

Environmental and Cultural Frames in Histories of Disease: The Case of Smallpox in Brazil

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Smallpox became a bigger killer in Brazil during the nineteenth century because of the limited capacity of a deregulated and uncoordinated vaccination program and the increasing movement of people who carried the *variola* virus. This disease killed about a half million Brazilians between 1850 and 1910 and at a rate that was probably about two or three times higher than the preceding two centuries.¹ During these six deadly decades, its epidemics arrived more frequently and were often more lethal. Furthermore, smallpox became a worse problem in Brazil at the same time that it diminished in other parts of the Atlantic world. Not until the early 1900s could mass vaccinations begin to lower the incidence of this disease. With the small prick of a vaccinator's needle, smallpox transformed. In a single generation, it changed from an affliction that nearly everyone expected to get once in their lives (and survive at God's will), to an uncommon killer. Yet prophylaxis went hand-in-glove with a more surveilling and personally intrusive public health system. The fact that armed medical police sometimes accompanied vaccinators better reflects a complex evolution of public health and disease environments than the misleading simplicity of an inevitable triumph of medicine.

Smallpox occurred during Brazil's "second era of epidemics," a period between 1849 and 1909 when yellow fever, cholera and bubonic plague arrived. These diseases were unfamiliar, frightening, and destructive, and so were worsening epidemics of smallpox. They also had large political and economic consequences and shifted or sharpened various cultural beliefs, such the mutability or immutability of race. Furthermore, Brazilians appear to have not been alone in facing dramatically altering infectious disease ecologies in their quotidian worlds. Historians have not considered if or how the epidemiological environment transformed across the Americas after independence, even though this has been a popular area of investigation of the colonial period.² I offer what I believe is some of the first evidence that Latin America experienced

significant and often shared changes in the relationship between its diverse populations and the microbes that inhabited their bodies during the first century of the national period.³ The rise and fall of contagion in Latin America have causes and consequences that historians have yet to explore.

My paper today has three parts. First, I plan to discuss smallpox in Brazil during the nineteenth century, giving a detailed case study that fits within dynamic microbial and human ecologies. The second part widens the lens to look at the changing epidemiological environment in Brazil and in the broader region. Finally, I discuss how Brazil's history of smallpox and changing infectious disease ecologies compares to popular trends of the historiography of medicine of Latin America. In the last three decades, historians have frequently and productively “framed” disease within cultural and political contexts, but doing so might sometimes confuse the picture for the frame. A recognition that microbes can have more effect on us than we have on them provides firmer ground to find inherent weaknesses of “whiggish” history of medical progress.

Part I.

Typically, people infected by smallpox experienced severe flu-like symptoms soon followed by the appearance of flat, red spots, which usually moved from the face to the hands and arms to the upper torso (Figure 1). Lesions transformed from pimples filled with clear fluid into small pustules with predictable timing. About eight to nine days after their appearance, pustules turned to scabs and left deep-pitted scars when they fell away.⁴ In its worst form, smallpox developed under the skin, leading to internal hemorrhaging and a painful death. With these symptoms, this disease was unlike most other illnesses and not easily confused. Light forms of smallpox, were sometimes misdiagnosed as another cutaneous infection especially if

measles or chickenpox were prevalent. Although by the nineteenth century, doctors had far less trouble distinguishing this disease, especially during large outbreaks, due to its particular timing, location and appearance of rashes, mortality, and movement.

