

“Secret Disease”: Tracking syphilis through America

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Abstract. This review essay tracks syphilis, and the medical community’s responses to the disease, from the Colonial Period through the availability of penicillin in the 20th century (1585 to 1945). The essay demonstrates physicians actively aided their patients to hide their syphilis diagnosis due to the severe stigma associated with the disease. References from prominent figures from the 18th to the 20th centuries reveal an apparent debate within the medical community that lamented prioritizing patient privacy over public health, especially for a virulent, disfiguring disease. By mining data sources representing specific locations and broad regions it is suggested that syphilis likely became endemic in the USA sometime between 1810 and 1830. At that point, based on historical references, it appears that syphilis was widespread enough to persist endemically in most communities. A systematic analysis of bioarchaeological sites (28 sites; N=6,611; interments 1600-1944) is conducted to examine the rates and distribution of tertiary syphilis across time and by type of site. Reports demonstrate that no case of the disease has been found from a family, community, or military skeletal collection whereas all institutional skeletal collections report cases of tertiary syphilis with rates ranging from 1 to 19%. This pattern suggests an unrecorded cultural system was in place that culled individuals with tertiary syphilis from mainstream society and placed them in institutions where they were cared for by strangers, perished, and buried in anonymity. This study shows how bioarchaeology can provide significant information on disease and cultural practices not available from other sources.

Key words: syphilis, stigma, endemic, Abraham Lincoln, bioarchaeology

“In the past we have not only been afraid to talk about syphilis, we have been afraid to count it.”
Dr. Thomas Parran, US Surgeon General (1)

Introduction

The opening quote by Thomas Parran, US Surgeon General (1936-48), references the ongoing tensions over the medical community’s blind eye to the debilitating syphilis epidemic in the early twentieth century (1-4). Since the early 1700s, prominent figures had lamented physicians’ practice of “hiding” their patients’ syphilitic infection. This practice prioritized syphilitic patients’ privacy over the threat to public health, even at the cost of a morbid and virulent disease lurking

in the general population. The stigma syphilis carried, an infection obtained from sexual promiscuity, fueled the practice until the 1940s when penicillin, an easy and effective cure, became available (2, 5-7). In this context of medical and public health secrecy, the essay mines historical data from local centers, such as early hospitals, as well as broad geographic regions, reflected in military mustering physical exam records, to track the timing of when syphilis likely became endemic in the USA. In addition, the essay reviews bioarchaeological studies that report for the presence/absence of tertiary syphilis in their findings. The study examines the bioarchaeological record for the distribution of syphilis during the historic period and specifically focuses on the types of contexts individuals with syphilis are recovered from and which contexts they are not

found. Given the secrecy of the medical community, bioarchaeological studies can help to demonstrate how society dealt with the complexities of a stigmatizing, virulent, debilitating disease.

Historiography of syphilis

America's Colonial Period (1565 to 1783) provides the earliest historical references to syphilis. Sassafras serves as proxy for syphilis' presence in that a brief cottage industry for the tree's leaves arose in New England in the late 16th century (8, 9). Sassafras was briefly believed to be a cure for syphilis. Rooted in the notion of the "Doctrine of Signatures," meaning the cure for the disease would be found in the region of its origin (10), it was expected the cure would be found in the New World since some claimed, at that time, that was where syphilis originated (8, 9). The earliest direct reference to syphilis comes from John Winthrop's journal in 1646:

There fell out also a loathsome disease at Boston which raised a scandal upon the town and country, though without just cause. One of the town ... having gone cooper in a ship into ... at his return his wife was infected with lues venerea, which appeared thus: Being the midwife, a skilled woman, finding her body as sound as any other after her delivery, she had a sore breast, whereupon divers neighbors resorting to her, some of them drew her breast and others suffered their children to draw her, and others let her child suck them (no such disease being suspected by any) by occasion whereof about 16 persons, men, women and children were infected, whereby it came at length to be discovered by such in the town as had skill in physick

and surgery, but there was not any in the country who had been practiced in the cure (11).

