

The Yellow Fever Epidemic of 1878 and Public Health Reform in Memphis

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On August 1, 1878, William Warren disembarked from the *Golden Crown*, the steamer on which he worked as a deckhand, and landed on the shores of Memphis, prominent cotton hub and Southern port. Like most river men, Warren ventured to the Pinch District, a poor immigrant neighborhood at the northern end of the city, probably looking for a good time of gambling and strong drink in his break from the ship. Seeking a hearty meal, he visited an Italian snack-house in the neighborhood owned by Mrs. Kate Bionda. But unbeknownst to Warren and those with whom he came into contact, he carried with him a dangerous cargo of yellow fever. He had been infected while in New Orleans, bitten by a mosquito carrying the disease. Of course, he would not have given any thought to the bite, for contemporary medicine had yet to pinpoint mosquitos as the medium for transmitting yellow fever.¹ Even when he developed a fever the next morning, likely along with chills, muscle aches, and nausea, doctors at the city hospital had no reason to suspect yellow fever over the countless other diseases common to Memphis.

Nevertheless as the case grew more suspiciously similar to yellow fever, Dr. John Erskine, Health Officer on the Board of Health, admitted Warren to a quarantine hospital. Officials burned the bedding and clothing from his original hospital room and disinfected the entire building, hoping to eliminate any infected fomites that could spread the yellow fever germ, which would certainly thrive in the hot, humid, and filthy environs of Memphis. When Warren died on August 5, doctors would have recognized his jaundiced skin as the final confirmation

¹ This idea of the mosquito vector for yellow fever was first proposed by Carlos Finlay in 1881 and later confirmed in 1900 by Walter Reed, whose experiments on American troops in Cuba dispelled the previously held notion of transmission through fomites and supported transmission by mosquito.

that his illness had been a definitive case of yellow fever. Yet health officials, assuring themselves that Warren had contracted yellow fever in New Orleans, did not report the case, hoping to avoid creating a public panic. However this very panic erupted in Memphis just one week later on August 14, when newspapers reported the death of Mrs. Bionda due to yellow fever, the first official case in Memphis. Health officials quickly attempted to isolate the source of the infection, closing off and disinfecting the block containing the snack-house, but these efforts came too late. Yellow fever had invaded Memphis.²

In examining the yellow fever outbreak of 1878, which infected 120,000 people across the Mississippi Valley, most scholarly work views the epidemic within the broader experience of yellow fever in the United States.³ Such research details the 1878 epidemic as a progression from the nation's first significant epidemic in Philadelphia in 1793, or as a representation of the South's experience with yellow fever throughout the nineteenth century. In contrast, this paper focuses on the 1878 epidemic as a watershed moment in Memphis history, one that permanently altered the course of the city. In terms of prestige, Memphis acquired a second-tier status among Southern cities, falling in importance relative to Nashville and Atlanta. The epidemic confirmed Memphis's tainted reputation as a city of filth and disease, driving away valuable capital and restricting the local economy to a reliance on the cotton industry. Furthermore, the 1878 outbreak reshaped the racial dynamics of the city leading into the twentieth century. Since blacks proved more resistant to yellow fever, the epidemic increased the proportion of black Memphians until they comprised almost half of the city's total population. Additionally, the immigrant population shrank due to mortality and flight from the fever, later replaced by an

² The narrative of William Warren borrows from Molly Caldwell Crosby's *The American Plague: The Untold Story of Yellow Fever, the Epidemic that Shaped Our History*, who provides her own such account, with additional facts from John M. Keating's *A History of the Yellow Fever. The Yellow Fever Epidemic in 1878 in Memphis Tenn.*

³ Along these lines, Crosby's *The American Plague* provides an excellent narrative of the epidemic in Memphis before transitioning to Walter Reed's work in Cuba at the turn of the century.

influx of provincial farmers into Memphis. These two demographic shifts departed from Memphis's previously cosmopolitan nature, creating a city with increased divisions across racial lines.⁴ Yet for all of these grand effects, the epidemic had an immediately significant, if seemingly ordinary, impact on public health in the city, bringing about an overhaul of the city's public health and sanitation systems to combat yellow fever. Whereas Memphis had been negligent in maintaining the health of the city before 1878, the epidemic forced the city to recognize the need for significant public health improvements to prevent another visitation of yellow fever. The 1878 yellow fever epidemic exposed not only the deplorable sanitary conditions in Memphis, but also the failure of the city government to address public health woes. Therefore, the epidemic galvanized Memphis to create a powerful health authority in the new Board of Health and to undertake significant public health reforms, including radical innovations in its new sewage system and wholesome water supply, efforts that transformed Memphis into a sanitary model for the nation.

In 1878, Memphis was a leading Southern city, on par with New Orleans and Atlanta in terms of size and economic growth. Since the 1840s, Memphis had been a hub for the numerous cotton plantations in the surrounding countryside of the Mid-South. With its position on the Mississippi River, Memphis became the largest inland cotton market in the world, handling 360,000 bales per year, and the city served as a regional center of trade both on the river and by railroad.⁵ Despite the economic setbacks of the Civil War, Memphis continued to grow, reaching a population of 40,000 by 1870, second only to New Orleans among southern cities.⁶ Yet for its private economic prosperity, Memphis's city government struggled under a massive

⁴ Molly Caldwell Crosby, *The American Plague: The Untold Story of Yellow Fever, the Epidemic that Shaped Our History* (New York: Berkeley Books, 2006), 103.

⁵ *Ibid.*, 20.

⁶ *Ibid.*, 21.

burden of debt. Spendthrift policies, failed investments, and outright corruption by local officials had drained the city's budget. By 1878, the financial situation had become increasingly dire: the city had accumulated five million dollars of debt and was on the brink of total insolvency, attempting to take out new loans and bonds to make good on its original debts.⁷ In 1878, Memphis remained focused on economic concerns, attempting to maintain commercial growth while avoiding the financial collapse of the government

However, the most defining characteristic of Memphis in 1878, as well as its most glaring fault, remained the city's sanitary plight. As the city grew and the population increased, especially in the poor black and immigrant communities of the city, Memphis encountered mounting sanitary difficulties and ultimately degenerated into an environment of filth. The city's cheap Nicholson street pavement, a network of cypress wood blocks and pitch completed only a decade earlier, was already "decaying and sending forth a poison that none in the city limits could avoid."⁸ Furthermore, Memphis had no sanitary regulations on building construction, so "the cellars of the houses in the leading thoroughfares...manufactured noxious gases which stole out and made the night air an almost killing poison."⁹ Since no public service existed for the collection of garbage, refuse accumulated in yards and alleys, or individuals dumped their waste into the Bayou Gayoso. Under these conditions, the Bayou, once a stream traversing the center of the city, deteriorated into a stagnant pond that gave off the stench of the animal carcasses and human waste that filled its waters.¹⁰

⁷ John H. Ellis, *Yellow Fever and Public Health in the New South* (Lexington, KY: The University Press of Kentucky, 1992), 105.