The indigenous peoples of Brazil and other parts of the Americas were originally unexposed to smallpox, creating the conditions for terrible destruction and an enormous decline in population when it arrived with European explorers and their livestock. Smallpox may have spread west and south from afflicted areas in the Andes as early as the 1520s, or it may have spread from the northeast coast of Brazil after Spaniards and Portuguese landed between 1499 and 1501. Historians have no good records from the Portuguese possessions until four decades later.⁵ Like other parts of the Americas, newly imported infectious diseases probably caused their worst ravages during the first century after contact, but too many deaths escaped memory in remote areas to know for sure (Figure 2). Between the middle of the sixteenth and the middle of the nineteenth centuries, smallpox appeared and departed about every ten to twenty years. The slave trade may have facilitated the disease because outbreaks coincided on both sides of the South Atlantic, and slaves died from this disease during their middle passage.⁶

Although smallpox was declining as a problem in many parts of the North Atlantic during the second half of the nineteenth century, it became a worse problem in Brazil. Contemporary doctors and government officials wrote longer and increasingly anguished reports of smallpox as the nineteenth century wore on, and, in the early twentieth century, their successors celebrated the reduction of smallpox mortality.⁷ We might attribute this to greater surveillance and better record keeping, so it is helpful to turn to mortality statistics kept by priests, cemetery administrators and civil authorities across Brazil. In Rio de Janeiro, Brazil's imperial capital, the number of smallpox epidemics and their virulence increased after 1850. Out of the eighteen

epidemics that struck this city in the nineteenth century, thirteen occurred during the second half. As Figure 3 shows, mortality rates grew from about 15 per 10,000 people per year in the early 1860s to about 22 per 10,000 people in the 1880s, before gradually falling. While fewer residents of Rio de Janeiro were dying on average by 1890, its epidemics continued to worsen. In fact, the epidemic of 1908, killing 6,545 people (or nearly one out of every 100 *cariocas*), appears to have been the city's worst epidemic of the nineteenth and twentieth centuries.

After about 1850, smallpox broke its one or two-decade cycle, arriving in epidemic form in Brazil's coastal cities every 3-5 years. It was true in Belem, in the far north of Brazil, and in Porto Alegre two thousand miles to the south (Figure 4). Belem experience two epidemics between 1800 and 1865 but five epidemics during the 25 years after. Unlike Rio de Janeiro, overall mortality declined in Belem over the century but the virulence of its epidemics between 1865 and 1890 were much worse than Brazil's capital. Like Belem, Porto Alegre's overall smallpox mortality from smallpox gradually declined, yet again worse outbreaks occurred after 1850.⁸ Beyond these coastal cities, the smallpox virus more successfully penetrated the diffuse populations of Brazil's expansive interior regions after 1860.⁹

As I will discuss, smallpox may have also worsened as a problem in other parts of Latin America. If this is true, the ecology of smallpox in the wider region follows a nearly opposite ecological pattern than many parts of the North Atlantic. For example, the disease caused greater mortality and more frequent epidemics in London, New York, Philadelphia, and Boston during the first half of the century, although there were several terrible outbreaks in these cities during the second half.¹⁰ London bills of mortality measured fewer deaths from smallpox as early as the 1810s and mortality declined in overall terms in the United States, Canada, and Western Europe over the nineteenth century.¹¹

What accounts for the rise of smallpox in some parts of the Atlantic world, but its decline in others? Smallpox grew to be a more frequent and intensely virulent problem in Brazil when inoculation and vaccination efforts failed to produce a sufficient number of people with artificial resistance, the nation's population grew, transportation infrastructure expanded, and more people moved within or to Brazil. But considering that population, migration, and immigration grew, and transportation infrastructure expanded in the North Atlantic, yet smallpox mortality declined, public health is the best explanation for why smallpox took different paths.¹²

Brazilians, like their North Atlantic counterparts, attempted to reduce the risk of smallpox using isolation, disinfection, inoculation, and vaccination.¹³ And like in the north, these measures were mostly implemented and regulated at a very local level. For example, township ordinances in Brazil regularly prohibited the entry of anyone afflicted by smallpox, quarantined its sick, and established sanitary cordons when neighboring regions reported epidemics. These measures may have worked in rural areas where populations were diffuse, but was impractical in more densely populated areas.¹⁴ Township officials may have erected cordons too late, or their barriers breached. Like isolation, disinfection was limited in its power since the virus was more likely spread through inhaled droplets of infected saliva after direct contact with infected people than from inanimate objects. Inoculation (or variolation), or the deliberate introduction into the skin of material from smallpox pustules, had been practiced for centuries in Asia and Africa, but it appears to have been uncommon in Brazil.¹⁵ Vaccination was the best option, and Brazilians recognized its benefits only a few years after Edward Jenner legitimated and medicalized English folk knowledge in 1798.¹⁶ Vaccination arrived in Brazil six years later, carried by a group of Bahian slaves who had vaccinated "arm-to-arm" sequentially during their trip back from Europe. Over the next several decades, the Vaccine Board of Rio de Janeiro and several provincial