This outbreak serves as the first recorded epidemic of syphilis in North America. Other indirect indicators of syphilis are the wide array of medicinal bottles that included a range of potential cures which varied from turpentine to willow bark throughout the 18th century (See Table 1; (6)). Even famed figures such as Benjamin Franklin attempted concoctions in the effort to find a cure for syphilis. Franklin's "Inner Bark" elixir was a combined preparation of pine, Spanish Oak, and spruce bark (1). Cotton Mather, noted influential minister, directly addressed the presence of syphilis in Boston and is the first to expose the problem of physicians' cover-up of syphilitic patients. In 1721, Mather refers to syphilis as the "secret disease" and laments that physicians not only hid patients' syphilitic condition but also would falsify cause of death on vital statistics records by listing some other chronic debilitating disease such as tuberculosis instead of syphilis (1, 3). The first actual data for syphilis comes from Revolutionary War (1775 to 1783) reports and early hospital records. Military hospitals and Bellevue, the first hospital in New York, show that approximately 25% of patients were admitted for either venereal disease (in which syphilis and gonorrhea cases are conflated) or directly list syphilis (1, 3, 12).

The 19th century opens with a fairly direct reference to syphilis. The Lewis and Clark Expedition (1804-06) to explore the western portion of the continent after the Louisiana Purchase is a prominent example of a known dissemination of syphilis. Lowry (2004) details that traveling with Lewis and Clark were 30 crew members, some of which began the trip infected with syphilis (13). To address their

Table 1. This table lists various compounds, diseases, and even other people, used in the attempt to cure syphilis in early America to the 20th century. Most ingredients are based on concepts such as the Doctrine of Signatures or Humoral Theory. Mercury (in a salve, pill, or inhalant) was the most common and consistently used medicinal ingredient for the treatment for syphilis. For detailed discussions of attempted syphilis remedies, (see 1, 3, 6).

Sassafras	Lobelia root	Inoculation	Mercury
Sumac root	Turpentine	Deer dung	Inner Bark
Jesuit's Bark	Malaria	A virgin	Diet/Geography

needs, the expedition physician prepared by packing 15% of the medical supplies specific to syphilis treatment. Hospital records from the early decades of the century show persistent admission rates for venereal diseases and syphilis at 20 to 25%. At mid-century, the Civil War provides the best data for the presence and rates of syphilis due to the volume of medical exams taken during the mustering of troops. Mustering data for the Union Army shows that out of over 800,000 men medically examined, 9% were rejected from military service due to syphilis (3). Furthermore, based on data collected from the 1850s and 1860s the Union Army developed a map (Figure 1) of the distribution of syphilis for the northern states showing prevalence ranged from 1 to >7% in the general population (14).

Abraham Lincoln, 16th President of the US, provides a model for understanding the hidden pattern

of syphilis and its consequences. Lincoln confided to William Herndon, his biographer, that he contracted syphilis from a prostitute as a young man sometime between 1835 and 1836 (15-17). In 1841 Lincoln sought treatment for the syphilis that “hung to him” from Dr. Daniel Draker (16). A year later, Lincoln wed Mary Todd and the couple produced four children, losing three in childhood. Herndon, based on his interviews with Lincoln, believed, though not recorded as such in vital records, congenital syphilis was the cause of the three children’s deaths. Mary Todd Lincoln, long vilified in the press for her varied, unladylike behaviors, whether warranted or not, was believed to be mentally ill. In her later years of widowhood, she died in 1882, her health struggles extended to various maladies including paralysis. Attending physicians diagnosed her with “tabes dorsalis” and later diagnoses included “general paresis of the insane” both of which



Figure 1. This map demonstrates the distribution of syphilis in the northern states during the mid 19th century. The rates range from 1 to >7% with higher rates occurring in urban areas (14).

were recognized symptomatic manifestations of tertiary syphilis (15-17). A significant reference to the damage syphilis rendered on families, and especially unsuspecting brides, comes from physician Marion Sims, who, as president of the American Medical Association in 1876, chastised American physicians for their “conspiracy of secrecy” with regard to their syphilitic patients (1-3).

In the first decade of the 20th century an actual efficacious cure for syphilis was developed and made available. Salvarsan, also known as formula 606, was developed in 1906 but made little impact on the number of syphilis cases (3, 10). Various medicinal forms of mercury were the traditional treatment for syphilis and that tradition was difficult to overcome (6). Several factors worked against the acceptance of Salvarsan by both physicians and patients. Physicians trained in the 1800s, before advances in microscopy and Germ Theory, were reluctant to accept the concept of a bactericide and eschew decades of practice and the Salvarsan treatments involved painful arsenic laden injections over a period of months (3). Once symptoms improved after the first treatment, which is typical of syphilitic symptoms in the primary and secondary phases even without treatment, few patients returned for the required follow-up injections (3, 6). Despite the development of an efficacious treatment the US experienced an epidemic of syphilis. Stokes (1917) and Parran (1937) report that in the early decades of the 20th century 10% of US married couples were infected with syphilis and the disease was responsible for 30% of all fetal mortality. In the face of that dilemma, Stokes (1917) argued for aggressive public health measures against syphilis (1, 4).