⁸ John M. Keating, *A History of the Yellow Fever. The Yellow Fever Epidemic in 1878 in Memphis Tenn.* (Memphis: Howard Association, 1879), 103.

⁹ *Ibid.*

¹⁰ *Ibid.* When Memphis experienced heavy rain, the Bayou overflowed its banks and emptied into surrounding low-lying neighborhoods, compounding their sanitary troubles.

Of the sanitary woes afflicting Memphis on the eve of the 1878 epidemic, the city's lack of effective sewage and water systems offered the most flagrant indictment of Memphis's experience with public health. With regards to sewage, Memphis in 1878 had only four and a half miles of privately-owned sewers, which served the affluent commercial areas of the city; most Memphians instead used outdoor privies, with underground vaults attached for the collection of waste.¹¹ When the privy-vaults contents were not being emptied into the Bayou Gayoso and thus adding to its offensive condition, the waste saturated the soil until it "was reeking with the offal and excreta of ten thousand families."¹² Like the sewer system, the city's supply of water remained outdated and inadequate for the growing population. Cisterns and wells, which collected rainwater and surface drainage, offered the predominant sources of water for both commercial and domestic use. However, these vessels were often defective and leaky, allowing seepage in the soil to contaminate their waters. In addition, these wells and cisterns served as excellent breeding grounds for the *Aedes aegypti* mosquitos, aiding the introduction and spread of yellow fever in Memphis. To expand the municipal water supply and provide a water source without the sanitary drawbacks of cisterns and wells, the Memphis Water Company began drawing water from the Wolf River, a tributary of the Mississippi River, in the early 1870s. While this supply initially seemed to promise a clean source of water for Memphians, the costs of purifying the Wolf River water remained prohibitively high for the Memphis Water Company to pursue filtration. Therefore, Memphis remained burdened by its sanitary plight as it entered 1878, with the lack of a sewage or drainage system and of a source of pure water contributing most greatly to the city's dire conditions.

¹¹ Ellis, *Yellow Fever and Public Health*, 27.

¹² Keating, *History of Yellow Fever*, 103.

Unsurprising in light of its sanitary state, Memphis repeatedly suffered from epidemic disease, witnessing outbreaks of yellow fever, cholera, smallpox, and malaria, and in the process earned a national reputation as a city of disease and filth.¹³ However, city leaders remained inattentive to the urgent need for public health improvements. In addition to being saddled by debt, the Memphis government placed commercial ambitions ahead of sanitary concerns, fearing that strict quarantine practices or sanitary reforms would hinder the growth of the city's manufacturing and cotton trade. Furthermore, the Memphis Boards of Health convened intermittently and remained advisory, lacking independent authority or funds to effect significant change; similarly, the Tennessee State Board of Health, established in March 1877 in response to the yellow fever epidemic of 1873, lacked proper funding from the state until after the 1878 epidemic.¹⁴ Therefore, despite the public's clamor for health improvements after yellow fever epidemics in 1867 and 1873, appeals that were frequently echoed in the pages of local newspapers, "attempts at local sanitation...were of a spasmodic character," occurring only to temporarily mollify the public's dissatisfaction with present sanitary conditions.¹⁵ Meanwhile, city officials maintained their false confidence in the city's good health. Even the *Daily Appeal*, seeking to avoid a public panic over yellow fever, endorsed Memphis's sanitary environment on the eve of the 1878 epidemic. In a reversal from previous criticisms of public health conditions, the paper proclaimed that "Memphis is about the healthiest city on the continent at present," and that "We need not fear in Memphis. We were never in as good a condition from a sanitary point of view...Nothing in our atmosphere invites that dreaded disease."¹⁶ However, J.M. Keating,

¹³ The contemporary medical consensus linked filth and waste to the organism for yellow fever, believing that toxic vapors from putrefying animal and vegetable matter provided a favorable environment for the disease.

¹⁴ Ellis, *Yellow Fever and Public Health*, 34.

¹⁵ G.B. Thornton, "Six Years' Sanitary Work in Memphis," *Mississippi Valley Medical Monthly* 6 (Oct 1886): 440.

¹⁶ "Memphis is about..." *Memphis Daily Appeal*, June 22, 1878, quoted in Crosby, *The American Plague*, 45. "We need not fear..." *Memphis Daily Appeal*, July 4, 1878, quoted in Crosby, *The American Plague*, 45.

editor at the *Daily Appeal* and chronicler of the epidemic, later asserted that, in reality, Memphis in 1878 sat on the precipice of a devastating epidemic. Although Keating's account had the benefit of hindsight, his words rang true when he noted that "every affliction that could aggravate a disease so cruel [as yellow fever] seemed to have been purposely prepared for it by the criminal neglect of the city government."¹⁷

The debate over quarantine on the eve of the 1878 epidemic demonstrated the culmination of Memphis's failure to take action to improve the health of the city and thus prevent disease. When rumors emerged in May of 1878 about yellow fever in the Caribbean, the Memphis Board of Health, organized only in March and comprised of three Memphis physicians, the mayor, and the chief of police, debated the issue of establishing quarantine in the city. Under quarantine, Memphis health officials would inspect all ships arriving at the city's port. If the inspector suspected yellow fever on board, or the ship had originated in an infected port like New Orleans, then officials detained the ship for approximately seven to ten days and disinfected its cargo. The possibility of quarantine had long been a polarizing issue in the battle against yellow fever, dividing Memphis's medical community among approaches to the disease. A consensus opinion held that localized filth in a community certainly provided the yellow fever germ a hospitable environment for widespread infection, and that the germ could be transported by fomites such as infected clothing or bedding. However, physicians disagreed over whether the disease originated locally or first required importation into the city. For the latter faction, a quarantine program of detention and disinfection offered valuable protection against the introduction of yellow fever into the city. In contrast, opponents of quarantine denounced it as an ineffectual method of resistance as well as an undue burden on local commerce and trade.¹⁸

¹⁷ Keating, *History of Yellow Fever*, 103.

¹⁸ Crosby, *American Plague*, 48.

Seeing the value in quarantine, Dr. Robert W. Mitchell, the new president of the Board of Health, announced to the Board on June 3 that he would approach the General Council, the city's main legislative body, to request \$10,000 to establish quarantine procedures.¹⁹ After the Board endorsed this proposal by a 3-2 vote, with the two other physicians in opposition, Mitchell then took his campaign to the public. Mitchell submitted a petition, signed by twenty leading merchants, in favor of quarantining the city from July to October, the height of the yellow fever season.²⁰ In response, Drs. Erskine and Brown, the health officer and secretary on the Board of Health, initiated a counter-petition, acquiring the signatures of thirty-two local physicians opposing the quarantine as a financial and commercial burden that would accomplish little. Interpreting the counter-petition as evidence that the medical community did not support quarantine, the General Council voted against enacting a quarantine program in early July.²¹ Frustrated by this further inaction of the city government to protect the city from disease and the betrayal of his fellow board-members in leading the movement against quarantine, Mitchell resigned from the Board of Health on July 10. In his resignation letter, printed in local newspapers the following day, Mitchell gave an ominous warning that "should we ever have yellow fever again, it will be our own fault in not taking the known necessary precautions against it."²² Mitchell's criticisms were specifically directed at those who had defeated quarantine and thus ruined what would be Memphis's last chance to avert an epidemic. However, his words applied to the entire city, condemning Memphis for forfeiting its opportunities to resolve its public health problems and to thereby stave off the forthcoming devastation of another yellow fever epidemic.