vaccine institutes distributed vaccine in relatively small quantities across the empire, usually in response to outbreaks.¹⁷

Vaccination became mandatory for all Brazilians and residents, free or enslaved, in 1846.¹⁸ This law appears to have been among the first in the world that required vaccination at the national level, but it did little good because it placed enforcement in the hands of local officials who were unable or unwilling to do so. Provincial governments also ignored the national law when they approved municipal codes that lacked vaccination regulations. For example, among 216 ordinances passed by 99 municipalities in São Paulo between 1865 and 1889, more than half had no vaccination rules, allowed broad exemptions, or set trivial penalties. Low levels of vaccination failed to create herd immunities. In fact, townships that complied with the 1846 decree experienced no fewer epidemics than those that did not comply with the Emperor's wishes.¹⁹

The great challenge of attaining good vaccine made the problem worse. The imperial and provincial vaccination institutions were underfunded and entirely unprepared to distribute vaccine to millions of Brazilians, even in the wealthiest urban areas.²⁰ Despite a large reward promised to any individual who could manufacture vaccine from cows, the vaccine institutes had to order vaccine from London or Paris until 1887. Vaccine frequently decomposed and disabled the *variola* virus when it crossed the thousands of miles of the Atlantic Ocean or Brazilian territory.²¹ Even when good vaccine was available, people in Brazil (and nearly everywhere else) expressed deep distrust toward the “unholy” vaccine, an understandable reaction considering the procedure transferred the pus of diseased tissue into the bloody incision left by a blade. Enough knew that a vaccination might spread syphilis while failing to provide resistance. A major revolt

against obligatory vaccine in Rio de Janeiro in 1904 is a well-known expression of long-running fears against vaccination, but vaccinators were turned away at gunpoint decades earlier.²²

As early as the 1830s, most high-level officials and literate Brazilians were aware that state managed vaccination could help eliminate this disease. Many newspapers offered declining mortality rates in France and England as proof (Figure 5).²³ Despite this, the state responded to smallpox through a highly unregulated system did not have the means to prevent it, especially among Brazil's *povo* (mostly non-white and poor populations). The government could only enact policies to end one of its most destructive scourges after the Empire collapsed in 1889.

Smallpox was not the only disease devastating Brazil during the second half of the nineteenth century as I explore in the second part of my paper.

Part II

Up to the middle of the nineteenth century, Brazil had earned a reputation as being a “salubrious” place. This popular view was based on the observation that influenza and cholera pandemics, which had killed hundreds of thousands from Bengal to Hamburg to Havana, had not dipped below the South American equator.²⁴ Brazil’s coastal population was probably too disconnected and diffuse to invite the influenza and cholera pandemics that had caused destruction throughout much of the world in 1802 and 1831. Brazil’s reputation began to sour when yellow fever struck in 1849. Government officials blamed a ship ferrying American gold prospectors to California as its fatal carrier (Figure 6).²⁵ Yellow fever caused epidemics in coastal towns about one out of every two years between 1849 and 1910, but it was especially virulent in the 1850s, 1870s, and 1890s. Yellow fever also expanded its territory, with its mosquito vector riding the rails and prompting the first epidemics in the coffee highlands in the 1880s. In 1855, as government officials were expressing their dread that they could not dislodge

yellow fever, cholera arrived. In this case, it was first phase of a rubber boom in northern Brazil that helped create the transport and personal connections required for cholera's arrival from Portugal. Cholera killed as many as 200,000 people in Brazil before it disappeared in 1868, but it especially targeted the poor who were mostly of indigenous and African descent.²⁶ Finally, bubonic plague – the great biblical scourge – was recorded as the official cause of death for the first time in Brazil in 1899.²⁷