Federal, state, and local municipalities were aligned in the first half of the 20th century with aggressive measures against other disease threats that carried heavy morbidity and mortality such as tuberculosis (18, 19) and smallpox (10, 20). For syphilis, however, an indirect approach was taken in the 1910s in response to the nation’s needs during WWI. During wartime venereal diseases, generally, were the leading cause of soldiers’ hospitalizations (3, 10). Thus, syphilis, the most virulent and devastating of the venereal diseases, was considered a threat to national security. Zipf (2016) reports that a strategy to reduce the risk of

soldiers’ exposure to venereal infection was to remove adolescent girls from communities that might pose threats to soldiers (21). The term “charity girls” was applied to girls that came from families of “low reputation” and could potentially serve as sources to infect soldiers with venereal diseases. Charity girls were the subject of a major US intervention into the syphilis problem for the war effort. Over 100,000 girls were rounded up and incarcerated in institutions where they were held and given training in appropriate virtues (21). The persistent blind eye by the medical community to directly address the nation’s syphilis problem motivated US Surgeon General Thomas Parran to prioritize the issue. As the opening quote demonstrates, Parran grew increasingly frustrated at the shroud of secrecy concerning a disease that had such ravaging consequences throughout the nation. Despite his efforts in the face of an obvious health crisis, Parran made little headway until the availability of penicillin. Developed in 1928 but not available for mass distribution until 1945, the widespread use of an efficacious, easily administered antibiotic finally brought syphilis in line with other diseases with regard to record keeping and public health monitoring (3, 10).

When does syphilis become endemic?

An interesting goal for this essay is to determine when syphilis became endemic in US history. Early references, such as John Winthrop’s account in the 17th century, and proxies such as 18th century medicinal elixirs provide evidence that syphilis was present in urban centers but provide little hard data. Grob (2009) asserts that the presence or rate of syphilis in America’s past is probably unknowable (12). This study attempts to pool the known data to estimate when syphilis is likely to have become endemic. Figure 2 plots rates of syphilis as reported from various sources. The earliest data comes from the late 1700s to the 1830s drawing on Revolutionary War medical records and early hospital admission records such as Bellevue (1, 3, 12). Civil War data, from the Union army, shows a snapshot at midcentury of syphilitic young men rejected from military service a rate at 9% for that cohort and rates in the general population ranging from 1 to >7%

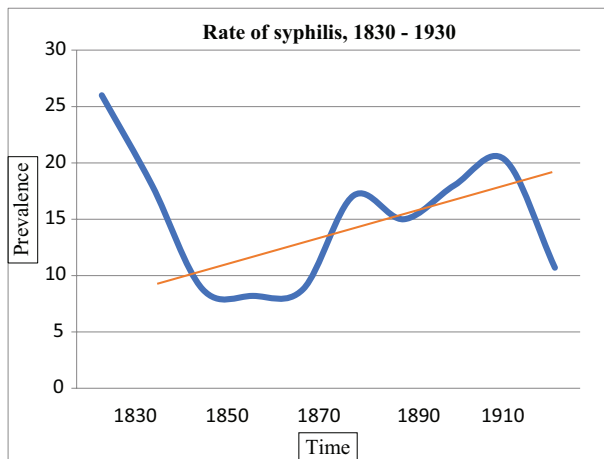


Figure 2. This graph plots a variety of US data sources reporting syphilis rates for the 100 year period from the early decades of the 19th to 20th centuries. Sources reported in (1, 3): 1830-1840, Bellvue, NY; 1850-1870, US Military Records; 1880-1900, Lancet studies; 1900-1930: Lancet & Nursing Journal studies; US Military Records.

in the northern states (3). Parascandola (2008), Pararan (1973), and Stokes (1917) report a variety of studies published in British journals, such as the Lancet, that provide data for the later 19th and early 20th centuries (1, 3, 4). Those studies report significant findings such as 10% of US couples had contracted syphilis and that 30% of fetal loss was due to the disease. Based on those data it is suggested that syphilis likely became endemic in the US in the early 19th century circa 1810 to 1830 and was, at that point, persistently present in most communities, towns, and major urban areas. This suggestion is founded on the observation that prior to the 1810s syphilis was reported in urban centers along the eastern seaboard, but, as Grob (2009) maintains, there is no consistent evidence to suggest that syphilis was ubiquitous in all eastern communities (12). Prior to the 1810s, few US communities existed beyond the Ohio River to harbor the disease. As with the Lewis and Clark Expedition, syphilis likely accompanied some westward bound settlers throughout the early 19th century. As a chronic disease, syphilis could continue its chain of transmission over decades which aided its emergent endemic status. Through that migration and settlement process, by the 1830s, syphilis likely persisted endemically throughout all US communities.