¹⁹ Ellis, *Yellow Fever and Public Health*, 41

²⁰ *Ibid.*

²¹ *Ibid.*

²² *Memphis Daily Appeal*, July 11, 1878, quoted in Crosby, *American Plague*, 49.

With Memphis completely vulnerable to disease after the failed quarantine debate, the menace of yellow fever loomed even larger as multiple rumors of yellow fever in New Orleans circulated throughout Memphis. However, the New Orleans Board of Health reported no official cases to its Memphis counterpart; only on July 26 did health officials indirectly learn of yellow fever in New Orleans, prompting Dr. Erskine to finally establish quarantine around the city. As part of this quarantine, the Board of Health created three inspection stations: one on the Memphis and Charleston Railroad at Germantown, one on the Mississippi and Tennessee Railroad at Whitehaven, and one on the Mississippi River at President's Island, just south of the city.²³ With the news of yellow fever in New Orleans and the enacting of quarantine, public concern over yellow fever gradually escalated until panic erupted in early August. On August 14, the death of Mrs. Kate Bionda, the owner of an Italian snack-house, was reported as the first official case of yellow fever originating in Memphis. City officials quickly took steps to eliminate the disease's spread, closing off and disinfecting Bionda's shop and adjacent buildings, as well as burning her body.²⁴ Despite these actions, Bionda's death and the report of twenty-two new cases and two deaths on August 15 incited many terrified citizens to flee the city. According to Keating's account, "Men, women and children poured out of the city by every possible avenue of escape....The stream of passengers seemed to be endless."²⁵ Of Memphis's 47,000 citizens, 25,000 left the city in a matter of days. Some refugees escaped to the nearby countryside, but "shotgun quarantines," local militias organized to bar any possibly-infected Memphians from their towns, forced others to cities as far as Louisville and Cincinnati to escape the epidemic.

As September arrived in Memphis and the epidemic worsened, only 19,600 Memphians remained in their homes, a population that consisted primarily of poor blacks and Irish

²³ Keating, *History of the Yellow Fever*, 105.

²⁴ Crosby, *American Plague*, 54.

²⁵ Keating, *History of the Yellow Fever*, 107.

immigrants. With nearly all businesses and shops shut down by their fleeing owners, economic activity shuddered to a halt, and necessities such as food and medicine became increasingly scarce. In the words of the *Public Ledger*, “All industries have ceased. The stores are closed, the factories are not running, [and] wharves and depots are deserted, for boats and trains neither arrive nor depart.”²⁶ Even those few businesses that remained open, such as the banks, telegraph office, post office, and the newspapers, could only do so on a limited basis; furthermore, these businesses suffered heavily as yellow fever decimated their ranks. With 3,000 reported cases by the end of August, “an appalling gloom hung over the city.”²⁷ The detonation of gunpowder and the burning of tar barrels, both efforts by the Board of Health to clear the atmosphere of the yellow fever germ, clouded the city in haze, further adding to the pall.²⁸ Sick and healthy alike remained cloistered in their homes, afraid to venture into the streets and expose themselves to the dreaded fever. Memphis’s streets remained deserted, with the movement of relief workers and the transport of the dead offering rare glimpses of human activity.

As citizens looked for care and relief in the struggle against yellow fever, the city’s public institutions offered little respite. Valuing their own survival above their duty to the city, many city councilmen and aldermen joined the flood of residents attempting to escape Memphis. Since the city’s General Council could not assemble a quorum from the few officials who remained, the local government ceased to function for the length of the epidemic. In addition to the dereliction of its politicians, Memphis suffered from the depletion of the city’s fire and police forces. While 48 policemen had patrolled Memphis prior to the epidemic, only 31 officers remained on duty following the emergence of yellow fever; of those who continued working, all

²⁶ *Memphis Public Ledger*, September 20, 1878, quoted in Keating, *History of the Yellow Fever*, 165.

²⁷ Keating, *History of the Yellow Fever*, 110.

²⁸ Mildred Hicks, ed., *Yellow Fever and the Board of Health – Memphis, 1878* (Memphis: Memphis and Shelby County Health Department, 1964), 28, 31.

but six contracted the fever, and 10 men ultimately succumbed to the disease.²⁹ The local fire department suffered from similar desertion and affliction: at one point, just seven men remained healthy enough to fulfill their responsibilities.³⁰

For its part, the Board of Health lacked the authority and the monetary means to combat the epidemic, despite the commitment of its members to protecting public health. The Board met daily through the end of August, but yellow fever soon spread to four of its five members, including Health Officer John Erskine, Chief of Police Philip Athey, and Mayor John Flippin. Therefore, the Board only convened a handful of meetings, comprised of acting members, before it ultimately declared an end to the epidemic on October 29. Even when it was able to meet regularly, however, the Board of Health lacked the power and the funds to attempt a serious resistance against the spread of yellow fever. Although the quarantine had likely begun too late to prevent the importation of the fever, the Board of Health further constrained the quarantine's effectiveness when it acceded to the demands of local businessmen and allowed a freight train from New Orleans to bypass the quarantine.³¹ With the quarantine too limited to be effective and yellow fever already in the city, the Board ultimately lifted the quarantine on August 16. In addition to the failure of quarantine, the Board had no authority to enforce the public's compliance with its sanitary ordinances, and its meager funding of \$8,000 precluded any action beyond minor sanitary efforts.³² These efforts focused primarily on cleaning thoroughfares and disinfecting houses and streets in the infected district, but the Board also attempted the more drastic attempts to clear the atmosphere of yellow fever germs with the smoke from exploding

²⁹ Keating, *History of the Yellow Fever*, 182.

³⁰ Thomas Baker, "Yellowjack: The Yellow Fever Epidemic of 1878 in Memphis, Tennessee," *Bulletin of the History of Medicine* 42 (1968), 250.

³¹ John A. Pierce and Jim Writer, *Yellow Jack: How Yellow Fever Ravaged America and Walter Reed Discovered Its Secrets* (Hoboken, NJ: John Wiley & Sons, 2005), 65.