Historians describe these diseases as consequential, but they rarely talk about them in a way that recognizes a more broadly shifting epidemiological environment.²⁸ For example, scholars have claimed the epidemics or fears of disease helped end the international slave trade²⁹ and prompted significant urban reconstruction projects.³⁰ They argue fears of disease increased support for a more decentralized federal system and a coup d'état that ended the monarchy in 1889.³¹ Our colleagues have described epidemics of yellow fever and a major urban revolt against compulsory smallpox vaccination that shook the First Republic.³² Thus, disease has provided fertile ground for large historical claims. Despite this, we have little idea of the top causes of death, how these differed between populations such as slaves and free people, how elites used diseases to justify their moral agendas, and how Brazil's experience fit within a wider Atlantic epidemiological context.

In fact, these changes are probably best located on a continental scale. Smallpox appears to have worsened during the second half of the century in Mexico³³, Cuba,³⁴ (Figure 7) Chile³⁵ and Argentina,³⁶ although no one has recognized a regional pattern. Yellow fever began killing in large numbers in southern Mexico and Central America after 1850; it was, however, well recognized as a ghastly problem in other cities rimming the Caribbean Sea and Gulf Coast in the 1830s and 1840s.³⁷ This disease left “multitudes of diseased corpses” following an outbreak in

the Yucatán in 1855.³⁸ Cholera became another new visitor to this region about the same time. It emerged in Costa Rica in 1856 when a militia mobilized against the invading army of William Walker. Not only did cholera kill 8 percent of the population and create an “acute economic crisis in the coffee industry,” Costa Rican public health officials used its memory as part of a “patriotic anti-cholera discourse” when the disease returned for the first time 135 years later.³⁹ Infectious diseases also appear to have altered in South America in the middle of the nineteenth century. Besides Brazil, Peru and Ecuador were not struck by yellow fever until 1842 while Uruguay and Argentina saw their first epidemics in 1871.⁴⁰ Cholera killed tens of thousands in the Southern Cone and Bolivia in the late 1860s, a conflagration ignited by the Paraguayan War.⁴¹

Latin America’s second “era of epidemics” ended in the early twentieth century. For example, smallpox was reduced to a much less common disease in many of Brazil’s wealthier states between 1890 and 1910. The new republican government gave state authorities more power to centralize and regulate vaccination (Figure 8). Unlike the Imperial law that had placed the power of enforcement in the hands of township councils, new state laws carried greater fines and stipulated that the civil and military police would take “appropriate measures” to ensure vaccination.⁴² Additionally, safer, cheaper and more effective vaccine became available. After nearly a decade of trials, the director of the Santa Casa de Misericórdia of Rio de Janeiro, Pedro Affonso, successfully reproduced the *variola* virus in calves. The Vaccine Institute could then begin manufacturing vaccine at a much larger scale and lower cost.⁴³ In 1905, the *Paulista* government reported that it had vaccinated more than 27,000 people that year, about the same number of vaccinations in that province between 1841 and 1872.⁴⁴ Popular resistance appears to

have withered in the face of safer vaccines, evidence of broad successes, fears of worse epidemics, and the threat of force.⁴⁵

The decline of smallpox in Brazil's cities was a part of a larger change in the disease environment; much of it prompted by direct action. Mosquito eradication programs banished yellow fever from many urban areas, chlorine, and sewage treatment reduced the cholera *vibrio* and other gastrointestinal diseases from drinking water, and vaccines and rat campaigns made bubonic plague to an uncommon killer.⁴⁶ Three important infectious diseases disappeared nearly as quickly as they had appeared, bringing the era of epidemics to an end. Infectious disease ecologies altered over a wider region than just Brazil. Similar campaigns against arthropod vectors and contaminated water reduced or eliminated cholera, yellow fever, and malaria in many parts of Latin America. Smallpox, a disease that had decimated indigenous groups during the European conquest and had remained one of the leading causes of death during the nineteenth century, ceased to be endemic in most parts of Latin America by 1960. The last known case of smallpox was recorded in Brazil in 1971.⁴⁷