Bioarchaeology of syphilis

Syphilis is unquestionably the most researched disease in the field of paleopathology with the primary focus on the origins of the disease and the subsequent global consequences between the Old and New Worlds since the inception of colonialism (22-26). Along with the debate over the origin of syphilis, much research by bioarchaeologists and medical historians has been devoted to syphilis treatments and the wide range of, largely ineffective, cures attempted for the disease (See Table 1; (6, 27-30)). Those two research themes have overshadowed the need to address other important questions regarding syphilis. Given the medical community's active role to protect syphilitic individuals' privacy over public health concerns, significant epidemiological dynamics for the disease in US history remains shrouded. Issues such as prevalence, epidemics, congenital transmissions, morbidity and mortality rates and other measures of disease burden are lost. In that absence bioarchaeology can play a singular role to provide the only source of biological data to begin to address some questions and fill a yawning chasm in the knowledge on this disease.

The recovery and reporting of syphilis from bioarchaeological contexts can provide important missing information on how society actually dealt with a disease that was actively hidden by the medical community. Table 2 pools archaeological sites from America's historic period. Only reports which specify that observations for tertiary syphilis are presented. The systematic analysis includes 28 sites (N=6,611) with interments spanning from 1600 to 1944. The sites reflect the broad swath of the country with collections from the northeast (New York), southeast (Alabama), midwest (Indiana), southwest (Texas), and northwest (Montana) with a total of 16 different states represented. Table 3 shows there are three site categories with family and community (11), military (8), and institutional (9) sites presented for analysis. Notably, no cases of syphilis have been reported from the 11 family and community sites and 8 military sites. However, all 9 of the institutional sites report cases of syphilis with percentages ranging from 1 to 19%. It should be stated that only tertiary syphilis affects bone so it is possible, and likely, that undiagnosed cases of syphilis in earlier

Table 2. This table represents a systematic review of bioarchaeological studies that report for the presence/absence of tertiary syphilis (28 sites; N=6,611). "Red" indicates the disease was reported in that collection.

Arch Site (by state)	Dates	N	Site
Alabama	1850-1920	56	Shogren, et al., 1989 (31)
Arkansas	1865-1930	80	Maish, et al., 1997 (32)
Arkansas	1857	28	Novak, 2008 (33)
California	1858-1900	90	Buzon, et al. 2005 (34)
Colorado	1880-1920	100	McGloin, 2007 (35)
Illinois	1820-1846	23	Larsen, et al., 1995 (36)
Indiana	1812	16	Phillips & Dearth, 2008 (37)
Indiana	1814-38	25	Phillips, 2023 (38)
Indiana	1880-1920	12	Phillips, et al. 2014; 2016 (39, 40)
Kentucky	1850-1920	220	Killoran, et al., 2016 (41)
Kentucky	1764-1944	71	Phillips, 2016 (42)
Mississippi	1850-1920	227	Zuckerman, et al., 2014 (43)
Montana	1876	8	Willey & Scott, 1996 (44)
Missouri	1830-1873	252	Buikstra, 2000 (45)
New York	1600-1720	408	Barrett & Blakey, 2011 (46)
New York	1850-1920	261	Lanphear, 1988 (47)
New York	1812	26	Pfeifer & Williamson, 1991 (48)
New York	1780-1820	32	Phillips, 1998 (49)
New York	1850-1920	1,205	Fischer, 2004 (50)
New York	1865-1890	102	Phillips, 2001 (51)
New York	1828-1926	310	Muller et al., 1993 (52)
North Carolina, Pennsylvania, New York, Texas, Virginia	1778-1876	83	Sledzik & Sandberg, 2002; 4 military sites reported (53)
Pennsylvania	1833-1861	724	Ubelaker & Jones, 2003 (54)
Texas	1869-1907	1,150	Davidson, 1999 (55)
Wisconsin	1880-1920	1,102	Richards, 1997 (56)
		N=6,611	

Table 3. This table categorizes bioarchaeological sites by type (family/community; military; institutional) and shows the ratio of the number of sites with whether or not they reported the presence of syphilis.