³² Crosby, *American Plague*, 44.

gunpowder and burning tar. However, all of these efforts ultimately proved to be ineffectual, and the Board of Health provided little abatement to the continued spread of yellow fever through the city. Decimated by the devastation of yellow fever, both the city government and the Board of Health proved unable to mount an effective response to the epidemic, thus leaving citizens to fend for themselves against the fever.

While the epidemic certainly exposed the inability of the city's established public institutions to offer any relief from the scourge of yellow fever, it also encouraged private organizations, such as the Citizens' Relief Committee and the Howard Association, to selflessly shoulder the burden of providing assistance. The Howard Association, an organization explicitly organized to provide care for the sick during yellow fever epidemics, had operated a Memphis chapter since 1867. Despite a membership comprised primarily of local businessmen, the Howards provided valuable medical assistance in the 1867 and 1873 epidemics. Thus, when yellow fever erupted in 1878 and the government again failed to generate a response, the Howards set to work without hesitation. In contrast, the Citizens' Relief Committee (CRC) began with an impromptu meeting of prominent citizens on August 16 to provide organization and mutual assistance during the epidemic.³³ With the city government decimated, the CRC, comprised of thirty-two members and led by cotton merchant Charles G. Fisher, occupied the role of public administration, seeking to provide relief to the sick and needy of Memphis and, perhaps most importantly, to maintain law and order.

At the time of the CRC's creation, Memphis was at the brink of lawlessness: "With the police and fire departments reduced to a mere handful, it would not have been difficult for those so inclined to have pushed on to the consummation of the vilest purposes."³⁴ Attentive to the

³³ Keating, *History of the Yellow Fever*, 390.

³⁴ *Ibid.*, 130.

threat of looting and theft, the Committee supplanted the police force with thirteen new recruits and established a curfew of nine p.m., directing officers to arrest anyone not engaged in relief work.³⁵ Furthermore, two military companies, the Bluff City Grays and the Chickasaw Guards, encamped in the city, with additional militias remaining on reserve. According to Keating, the installation of these companies and the shooting of a “ruffianly” man who harassed the commissary department succeeded in demonstrating the resolve of the CRC to provide law and order.³⁶ By maintaining public order for the course of the epidemic, the CRC not only allowed the Howards and other relief workers to provide care without fear for their own security, but also, in Keating’s judgment, averted “the destruction, perhaps, of the city.”³⁷

Beyond the duty of preserving order, the Citizens’ Relief Committee offered an extensive program of aid to the needy citizens of Memphis. In conjunction with the Board of Health, the CRC established refugee camps, located beyond the reach of the yellow fever, to which citizens could escape from the plague-ridden city. Following an appeal to the Secretary of War, health officials received 1,000 A tents and 40,000 rations, allowing for the formation of Camp Joe Williams on August 15 on the Missouri and Tennessee Railroad line at a point four and a half miles south of the city.³⁸ Besides operating Camp Joe Williams, the CRC also oversaw smaller camps nearby and north of Memphis. These camps ran according to a flexible military discipline, with members from two Army companies, the Bluff City Grays and the McClellan Guards, occupying the southern camps to provide security against local opposition to the camps and to maintain sanitary regulations.³⁹ Despite these measures, the camps did not entirely escape

³⁵ New recruits: Baker, “Yellowjack,” 250; curfew: Keating, *History of the Yellow Fever*, 130.

³⁶ Keating, *History of the Yellow Fever*, 131.

³⁷ *Ibid.*, 133.

³⁸ Tents and rations: Simon R. Bruesch, “Yellow Fever in Tennessee in 1878. Part II,” *Journal of the Tennessee Medical Association* 72 (Feb 1979), 96; site location: John F. Cameron, “Camps: Depopulation of Memphis; Epidemics, 1878 and 1879,” *American Public Health Association Reports* 5 (1879), 152.

³⁹ Keating, *History of the Yellow Fever*, 394.

the reach of yellow fever, since some refugees had already contracted the disease upon their entrance to the camps. For example, Camp Joe Williams suffered 186 cases of yellow fever, of which 58 resulted in death. Nevertheless, the establishment and maintenance of these refugee camps by the CRC offered a haven to approximately 1,300 Memphians from the threat of yellow fever.⁴⁰

While its refugee camps assisted those citizens who could escape the pestilent city, the Committee also provided relief within the city by managing burials and disbursing supplies to the public. As the number of victims steadily rose, the stacks of coffins awaiting burial overwhelmed the county undertaker Jack Walsh and his crew of gravediggers.⁴¹ Therefore, on September 6 the Board of Health enlisted the CRC to assume the duty of burying the dead.⁴² Since many victims were not found until they had reached an advanced stage of decomposition, the CRC also established a burial corps to locate unburied bodies throughout the city.⁴³ In providing relief to the living, the CRC's commissary occupied the void left by the closure of stores, providing food and supplies to the public. Over the course of the epidemic, the commissary supplied 745,735 units of rations, including 290,303 pounds of bacon, 32,858 pounds of coffee, and 1,046 barrels of potatoes.⁴⁴ In allocating rations of food and clothing, the Committee utilized a system of vouchers distributed to the needy by ward committees, an orderly practice that presented each citizen with his fair share while avoiding favoritism or waste.⁴⁵ Throughout all of its activities, the CRC displayed a sense of munificence and humanity, relying on donations alone to provide relief and continuing its work despite the deaths of all but seven of

⁴⁰ Cameron, "Camps: Depopulation of Memphis," 154.

⁴¹ Walsh even attempted, unsuccessfully, to save time by substituting long trenches for individual plots in the cemetery. This decision brought much criticism and pain, since survivors discovered that they could not locate their dead after the epidemic.

⁴² Hicks, ed., *Yellow Fever and the Board of Health*, 37.

⁴³ Keating, *History of the Yellow Fever*, 111.

⁴⁴ *Ibid.*, 393.

⁴⁵ *Ibid.*, 132.

its original thirty-two members, including President Fisher.⁴⁶ The Citizens' Relief Committee's assumption of the role of government not only offered relief and security to citizens, it gave the entire city "courage by its constant, undeviating course" during the ordeals of the epidemic.⁴⁷

While the Citizens' Relief Committee acted as a provisional government offering protection and public relief to Memphis during the epidemic, the Howard Association assumed responsibility for medical care in the city. In the first weeks of the epidemic, a time when many victims suffered without medical care due to the scarcity of available physicians, the Howards appointed pairs of Visitors to visit the houses in each ward to locate any cases of yellow fever, in effect conducting a census of the city's infected population.⁴⁸ With this information, the Howard Medical Corps, centered at the Peabody Hotel under the direction of former Board of Health president Dr. Mitchell, dispatched physicians and nurses to patients in their respective wards, where the physicians would provide treatment and dispense any necessary medications. Although the organization converted two public schoolhouses into infirmaries, doctors and nurses primarily toiled in the homes of victims, with physicians seeing from one hundred to one hundred fifty patients daily.⁴⁹ During the epidemic, the Howards employed 111 physicians and 2,995 nurses, many of whom were volunteers recruited from across the country.⁵⁰ As a charitable organization, the Howards provided all care and medicine free of charge, utilizing over \$400,000 in donations from across the country to finance their efforts, which also included the establishment of warehouses to assist the CRC in providing supplies.⁵¹

⁴⁶ Keating, *History of the Yellow Fever*, 129.