Part III

A few years ago, Diego Armus described several “ways of writing” the history of disease in Latin America. One way, the “history of public health” pursues the “medical and epidemiological” and is more “concerned with issues of collective health than the individual body.” Another, the “sociocultural history of disease” is “only vaguely linked with biomedicine” and its writers are much more interested in metaphors of disease, medicalization, professionalization, and “disciplinary discourses and medicosocial control strategies.”⁴⁸ Today, the second way of writing extends a long shadow over the first, at least among scholarly monographs and articles. Indeed, a recent review of the historiography argues “the centrality of

medical discourses to state formation” has been a principle endeavor among historians since 1970.⁴⁹ This trend liberates scholars from the inherent biases of a long narrative tradition that too often ignored the many ways that medicine, colonialism, and public health worked together served anti-heroic and anti-humanitarian interests. That said, it is worthwhile to take a step back to view the long historical trajectory. Numerous texts, including a very popular Pulitzer Prize winning book⁵⁰, have described the transfer of many types of virulent microbes between Eurasia, Africa and Latin America in the sixteenth and seventeenth centuries. These pathogens caused millions of Native American deaths because their genetic makeup and lack of childhood exposure left them horribly susceptible. To assume that microbes, genes, and the physical environment mattered enormously in the 1500s and 1600s, but culture, ideology and state power are the principle drivers of historical change in the 1800s and 1900s is not only inconsistent, but may exaggerate human power in the face of multitude of life forms with whom we share a fragile balance.

Epidemiological evolution does not mean medical triumph. Sidney Chahloub, Marcos Cueto, Mariola Espinoza, and others and have demonstrated how Latin America’s rulers have long used the old (but still contemporary) metaphor of medicine as a civilizing process and liberation from death in order to justify terribly intrusive, disruptive and unsympathetic policies.⁵¹ The many powerful ways that medicine and health campaigns went hand-in-glove with prejudices of race and gender and colonialism gives the strongest reason to question an older “whiggish” history of disease. Additionally, it is hard to argue that life and health improved in the twentieth century. We should celebrate the fact that far fewer infants die before the age of five, and many more women survive childbirth. Although Latin Americans live much longer their great-grandparents, many more years will be spent “managing” the disability and

pain that accompanies chronic and degenerative illnesses. Furthermore, the new Latin American “plague” of the twentieth and twentieth first centuries is violence, homicide, and disappearances, much of it at the hands of the state.

In their critique of the positivist and victorious view of medicine, historians of Latin America have often turned to Charles Rosenberg and Janet Golden’s ideas of disease “frames.” In this way, diseases are *contingent* to particular political, cultural context and discourses. As Rosenberg and Golden write: “In some ways a disease does not exist until we have agreed that it does, by perceiving, naming and responding to it”⁵² In “naming” diseases, (generally white and male) elite have often gained potent excuses, including racialized beliefs that privileged their power and legitimated their self-preservation (over generally poorer people of color). Nevertheless, “framing” disease may, at times, insufficiently acknowledged how a biological and ecological relationship of people and microbes in fact supports a more neutral and “decentered” historical narrative. When we discard the teleology of medical progress, we might find humility in a position that recognizes the epidemiological influence on human action and belief.

Asking how diseases, such as smallpox in Brazil, are understood within different cultural and social contexts and relations of power gives historians important insight into Latin America’s past and present. How cultural and social context and relations of power alter within new epidemiological environments – the ways diseases “talk” – is equally important but appears to be of less interest these days to historians of Latin America’s post-independence period. In fact, each question can’t be asked without the other. Historians of disease, therefore, face the same challenges as historians of the environment: to recognize the interwoven influences of changing nature, society, and culture.