Context	Ratio with Syphilis	%
Family/Community	0:11	0
Military	0:8	0
Institutional	9:9	1-19

stages of infection were present among the interred. Given the secretive practice by the medical community, individuals with primary and secondary syphilis could maintain their place in society. It is understandable,

however, that once certain tertiary symptoms emerged patients were exposed to the stigma associated with the disease and lost the prior protection afforded by physicians.

Discussion

The historiography of syphilis in America shows the medical community prioritized patient privacy over public health at great cost due to the unchecked morbidity and mortality from the disease until the discovery and availability of penicillin for treatment.

Physicians quietly treated syphilitic patients but kept their condition secret and withheld the infections from public health records. It seems there was an ongoing hidden internal debate within the medical community over this matter as examples, spanning 200 years, of prominent figures' lamentations and chastisements over the secretive practices regarding syphilis. The example of Abraham Lincoln's experience with syphilis uniquely demonstrates the simultaneous benefits to the infected individual to maintain their privacy and the dire consequences of the disease to American families. Given the cover of medical secrecy, the syphilitic patient's privacy was protected and they were unhindered in their public life. Until the final stages of tertiary syphilis, individuals, even a president, could function within society as the disease waxed and waned through its various possible manifestations. Thus physicians enabled their syphilitic patients to continue their lives as the disease potentially compromised, enfeebled, or killed those closest to them.

By the early 20th century medical figures petitioned for aggressive public health measures akin to those undertaken against other virulent diseases, such as smallpox and tuberculosis, to also be employed for syphilis. With both smallpox and tuberculosis, public health was prioritized, sometimes violently, over individual rights. For example, compulsory vaccination programs against smallpox were at times administered forcibly and resulted in riots (20). Despite the medical community's willingness to wage direct public health campaigns against those diseases, syphilis was treated differently. Notable campaigns to remove potential sources of infection to protect soldiers, such as the incarceration of charity girls, only indirectly addressed the syphilis problem and with little evidence of success. The irony, in this campaign, to protect men and their privacy against syphilis by violating basic civil rights of the wrongly maligned adolescent girls is difficult to overstate. The burden of stigma that syphilis carried and the apparent inertia of a medical culture that prioritized syphilitic patients' privacy over public health was only, finally, lifted with the availability of an easily administered effective treatment.

A significant finding from the historical data is the observation that syphilis became endemic in the early 1800s. Prior to the 19th century, references to syphilis are limited to a specific region, such as Winthrop's

journal revelation, or proxy indicators such as sassafras or elixirs. The Revolutionary War and Bellevue Hospital data are limited to the northeast or specifically to soldiers during wartime. It is not until the 19th century that reports show individuals with syphilis moving across regions, such as the Lewis and Clark Expedition, and, of course, are reported as sexually active. By midcentury large data sets like the Civil War medical inspections reveal syphilis prevalence that span across all the northern states with urban centers having the highest numbers. Those data provide the strongest evidence to suggest that syphilis was endemic, consistently present in American communities. An important question is what was the social response? Physicians were treating patients but no effort at public health control was in place. The disease burden, suffering, and mortality are unknown due to this practice, especially since death certificates were possibly falsified, as suggested by Cotton Mather in the early 18th century and Herndon at mid 19th century. This cultural pattern creates an opportunity for bioarchaeological research to address an important gap in the clinical and historical records.

The distribution of syphilis cases reported from archaeological studies reveals a salient pattern that likely reflects unspoken cultural traditions. No family or community cemeteries have reported a case of syphilis. It is possible that individuals with syphilis died before the onset of tertiary syphilis, but still, it is notable that no cases have been recovered in the reported timespan. Somewhat surprising, no military sites report a case of syphilis. Given that venereal infections were the leading cause of hospitalizations during wartime, it should be expected to find syphilitic lesions in military sites. Two factors, however, restrict that possibility. First, as with the Civil War, medical inspections of potential conscripts culled syphilitic men from entering service. Second, only tertiary syphilis affects bone. Military service typically only extends a few years and, thus, precludes the onset of late-stage syphilis in active service men. It should be expected, then, that tertiary syphilis not be found in military site collections. Finally, all institutional skeletal collections report cases of syphilis, ranging from 1 to 19% in the respective collection. This finding suggests that a cultural system existed to remove syphilitic individuals from mainstream society and place them in institutional care

once tertiary syphilis became evident. This practice, then, implies the medical community's secrecy could only extend until the onset of tertiary syphilis. Once the debilitating symptoms of tertiary syphilis became apparent in an individual the bioarchaeological record shows they were removed from society and placed in an institution, cared for by strangers, perished, and buried in anonymity.