⁴⁷ *Ibid.*, 390.

⁴⁸ *Ibid.*, 140.

⁴⁹ Crosby, *American Plague*, 70.

⁵⁰ Ellis, *Yellow Fever and Public Health*, 52.

⁵¹ Keating, *History of the Yellow Fever*, 336.

The Howards proved tireless in their work throughout the city, but they did not escape their share of difficulties in providing relief. Firstly, some volunteers from the North came to Memphis not to give aid, but to satisfy their own selfish vices. In his post-epidemic report to the Howard Association, Dr. Mitchell roundly denounced these volunteers, though few, “whose only purpose seemed to be plunder and the gratification of alcoholic thirst, and whose presence here was scarcely less destructive to human life than the plague itself.”⁵² Nevertheless, the vast majority of nurses and physicians nobly served the sick and the needy, receiving considerable praise for their “heroism and fidelity to the cause of humanity” during the dark days of the epidemic.⁵³ Besides the occasional misconduct by volunteers, the Howards struggled to provide effective treatment against yellow fever. Since there was no established cure, physicians and nurses could do little to improve the condition of the patient; instead, they were limited to alleviating the worst symptoms and working to make the patient comfortable as the disease ran its course, imparting a sense of futility on many doctors.⁵⁴ Moreover, the physicians and nurses, especially those from the North who had never come into any contact with yellow fever, were vulnerable to yellow fever as they trekked from patient to patient. With many volunteers falling ill and thereby adding to the burden of care, Mitchell claimed that only twenty-five acclimated nurses could have offered more help than the hundreds of susceptible nurses that ventured to Memphis.⁵⁵ Of the 111 Howard physicians, 54 contracted yellow fever and 33 died, while approximately one-third of the nurses succumbed to the fever.⁵⁶ Nevertheless, the Howard Association continued their work for the entire epidemic, treating over 15,000 Memphians. Both the Citizens’ Relief Committee and the Howard Association, motivated by a sense of humanity

⁵² Keating, *History of the Yellow Fever*, 367.

⁵³ *Ibid.*, 376.

⁵⁴ Baker, “Yellowjack,” 254.

⁵⁵ Keating, *History of the Yellow Fever*, 190.

⁵⁶ Crosby, *American Plague*, 83.

and duty to Memphis, provided invaluable relief during the epidemic, unflinchingly assuming the responsibility of public assistance that the city's civil institutions had surrendered.

As October arrived in Memphis, the epidemic, with the fever having infected most of its potential victims, finally began to slow. As their work in Memphis diminished, the CRC and the Howards offered assistance to nearby small towns, which had fewer resources to combat yellow fever. After securing trains on the three main railroad lines out of Memphis, teams of volunteers from the CRC and the Howards travelled down the line. Stopping at each town, the volunteers gave supplies to the town's inhabitants, and the Howard physicians and nurses disembarked and offered treatment to the sick before getting back on the train for the next stop.⁵⁷ Although these relief trains could not be organized until the end of the epidemic, they nevertheless mitigated the suffering of towns in west Tennessee. Finally, on the night of October 18 Memphis received its first frost, an event seen as a harbinger of the conclusion of a yellow fever epidemic, and on October 29 the Board of Health declared the end of the epidemic. As refugees trickled back to the city, the devastation of the epidemic became clear. Of the 19,600 citizens who had remained in Memphis during the epidemic, seventy percent of the population contracted yellow fever and 5,150 ultimately died.⁵⁸

As refugees trickled back to Memphis and the city gradually resumed its activity, Memphians expressed little doubt that the city's sanitary failures were to blame for the disastrous epidemic. Only days after the first announced case of yellow fever, the *Memphis Daily Appeal* cried out for "relief from ignorance and incompetency in government, the cormorant greed of city and foreign creditors, and the visitations of a disease from which we ought to be, and would

⁵⁷ Keating, *History of the Yellow Fever*, 142.

⁵⁸ During the epidemic, yellow fever struck down just 8 percent of the city's black population. In contrast, almost the entire white population contracted the fever, and the total white mortality was 70 percent. With these data, one can see how the proportion of black Memphians increased after the epidemic. From Keating, *A History of the Yellow Fever*, 140.

with proper sanitary regulations be exempt. We must make a change, some change.”⁵⁹ Now aware of the devastation induced by inaction, city authorities could no longer evade the pressing issue of health and sanitation. The epidemic of 1878 had not only cost the city 5,150 lives and \$15 million in economic losses, but also solidified Memphis’s reputation as a city tainted by disease.⁶⁰ Memphis had “obtained a notoriety which was any thing but agreeable to its citizens as a place of residence, or conducive to their interests as a place of business.”⁶¹ Although officials had repeatedly shelved health reforms to avoid restricting the city’s commercial activity and economic growth, it was clear that these policies had produced the reverse effect. The city government and business leaders recognized that the cost of epidemics, both immediate and long-term, far exceeded that of the sanitary reforms necessary to combat yellow fever. If Memphis remained on a path of inaction regarding public health, epidemics would continue to ravage the city until it ultimately collapsed, replaced by Nashville and Atlanta as the centers of the New South. Therefore, in order to reestablish Memphis as an environment of growth and development, the government and the business community became proponents of sanitary reform. By presenting the severe costs of epidemic disease, the 1878 yellow fever epidemic indicted the present state of public health in Memphis and persuaded the entire city that sanitary reforms were necessary to salvage the growth of the city.

Although the movement for comprehensive public health reform swelled among the public, Memphians retained little confidence that the existing government could be an effective force for change. After all, this was the same government that had buried Memphis under five million dollars’ worth of debt, partly due to corruption and malfeasance, and failed to properly

⁵⁹ *Memphis Daily Appeal*, August 17, 1878, quoted in Ellis, *Yellow Fever and Public Health*, 57.

⁶⁰ Ellis, *Yellow Fever and Public Health*, 57. These losses included the costs of caring for the sick and the dead, the expenses of the refugees who fled the city, and the interruption of trade and commerce during the epidemic.