¹ This is a rough estimate based on average mortality rates of 20 deaths 10,000 per year in Rio de Janeiro, Niteroi, Santos, Belem, and Porto Alegre. We might estimate mortality to be 10 deaths per 10,000 because incidence appears to have been lower away from the Brazilian coast. An estimate of 3-5 deaths per 10,000 per year between 1650 and 1850 is not unreasonable considering the many fewer epidemics smallpox caused.

² Alchon, Suzanne Austin. *A Pest in the Land: New World Epidemics in a Global Perspective*. Albuquerque: University of New Mexico Press, 2003; Cook, Noble David. *Born to Die: Disease and New World Conquest, 1492-1650*. Cambridge: Cambridge University Press, 1998. "New World Epidemics" are also a topic in top selling history texts. See Mann, Charles C. *1491: New Revelations of the Americas Before Columbus*. New York: Knopf, 2005; and Diamond, Jared M. *Guns, Germs, and Steel: The Fates of Human Societies*. New York: W.W. Norton & Co, 1998.

³ J.R. McNeil argues that "wealth and power changed ecologies in the Greater Caribbean" and "ecological changes in turned shaped the fortunes of empire, war and revolution in the years between 1620 and 1914." McNeill, John Robert. *Mosquito Empires: Ecology and War in the Greater Caribbean, 1620-1914*. New York: Cambridge University Press, 2010, 2-4. I share the McNeil's position that microbes were, at times, "inadvertent historical actors" and I believe this line of reasoning can be extended over a greater region and include more than anthropod disease vectors. Although diseases can come and go due to ecological change that is directly dependent on, indirectly influenced by, or independent of human action, groups and communities of people still make their own sense of these diseases in diverse and important ways. Culture is only mentioned twice in *Mosquito Empires*, and never in a way that recognizes the many ways that conquerors, rulers and elites used medicine to pathologize the bodies of people they already considered inferior and wished to control. In other words "ecological determinism" may be as limited as a perspective as one that does recognize the many ways that microbes and the environment can shape belief and ideology.

⁴ "Smallpox Symptoms" <http://www.mayoclinic.com/health/smallpox/DS00424/DSECTION=symptoms> (accessed December 10, 2011)

⁵ Cook, *Born to Die*, 42-43, 113-114

⁶ Alden, Dauril, and Joseph Calder Miller. 1987. "Out of Africa: The Slave Trade and the Transmission of Smallpox to Brazil, 1560-1831". *Journal of Interdisciplinary History*. n 2: 195-224., 195, 220.

⁷ See, for example: Lavradio, Barão de, "Paracer sobre a memoria do Dr. José Maria Teixeira. Causas da mortalidade das creanças no Rio de Janeiro." *Annaes da Academica de Medicina do Rio de Janeiro*, Ser. VI, Tomo IV (1888-1889), no. 2, 188-193; CC, box 6, f-251.

⁸ Read, Ian "Disease at the Front Lines: Municipal Public Health Efforts against Smallpox during Brazil's Era of Epidemics," paper presented at the 126th AHA Conference, Chicago, December 2011. This is available online: <http://empireofbrazil.org/journal/2011/12/29/did-brazils-first-railroads-worsen-smallpox.html>.

⁹ Presidents of São Paulo reported smallpox "throughout the province" during three separate years between 1837 and 1862. During the following three decades after, provincial presidents documented 10 epidemic years. Although residents of Minas Gerais were probably killed by outbreaks during the eighteenth century, smallpox caused no major outbreaks epidemics until 1874. It then reappeared until the 1890s. Similarly, Matto Grosso was spared until the disease was carried up the Paraná River from the front in Brazil's war against Paraguay.

¹⁰ Fenner, Frank. *Smallpox and Its Eradication*. Geneva: World Health Organization, 1988, 239.

¹¹ Hardy A. 1983. "Smallpox in London: Factors in the Decline of the Disease in the Nineteenth Century". *Medical History*. 27, no. 2: 111-38.