This study, hopefully, spurs further research into the complex social dynamics such as gender, race, economic status, and the differing distribution between urban and rural contexts had with regard to syphilis. White men, clearly, were favored in the cultural practice to protect patient privacy while women either unwittingly married a syphilitic man and suffered the consequences, as with Mary Todd Lincoln, or served as scapegoats as in the example of charity girls. Likewise, female prostitutes have long been blamed as sources of infection as though they acted alone in the transmission (2, 10). In fact, some bioarchaeological researchers have already begun to examine the differential threat women suffered from syphilis (57, 58). The dynamics of race is an important question for this topic as well. The power differentials from slavery through the Jim Crow south undoubtedly left African Americans vulnerable to a virulent disease the medical community actively ignored. An issue not covered here, infants with congenital syphilis have been recovered from southern rural African American family cemeteries (32, 55). While no adult remains have been recovered with tertiary syphilis, the presence of the disease in southern rural African American communities is evident. Moreover, the secrecy maintained in the infamous Tuskegee Experiment (1932-1972) bears an eerie familiarity for how the medical community can sometimes function. Finally, other issues such as economic status or the distribution of syphilis between rural and urban centers are also important factors to consider. All these issues are beyond the scope of this review essay but are excellent fodder for future research.

Conclusion

This review essay presents the medical community's treatment of syphilitic patients from the Colonial period until the 1940s. The essay details persistent

lamentations of prominent figures from the 18th, 19th, and 20th centuries revealing the physicians' efforts to protect the privacy of syphilitic patients given the severe stigma associated with the disease. That continuing pattern demonstrates a hidden debate within the medical community on the matter of prioritizing patients' privacy over the public's health in the presence of an endemic, debilitating, virulent disease. The essay mines data sources to piece together syphilis prevalence over broad regions to suggest when the disease became endemic. Regional data sources, such as military records and hospitals, show high syphilis rates (>20%) from the late 18th to early 19th centuries. Whereas large, geographically broad, data such as Civil War mustering records, show syphilis rates as high as 9% of men rejected from military service to rates ranging from 1 to >7% for the general population of the northern states. From those data it is possible to suggest that syphilis likely became endemic in the US during the early decades of the 19th century sometime between 1810 and 1830. Finally, the essay pools bioarchaeological reports from the years 1600 to 1944 to examine the distribution of syphilis over that time span. A pattern that emerges is that while no syphilis cases are reported from family, community, or military cemeteries, all reports associated with institutions find syphilitic individuals with rates ranging from 1 to 19%. This suggests that while physicians maintained patients' privacy that there were cultural practices in place that culled individuals with tertiary syphilis from mainstream society, placed them in institutions where they perished and were buried in anonymity.

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References

1. Parran T. *Shadow on the land*. New York: Reynal & Hitchcock Inc.; 1937.
2. Brandt AM. *No magic bullet: A social history of venereal disease in the United States since 1880*. Oxford: Oxford University Press; 2020.