⁶¹ G.B. Thornton, “Memphis Sanitation and Quarantine, 1879 and 1880,” *American Public Health Association Reports* 6 (1880), 190.

resolve the city's growing health problems. The city's decaying Nicholson pavement offered a clear example of the city's attitude before the epidemic: The city had chosen wooden paving as a cheap solution to make its roads more navigable, having 10.75 miles of pavement laid by 1868. Yet, the city made no effort to maintain the quality of the pavement, which became saturated by a mixture of impure water and seepage from the soil, so the paving was already rotten by 1872.⁶² These sanitary failures, along with the hope that Memphis could repudiate its debts, influenced the city to recommend the revocation of the city charter at the end of 1878, which would place Memphis under the direct supervision of the state. The state legislature approved this measure and, on February 8, 1879, created the new Taxing District of Shelby County, an entity of the state led by prominent businessmen, whose position as appointed, rather than elected, officials created a government that focused on pragmatic solutions above political gain.⁶³

Under the act creating the new government of the Taxing District, the Tennessee legislature organized a permanent Board of Health in Memphis, which served as a new, empowered authority in stimulating public health reforms. As a permanent structure, the new Board of Health contrasted greatly with pre-epidemic boards, which were organized temporarily to combat potential epidemics then summarily disbanded after serving their limited purpose. Furthermore, the new Board of Health of the Taxing District received expanded powers over public health. Whereas previously the board had existed as an advisory body with limited means to effect substantial sanitary improvements, the new board possessed control over food and medicines, the construction of buildings, privies, cisterns and wells, sewers and drains, and the water supply. According to Keating, the new Board maintained expansive authority over the city's health, regulating "every thing, in fact, that can nearly or remotely affect the public

⁶² Thornton, "Memphis Sanitation and Quarantine," 191.

⁶³ G.B. Thornton, "The Yellow Fever Epidemic in Memphis, 1879," *American Public Health Association Reports* 5 (1879), 117.

health.”⁶⁴ Along with these extended areas of jurisdiction, the board received increased powers to enforce health ordinances. Most important among these was the board’s ability to conduct inspections of the city and to issue fines for any violations of health ordinances or “nuisances” to the public health. For the citizens of Memphis, the new Board of Health finally offered an authority with both the powers, if yet untested, and the motivations to immediately and wholly improve the health of the city.

With a clear mission for reform, the new Board of Health set to work inspecting and cleaning up the city. In terms of concrete improvements, the board organized a system of garbage carts to collect refuse and enacted new health ordinances to gradually prohibit the use of unsanitary privy vaults, cisterns and wells. Moreover, the board enlisted its first sanitary police to conduct regular inspections, which forced individuals to maintain health ordinances and thus produced compulsory sanitary reforms.⁶⁵ In its efforts, the local board benefitted from the assistance of the National Board of Health (NBH), a new organization created in 1879 from the same pressures for health reform that spurred changes in Memphis and secured proper funding for the Tennessee Board of Health. Since the new Taxing District lacked the finances to undertake widespread sanitary changes, the local board petitioned the NBH, which was designed to assist local and state boards in producing effective quarantine and sanitary measures, and received both counsel and financial assistance.⁶⁶

In their new support of public health reform to bolster the local economy, local merchants and cotton traders sought to assist health officials by creating the Auxiliary Sanitary Association (ASA) in May 1879. Organized at a meeting of the Cotton Exchange and the Chamber of Commerce, the ASA proposed to “assist local authorities in the improvement of the sanitary

⁶⁴ Keating, *History of the Yellow Fever*, 282.

⁶⁵ Thornton, “Yellow Fever Epidemic in Memphis,” 117.

⁶⁶ Margaret Humphreys, *Yellow Fever and the South* (Baltimore: The Johns Hopkins University Press, 1992), 69.

condition of the city,” including educating the public on the importance of sanitation and hygiene.⁶⁷ Besides purchasing disinfectants, garbage carts, and mules for the Board of Health, the group resorted to public shaming, publishing a list of landowners whose properties remained unsanitary.⁶⁸ G.B. Thornton, the new president of the Board of Health, applauded its membership, claiming that “the Association exhibited commendable zeal and rendered material assistance at a time when the city government was most embarrassed for means.”⁶⁹ As a result of coordinated efforts among empowered health officials and a concerned community, by the summer of 1879 Memphis had already begun to rectify its sanitary plight, but the city had only taken its first steps on its long path of public health reform.

Just as Memphis had begun to address its sanitary failings, the city was beset by another visitation of yellow fever in the summer of 1879. Following the pattern of the previous year, the announcement of the first official death on July 9 precipitated the flight of many Memphians. However, local authorities, who had been battle-tested by the previous epidemic and its aftermath, offered a more organized resistance to the epidemic. On July 11, the Tennessee Board of Health enacted quarantine for the city and appointed local physicians to serve as inspectors on the railway lines.⁷⁰ Moreover, national, state, and local health officials met in August and allocated duties for the epidemic: the State Board of Health controlled quarantine and disinfection, local officials led garbage collection and street cleaning, and the NBH provided advisory support and financial funding.⁷¹ Through these coordinated steps, as well as the

⁶⁷ *Memphis Daily Appeal*, May 22, 1879, quoted in Humphreys, *Yellow Fever and the South*, 102.

⁶⁸ Humphreys, *Yellow Fever and the South*, 103.

⁶⁹ Memphis Board of Health, *First Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1879* (Memphis: The Board, 1880), 33, quoted in *Ibid.*

⁷⁰ Ellis, *Yellow Fever and Public Health*, 108. This meeting was subsequently known as the McKenzie Conference, named for the town in northwestern Tennessee where the meeting took place.

⁷¹ *Ibid.*

establishment of seven camps outside the city, health officials displayed both order and urgency in taking appropriate measures to combat the epidemic.

Aware of the failure of quarantine in 1878, the superintendent of quarantine John Johnson established strict protocols to isolate Memphis, organizing picket guards to patrol the city. Furthermore, Johnson prohibited the movement of cotton, a potential fomite, into the city, a move that outraged the local cotton community. Although they had been supportive of Memphis's recent public health measures, cotton traders appealed to the State Board of Health and to the courts to relax these quarantine regulations, but their plea fell on deaf ears.⁷² In an about-face from previous years, health officials at the local and state level refused to place the public health at risk for the commercial gain of the cotton trade. Expressing a view held by most citizens, Board of Health President G.B. Thornton asserted Memphis could "better afford to give up the commerce of the whole country south of it for three or four months of the year... than be again subjected to a visitation of yellow fever."⁷³ Therefore, though the 1879 epidemic would claim 485 lives from 1,532 cases of yellow fever, the epidemic demonstrated the diligence of the new attitude in Memphis to protect the public health above all else.⁷⁴ Furthermore, health officials portrayed the 1879 epidemic as a continuation of the devastation of 1878, confirming their fears that poor public health would beget frequent epidemics. Whereas authorities had believed previous yellow fever epidemics to have been imported initially then spread by Memphis's filthy environment, Thornton suggested that the 1879 epidemic had originated locally, with the disease surviving the winter to reemerge in July.⁷⁵ Thus, the 1879 epidemic of yellow fever reiterated the threat posed by yellow fever and the need for continued

⁷² Ellis, *Yellow Fever and Public Health*, 110.

⁷³ Thornton, "Memphis Sanitation and Quarantine," 197.

⁷⁴ Thornton, "The Yellow Fever Epidemic in Memphis," 120.