¹² We also might not rule out that smallpox itself changed over this century, since a less virulent strain of smallpox (variola minor) with slight genetic differences displaced its deadlier cousin (variola major) in many parts of the world in the early twentieth century. Shchelkunov SN, AV Totmenin, VN Loparev, PF Safronov, VV Gutorov, VE Chizhikov, JC Knight, JM Parsons, RF Massung, and JJ Esposito. 2000. "Alastrim Smallpox Variola Minor Virus Genome DNA Sequences". *Virology*. 266, no. 2: 361-86.

¹³ A discussion of the changing medical practices in regard to smallpox is beyond the scope of this paper. Treatment can be found in Langaard and Chernoviz's popular medical guidebooks. See Chernoviz, Pedro Luiz Napoleão. *Formulario ou guia medica*. Pariz: Em casa do autor, (1864), 620-621; and Langgaard, Theodoro J. H. *Diccionario de medicina domestica e popular*. Rio de Janeiro: Laemmert, (1865), 287-295. For new therapies that became popular in the 1880s, see Du Castel, "Tratamento da variola," *O Brazil-Medico, Revista Semanal de Medicina e Cirurgia*. 5, 38 (1891), 304-305; CC, box 6, f-266

¹⁴ Unlike influenza and measles, smallpox does not spread by asymptomatic carriers. This makes its containment slightly easier, but people who were sick with smallpox or loved ones who wished to help them often had many reasons to not comply with isolation measures.

¹⁵ There is mention of inoculation, and the government's prohibition against it in Visconde de Mont'alegre, "Relatorio da repartição dos negocios do Imperio apresentado a Assembleia Geral Legislativa na 1ª sessão da 8ª legislatura pelo respectivo ministro e secretario d'estado"; Cooper Collection, personal notes, box 2, f-52,

¹⁶ Jenner, Edward. *An Inquiry into the Causes and Effects of the Variolæ Vaccinæ A Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of the Cow Pox*. By Edward Jenner, M.D.F.R.S. &C. London: Printed, for the author, by Sampson Low, No. 7, Berwick Street, Soho: and sold by Law, Ave-Maria Lane; and Murray and Highley, Fleet Street, 1798.

&type=getFullCitation&tabID=T001&prodId=ECCO&docLevel=TEXT_GRAPHICS&version=1.0&source=library&userGroupName=uvictoria>.

¹⁷ Fernandes, Tania Maria. *Vacina antivariólica: ciência, técnica e poder dos homens : 1808-1920*. Rio de Janeiro: Fiocruz, 1999. Soares Murilo A, Solosando Aline. "Apontamentos acerca da luta contra a varíola." *Cadernos de História da Ciência*, 1(1): 13-26, 2005, http://periodicos.ses.sp.bvs.br/scielo.php?script=sci_arttext&pid=S1809-76342005000100002&lng=pt (Accessed December 10, 2011); Associação do Quarto Centenario do Descobrimento do Brasil. Livro do centenario (1500-1900). Rio de Janeiro: Impr. nacional, 1900, pg. 97-100; "Instituto Vacínico Municipal," *Dicionário Histórico-Biográfico das Ciências da Saúde no Brasil (1832-1930)*, Casa de Oswaldo Cruz / Fiocruz, <http://www.dichistoriasaude.coc.fiocruz.br> (Accessed December 10, 2011) Lapa, José Roberto do Amaral. *A cidade: os cantos e os antros : Campinas, 1850-1900*. São Paulo, SP, Brasil: Edusp, 1996, 244-246. [ADD citation vaccination history in São Paulo]

¹⁸ *Collecção das Leis do Imperio do Brasil* (1846), tomo 9, section 16, part 2, 86 – 98. See specifically Articles 29 – 36.