3. Parascandola J. Sex, sin, and science: a history of syphilis in America. New York: Greenwood Publishing Group; 2008.
4. Stokes JH. The third great plague: A discussion of syphilis for everyday people. New York: Saunders Press; 1917.
5. Francis AM. The wages of sin: how the discovery of penicillin reshaped modern sexuality. *Arch Sex Behav* 2013; 42:5–13.
6. Parascandola J. From mercury to miracle drugs: syphilis therapy over the centuries. *Pharm Hist* 2009; 51(1):14–23.
7. Tampa M, Sarbu I, Matei C, Benea V, Georgescu SR. Brief history of syphilis. *J Med Life* 2014; 7(1):4–10.
8. Manning C, Moore M. Sassafras and syphilis. *N Engl Q* 1936; 9(3):473–5.
9. Willard FL, Aeby VG, Carpenter-Aeby T. Sassafras in the New World and the syphilis exchange. *J Instr Psy* 2009; 41:1–4.
10. Magner L. A history of medicine. New York: Marcel Dekker Press; 1992.
11. Winthrop J. The Journal of John Winthrop, 1630-1649. Boston: Harvard University Press; 2009.
12. Grob GN. The deadly truth: a history of disease in America. Boston: Harvard University Press; 2009.
13. Lowry TP. Venereal disease and the Lewis and Clark Expedition. Lincoln: U of Nebraska Press; 2004.
14. Baxter JH. "Illustrating by gradation of color the prevalence of syphilis," in Statistics, medical and anthropological, of the Provost-Marshall-General's Bureau, derived from records of the examination for military service in the armies of the United States during the late war of the rebellion. Washington, DC: US Gov't Printing Office; 1875.
15. Hayden D. Pox: genius, madness, and the mysteries of syphilis. New York: Basic Books; 2003.
16. Herndon WH., Hertz E. The hidden Lincoln: From the letters and papers of William H. Herndon. New York: Viking Press; 1938.
17. Hirschhorn N, Feldman RG. Mary Lincoln's final illness: A medical and historical reappraisal. *J Hist Med Allied Sci* 1999; 54(4):511–42.
18. Dubos RJ, Dubos J. The white plague: tuberculosis, man, and society. New Brunswick: Rutgers University Press; 1987.
19. Feldberg G. Disease and class: Tuberculosis and the shaping of modern North American society. New Brunswick: Rutgers University Press; 1995.
20. Leavitt JW. Public resistance or cooperation? A tale of smallpox in two cities. *Biosecurity Bioterrorism Biodefense Strat Prac Sci* 2003; 1(3):185–92.
21. Zipf KL. Bad girls at Samarqand: sexuality and sterilization in a southern juvenile reformatory. Baton Rouge: Louisiana State University Press; 2016.
22. Baker BJ, Armelagos GJ. The origin and antiquity of syphilis: paleopathological diagnosis and interpretation. *Curr Anthropol* 1988; 29(5):703–37.
23. Crosby Jr AW. The early history of syphilis: a reappraisal. *Am Anthropol* 1969; 71(2):218–27.
24. Harper KN, Zuckerman MK, Harper ML, Kingston JD, Armelagos GJ. The origin and antiquity of syphilis revisited: An Appraisal of Old World pre-Columbian evidence for treponemal infection. *Am J Phys Anthropol* 2011; 146(53): 99–133.
25. Meyer C, Jung C, Kohl T, Poenicke A, Poppe A, Alt KW. Syphilis 2001: a palaeopathological reappraisal. *Homo* 2002; 53(1):39–58.
26. Powell ML, Cook DC. The myth of syphilis: the natural history of treponematosi in North America. Gainesville: University Press of Florida; 2005.
27. Frith J. Syphilis: its early history and treatment until penicillin and the debate on its origins. *J Mil Vet Health* 2012; 20(4):49–58.
28. Karamanou M, Kyriakis K, Tsoucalas G, Androustos G. Hallmarks in history of syphilis therapeutics. *Infez Med* 2013; 21(4):317–9.
29. Keça M, Kozłowski T, Szostek K, Drozd A, Walas S, Mrowiec H, Grupa H. Analysis of mercury levels in historical bone material from syphilitic subjects—pilot studies. *Anthropol Anz* 2012; 69:367–77.
30. Zuckerman MK. More harm than healing? Investigating the iatrogenic effects of mercury treatment on acquired syphilis in post-medieval London. *Open Arch* 2016; 2(1):42–55.
31. Shogren MG, Turner KR, Perroni JC. Elko Switch Cemetery: An archaeological perspective. Birmingham: University of Alabama Press; 1989.
32. Maish A, Rose JC, Marks MK. Cedar Grove: African-American history in rural Arkansas. In remembrance: Archaeology and death. Westport: Bergin & Garvey; 1997. p. 105–18.
33. Novak SA. House of mourning: A biocultural history of the Mountain Meadows massacre. Salt Lake City: Utah University Press; 2008.
34. Buzon MR, Walker PL, Verhagen FD, Kerr SL. Health and disease in nineteenth-century San Francisco: skeletal evidence from a forgotten cemetery. *Hist Arch* 2005; 39:1–15.
35. McGloin CA. Crazy bones: evidence of insanity in the skeletal collection of the Colorado State Insane Asylum [master's thesis]. Denver (CO): Colorado State University; 2007.
36. Larsen CS, Craig J, Sering LE, Schoeninger MJ, Russell KF, Hutchinson DL, Williamson MA. Cross Homestead: Life and death on the midwestern frontier. Bodies of evidence: Reconstructing history through skeletal analysis. New York: Wiley-Liss; 1995. p. 139–59.
37. Phillips SM, Dearth E. The Indiana frontier during the War of 1812: A bioarchaeological study of the siege of Fort Harrison. *Ohio Valley Hist Arch* 2007; 22:82–7.
38. Phillips SM. "Indian Orchard Cemetery, Terre Haute's pioneer burial ground: Vigo County." In, Highlighting hoosier archaeological sites – Examples from 92 counties. Amy Johnson, ed. © Copyright Indiana Department of Natural Resources, 2023.
39. Phillips SM. Treponematosi in 19th century USA: Evidence of dependency and stigma in an American institution. *J Paleopath* 2016; 26(1):9–13.
40. Phillips SM, Ellis E, Maynard M, Newton L, Moroz M, Rio SD. Bioarchaeology of the Vigo County Home cemetery:

- Recovering social systems of care for the impoverished, infirm, and disabled. *Indiana Arch* 2014; 9(1):229–52.
41. Killoran P, Pollack D, Nealis S, Rinker E. Cemetery preservation and beautification of death: investigations of unmarked early to mid-nineteenth-century burial grounds in Central Kentucky. In: Osterholtz AJ editor. *Theoretical approaches to analysis and interpretation of commingled human remains*. New York: Springer Press; 2016. p. 219–41.
 42. Phillips SM. Bioarchaeology of a Kentucky pioneer family: The Vardeman-Holmes-Stephenson cemetery project, Lincoln County, Kentucky. *Ohio Valley Hist Arch* 2016 26:132–41.
 43. Zuckerman MK, Kamnikar KR, Mathena SA. Recovering the 'body politic': A relational ethics of meaning for bioarchaeology. *Camb Arch J* 2014; 24(3):513–22.
 44. Willey PA, Douglas D Scott. 'The bullets buzzed like bees': Gunshot wounds in skeletons from the Battle of the Little Bighorn. *Int J Osteoarchaeology* 1996; 6(1):15–27.
 45. Buikstra JE, O'Gorman AO. Never anything so solemn: An archeological, biological, and historical investigation of the nineteenth-century Grafton Cemetery. Kampsville: Center for American Archeology; 1999.
 46. Barrett AR, Blakey ML. Life histories of enslaved Africans in colonial New York: a bioarchaeological study of the New York African Burial Ground. *Soc Bioarch* 2011; 212–51.
 47. Lanphear KM. Health and mortality in a nineteenth-century poorhouse skeletal sample [dissertation]. Albany (NY): State University of New York at Albany; 1988.
 48. Pfeiffer S, Williamson RE. Snake Hill: an investigation of a military cemetery from the War of 1812. Toronto: Dundurn Press; 1991.
 49. Phillips SM. Skeletal analysis of the Queensbury Quaker Cemetery, Queensbury, NY. Unpublished CRM report; 1998.
 50. Ficsher C. Archaeological investigations of the Albany County Almshouse, NY. Unpublished CRM report; 2004.
 51. Phillips SM. Inmate life in the Oneida County Asylum, 1860–1895: A biocultural study of the skeletal and documentary records [dissertation]. Albany (NY): State University of New York at Albany; 2001.
 52. Muller JL, Byrnes JF, Ingleman DA. The Erie County Poorhouse (1828–1926) as a heterotopia: a bioarchaeological perspective. In, *The bioarchaeology of structural violence: A theoretical framework for industrial era inequality*. New York: Springer Press; 2020. p. 111–37.
 53. Sledzik, PS, Sandberg LG. The effects of nineteenth-century military service on health. In, *The backbone of history: Health and nutrition in the Western Hemisphere*, Cambridge: Cambridge University Press; 2002. p 185–97.
 54. Ubelaker D, Jones E. Human remains from the Voegtly Cemetery, Pittsburgh, Pennsylvania. *Smithsonian Contributions to Anthropology*, Number 46. Washington, D.C.: Smithsonian Institution Press; 2003.
 55. Davidson J. M. Freedman's cemetery (1869-1907): A chronological reconstruction of an excavated African-American burial ground, Dallas, Texas [dissertation]. Fayetteville (AR): University of Arkansas; 1999.
 56. Richards PB. Unknown man no. 198. The archaeology of the Milwaukee County Poor Farm Cemetery [dissertation]. Milwaukee (WI): University of Wisconsin-Milwaukee; 1997.
 57. Atwell MM. The madness they endured: A biocultural examination of women's experiences of structural violence within 20th-century Missouri state mental hospitals. *Int J Paleopath* 2022; 39:75–84.
 58. Zuckerman MK, Crandall J. Reconsidering sex and gender in relation to health and disease in bioarchaeology. *J Anthropol Arch* 2019; 54:161–71.
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