⁷⁵ *Ibid.*, 113.

improvements in public health to prevent future visitations of yellow fever. Although Memphis could praise the steps it had taken so far to eradicate filth, the 1879 epidemic confirmed that the city needed to undertake additional and more comprehensive measures to continue its fight against disease.

As its first avenue of reform in public health, the Board of Health created a stricter system of quarantine to prevent the importation of yellow fever, placing health concerns above economic gain. Following the passage of a national quarantine law in 1878, the Tennessee legislature authorized the State Board of Health to supersede the surgeon-general in controlling quarantine practices in the state. However, the statute proclaimed the goal of quarantine to be the prevention of the spread of disease “with the least inconvenience to commercial travel,” thereby offering the competing goals of trade and public health for quarantine officials.⁷⁶ Despite the opposition of cotton planters and traders to the quarantine procedures of 1879, Memphis as a whole supported quarantine measures, welcoming the regulations as effective protection in the best interests of the city. Beginning in 1880, the Taxing District’s Board of Health called upon the NBH to operate a quarantine of observation and inspection at the station on President’s Island. These quarantine officials communicated with NBH inspectors across the South on the condition of ports and the possibility of infected cargoes.⁷⁷ Following its success in 1880, Memphis enlisted the NBH to repeat this work each summer until the dissolution of the NBH in 1883. Although concerns about yellow fever would persist for many years due to the psychological impact of the 1878 and 1879 epidemics, the assistance of the National Board of Health in providing quarantine certainly served to assuage the worst fears of yellow fever among Memphians.

⁷⁶ Keating, *A History of the Yellow Fever*, 280.

⁷⁷ Memphis Board of Health, *Second Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1880* (Memphis: The Board, 1881), 9-10.

In addition to the support in operating quarantine, Memphis collaborated with the National Board of Health in confronting disease through improved local sanitation, particularly through the NBH's sanitary survey of Memphis. The survey, which began on November 24, 1879, consisted of 7 inspectors and 26 contracted sub-inspectors who conducted a comprehensive, house-to-house inspection of the city. With the goal of isolating specific sanitary problems and offering possible solutions, the survey gave detailed evidence of Memphis's poor health. While the Bayous Gayoso and Quimby offered potential sources of drainage, deposits of mud and sediment from the rising Mississippi had slowed the current of the bayous. Therefore, large deposits of organic matter accumulated in the bayous and subsequently decomposed, emitting an offensive stench within the city. In addition, the bayou had become contaminated from the emptying of privies and the surface runoff from contaminated soil. With no drainage system in place, the soil existed in a state of saturation, soaking basements and making unpaved streets impassable. The survey criticized the newly-introduced garbage force as inadequate: most areas of the city did not receive service twice per week as promised, but rather once per week or not at all. Therefore, citizens continued to dispose of their garbage into alleys, bayous, disused cisterns and privies, or wherever else that was convenient. Of the city's 7,202 buildings, only 2,204 had proper sub-floor ventilation, and inspectors condemned 494 buildings for their sanitary conditions, requiring their destruction or wholesale renovations. The horrid conditions continued in the city's basements: 786 of the 1,515 cellars and basements were "badly ventilated, damp, or wet, many with water standing from 2 to 18 inches deep on the floors, and with walls soaked by sipage [sic] from the surrounding polluted soil."⁷⁸

⁷⁸ *Annual Report of the National Board of Health, 1879* (Washington, D.C: Government Printing Office, 1879), 245, 248, 250-51.

Yet for all of these sanitary problems, the condition of the city's existing systems for sewage and water received the harshest rebuke in the survey. Since only four and a half miles of private sewers existed in the city, the vast majority of Memphis used one of the 6,000 privies and sub-surface vaults, of which "considerably less than one-third were sufficiently remote from living-rooms," including some privies located in the very cellars of houses. In total, the survey found 3,607 vaults in poor condition, which, with the added filth from disused privies, offered insight into the level of soil pollution. Furthermore, 3,408 of the 4,744 wells and cisterns in Memphis were located within a contaminating distance of 50 feet of a privy-vault, the underground storage receptacle for the privies' waste. With inspectors estimating over 1400 cisterns to be leaking, and thus highly likely to be polluted with sewage, these findings offered clear evidence that the system of wells and cisterns could not continue as the city's source of water. However, analysis of the supply from the Wolf River presented little improvement: the results of Dr. Charles Smart characterized the river as "an uninviting stream, turbid with particles of red clay, which...rendered filtration difficult." Since the water could not be effectively purified, the analysis showed the water to contain vegetable matter and to be "unwholesome to a high degree."⁷⁹

Despite the detailed censure of the city's sanitary conditions, the sanitary survey did offer some hope for improvement, laying down recommendations to rectify Memphis's sanitary woes. Foremost, Memphis required a new system for sewage and drainage. The survey recommended that all privies be emptied and filled with earth, and "hereafter no system of dealing with excrement shall be permitted which involves pollution of soil, water, or air." In place of privies, the survey proposed a new system of underground sewers to empty into the Mississippi River, where the waste could decompose away from the city. In conjunction with these sewers,

⁷⁹ *Annual Report of the National Board of Health, 1879*, 251-2, 260.

inspectors called for a system of subsoil drainage, which would reduce the saturation of the soil and turn the Bayou into a functioning drainage stream again. The report also recognized the need for an expansion of the garbage force and the replacement of Nicholson pavement with more durable paving. In terms of building regulations, the survey called for the destruction or wholesale renovation of unsanitary houses and the ventilation of all houses, including their basements and cellars, so as to remove any infected matter. To enforce these standards in the future, Memphis would require a new system of building regulations, mandating that new construction be approved by health authorities and subject to future inspections. Unfortunately, the survey could not offer Memphis a definitive solution to its water question, since neither the Wolf River nor the Mississippi River seemed to present viable sources of abundant, pure water. However, the survey did recommend that Memphis discontinue the use of polluted cisterns and wells and reorganize the waterworks as a public entity with the goal of introducing a better supply from an as-yet-unknown source. Following these steps, the NBH predicted that Memphis could reduce its mortality rate from 34 deaths per 1,000 citizens in non-epidemic years to a more respectable 20 deaths per 1,000 in five years. The National Board of Health's sanitary survey of Memphis gave detailed information on the persisting sanitary problems of the city, thus providing concrete targets for health improvements and empowering the local Board of Health to take increased action for sanitary reform.⁸⁰

Interpreting the results and the recommendations of the NBH's sanitary survey as a mandate for increased action in sanitary reforms, the Board of Health of the Taxing District redoubled its efforts, making improvements in construction, paving, and garbage collection. From its initial two sanitary officers, the Board of Health expanded its sanitary police corps, detailing regular officers with additional authority to conduct inspections, report sanitary

⁸⁰ *Annual Report of the National Board of Health, 1879*, 239, 252.

nuisances, and issue fines for public health purposes at the behest of the Board.⁸¹ The expanded sanitary police corps allowed the Board of Health to direct thousands of inspections annually, not only of buildings but also of privies, wells, and cisterns. Following these inspections, the Board would often order privies and cisterns to be cleaned, emptied, or disused entirely. Furthermore, in its first three years, the Board of Health condemned and destroyed 244 houses in the city, with many others being repaired to satisfactory condition by their owners.⁸² In addition to the added enforcement provided by the sanitary officers and these physical improvements, the Board of Health augmented its authority by expanding its realm of influence. The Board laid down new plumbing regulations, appointed an inspector for the city's milk and meat, began registration of births, and administered mandatory vaccinations against smallpox.⁸³ By expanding the breadth of health ordinances and wielding the powers of sanitary inspections and fines, the Board of Health expanded its powers over the public health of Memphis and compelled sanitary improvements among the citizenry.