¹⁹ Read, Ian "Disease at the Front Lines"

²⁰ The best funded vaccination institute was in Rio de Janeiro, yet it vaccinated only about 1 or 2 percent of its residents each year. Lima, Agostinho José de Souza, *Annaes a Academia de Medicina do Rio de Janeiro*, VI serie, Tomo III (1887-1888), 503-508; Cooper Collection, box 6, F. 245. Population figures for Rio de Janeiro are from: Placido Barbosa de Rezende, Cassio Barbosa de Rezende, and Oswaldo Cruz. *Os serviços de saúde publica no Brasil ... de 1808 a 1907*. Rio de Janeiro: Impr. Nacional, 1909. 502-503.

²¹ Among thousands of vaccinations given in São Paulo between 1840 and 1871, about one of every four vaccinations did not produce its intended effect Provincial reports, 1840-1871

²² When smallpox spread along the entire course of the Rio São Francisco, vaccinators sent by the government were seen to be "assassins." Visconde de Mont'alegre, "Relatorio da repartição dos negocios do Imperio apresentado a Assembleia Geral Legislativa na 1ª sessão da 8ª legislatura pelo respectivo ministro e secretario d'estado"; Cooper Collection, personal notes, box 2, f-52.

²³ For example, see "Higiene Publica. Influencia da vaccina sobre a duração da vida" *O Universal* (Minas Gerais) 31 August 1838. <http://memoria.bn.br/DocReader/DocReader.aspx?bib=706930&PagFis=8539>.

²⁴ European travelers and some provincial authorities frequently claimed Brazil had good health to other places. Yellow fever was not an urban problem until 1849, in contrast to the greater Caribbean and African coasts. São Paulo, Discurso recitado pelo Excellentissimo Senhor Marechal de Campo; Manoel da Fonseca Lima e Silva, Presidente da Provincia de S. Paulo, na abertura da Assembléa Legislativa Provincial, no dia 7 de janeiro de 1847 (S. Paulo: Typ. do Censor (Em Palacio), 1845-1849); Johann Baptist von Spix and C.F.P von Martius, *Viagem pelo Brasil, 1817-1820*, 3 vols. (São Paulo: Editôra da Universidade de São Paulo, 1976) cited in John Allen Blount, *The Public Health Movement in São Paulo, Brazil: A History of the Sanitary Service, 1892-1918* (PhD diss., Tulane University, 1982). John Mawe believed that the port of Santos was free of epidemic because of a successful vaccination program. John Mawe, *Viagens ao Interior do Brasil* (Rio de Janeiro: Hélio Valverde, 1944).

²⁵ As Sheldon Watts has pointed out, it is highly unlikely that the disease itself was new to Brazil, because most native Brazilians or foreigners who had lived in the country for many years did not contract the disease. That it suddenly became epidemic in Brazil's large cities is more suggestive of a new kind of disease vector. Entomologists have found that that the geographic distribution of the *Aedes aegypti* mosquito, yellow fever's best urban vector, has changed on a continental scale, adding support that this is what happened in 1849. Watts, Sheldon. *Epidemics and History: Disease, Power and Imperialism*. New Haven (Conn.): Yale university press, 1997, 250. For evidence of large-scale shifts in the distribution of *Aedes aegypti* in the twentieth century, see Gubler DJ. 1998. "Resurgent Vector-Borne Diseases As a Global Health Problem". *Emerging Infectious Diseases*. 4, no. 3.

- ²⁶ Read, Ian "A 'Slave's Disease': Cholera in Imperial Brazil" Paper presented at the Society of Social History of Medicine Conference, July 2014, Oxford, England.
- ²⁷ Cooper, Donald B. "The New 'Black Death': Cholera in Brazil, 1855-1856". *Social Science History*. 10, no. 4, 1986, 235-236; Cooper, Donald B. "Brazil's Long Fight against Epidemic Disease, 1849-1917, with Special Emphasis on Yellow Fever," *Bulletin of the New York Academy of Medicine*, vol. 51, no. 5, 1975, 672-673; Ian Read, "Sickness, Recovery, and Death Among the Enslaved and Free People of Santos, Brazil, 1860-1888," *The Americas*, Academy of American Franciscan History, vol. 66, no. 1, 2009, 57-58.
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