from-home, and “lockdowns,” which forces the government to walk the line when implementing policies. These policy risks also continue to be politically charged.

The 2020 covid-19 pandemic is unmatched in magnitude in modern Brazil, but it is unlikely to be as mortal as the 1918-1919 pandemic, although we face the same detection problem as influenza: both diseases “hide” behind other comorbid illnesses. Although less severe, covid-19 reminds the world that acute respiratory diseases remain a serious threat, as do the consequences of the policies – or lack thereof – to combat them. The lessons learned from previous pandemics and covid-19 may make the world more prepared for the next influenza pandemic.

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NOTES

¹ Recife's estimate is based on influenza deaths plus excess tuberculosis deaths. Since there are no counts of deaths by other respiratory diseases, we extrapolated the excess death rate from tuberculosis (Freitas, 1905). Rio de Janeiro's and Porto Alegre's estimates are total influenza deaths plus excess deaths from tuberculosis, bronchitis, pneumonia, and heart disease (Ministério do Interior, 1892, p.85). São Paulo is based on excess deaths from the parishes São Tiago and Santo Amaro.

² Quinine forms the basis of hydroxychloroquine, a drug which Brazil's president promotes for covid-19, despite strong evidence of ineffectiveness.

³ The combined population of Brazil's capitals, which included its largest cities, was 3.2 million in 1920. This urban population composed 11.7% of Brazil's total population (27,500,000) (IBGE, 2011).

⁴ These estimates are generated from mortality rates and the 1920 census. Please contact the authors for detailed methodology.

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