As it enlarged its authority, the Board of Health undertook comprehensive physical improvements across the city, including the replacement of the abhorrent Nicholson pavement and improvements in the city's garbage service. As drainage improvements dried the soil, the city tore up the wooden blocks and repaved the streets with more durable paving of rubble stone and gravel.⁸⁴ By 1886, Memphis had removed 9 miles of Nicholson pavement and laid 22.5 miles of new stone pavement; with the adoption of granite pavement for further durability in the late 1880s, the city paved some 50 miles of streets by the early 1890s, mostly throughout the

⁸¹ Memphis Board of Health, *Second Annual Report*, 5.

⁸² Memphis Board of Health, *Third Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1881* (Memphis: The Board, 1882), 11.

⁸³ Gerald M. Capers, *The Biography of a River Town: Memphis: Its Heroic Age*, 2nd ed. (New Orleans: Tulane University Press, 1966), 211.

⁸⁴ Ellis, *Yellow Fever and Public Health*, 117.

commercial and affluent residential areas of the city.⁸⁵ In garbage collection, the Board of Health continued to expand its force as per NBH recommendations, for example purchasing two new garbage carts and five mules in 1887.⁸⁶ The garbage force did remain inefficient and undersized, with only affluent neighborhoods receiving regular service. Nevertheless, through the new process of dumping garbage into the Mississippi River below the city, in conjunction with the reduced workload of the force due to sewer expansion, Memphis successfully limited the build-up of waste in the Bayou Gayoso and across the city.

Despite the benefits of these health improvements, the Board of Health performed no measure that carried as much sanitary significance as the development of a new sewer system for Memphis. For sanitarians, the antiquated privy system was a severe source of filth in Memphis, polluting both ground and air, and a new sewer system offered a decisive improvement in health conditions. Even before the sanitary survey in 1879, Memphis had contracted George E. Waring, Jr., a civil engineer who had led the drainage project in the construction of Central Park, to perform an examination of the city with the goal of organizing a plan for a sewer system. On November 26, 1879, the NBH released its preliminary report on Memphis's sanitary conditions and recommended the adoption of the Waring system, which envisioned separate systems for sewage waste and drainage. Although this proposal had never been implemented, the economy of the Waring system persuaded the impoverished Taxing District, which recognized the immediate need for improved drainage and sewers, to petition the state legislature for funding. Similarly convinced by the NBH's recommendations, a special session of the Tennessee

⁸⁵ 1886 statistics: Thornton, "Six Years' Sanitary Work," 447; 1890s: Ellis, *Yellow Fever and Public Health*, 117.

⁸⁶ Memphis Board of Health, *Ninth Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1887* (Memphis: The Board, 1888), 4.

legislature authorized the Taxing District to collect a two percent tax to finance the new sewer project, which then began on January 21, 1880.⁸⁷

In Waring's plans, each street contained 6-inch pipes and a 112-gallon flush tank, designed to clear the line daily to prevent blockages from the accumulation of waste.⁸⁸ As workers laid these pipes, the Board of Health ordered the disuse of privies, which were replaced by new water closets, with 4-inch drains from each house to the lateral street pipe. Although critics disdained these pipes as too small, Waring defended their size, claiming that smaller pipes provided for sufficient ventilation and proper flushing of the system.⁸⁹ These lateral lines then drained into a pair of 15-inch main sewers, one on either side of the Bayou Gayoso, and ultimately emptied into the Wolf River. In this manner, the sewers carried waste beyond the limits of the city before the beginning of decomposition and the release of putrefying toxins.⁹⁰ For drainage, Waring's men laid agricultural drain tiles, from which surface drainage entered underground pipes that drained into the Bayou Gayoso.

Until the project was temporarily suspended in June, work continued feverishly on the sewers, with 18 miles of new sewers, including all of the main lines, laid in just fifteen weeks and at a cost of \$137,000.⁹¹ As with most of the sanitary improvements, the new sewers experienced their share of criticisms and obstacles. Despite the repeated protests of Board of Health President Thornton that more sewers would reduce the burden on the garbage force, Memphis did not extend sewer access to the Ninth and Tenth Wards, the poorer neighborhoods

⁸⁷ *Annual Report of the National Board of Health, 1879*, 241.

⁸⁸ Ellis, *Yellow Fever and Public Health*, 114.

⁸⁹ George E. Waring, Jr., "The Sewerage and Drainage of Cities," *American Public Health Association Reports* 5 (1879), 37.

⁹⁰ *Ibid.*, 38.

⁹¹ George E. Waring, Jr., "The Memphis System of Sewerage at Memphis and Elsewhere," *American Public Health Association Reports* 18 (1892), 154.

of Memphis, until 1888.⁹² In this manner, sewer construction adhered to the common pattern of sanitary reform, which occurred rapidly in the commercial district and affluent residential neighborhoods before it gradually reached the entire population. Thornton also censured the city for constructing overflow pipes from the sewer mains that emptied into the Bayou Gayoso; although the first overflow, erected in 1880, began as a temporary measure to reduce the strain on the sewer system, by 1884 seven outlets emptied into the Bayou. According to Thornton, these outlets violated the ordinances of the Board of Health and, more significantly, negated overall sanitation efforts by reintroducing the Bayou's previously polluted condition.⁹³ Ultimately, the city constructed an intercepting relief sewer in 1885-6, allowing the closure of the sewer outlets into the Bayou.⁹⁴ Finally, the introduction of an entirely new system for sewage required adjustment by Memphians. Memphis suffered repeated blockages in the smaller pipes, but Waring found this complaint to be unique to Memphis, with other cities experiencing few problems. For Waring, it was clear that most stoppages arose from improper disposal of foreign substances such as sticks or garbage into the pipes. Furthermore, Memphis's muddy water supply clogged the flush-tanks and thus reduced their effectiveness in clearing the system, a problem that could be resolved by regular maintenance.⁹⁵

Despite the initial difficulties of constructing a new sewage system, Memphis's sewers performed admirably, receiving widespread praise for their overall effectiveness. By December 1886, Memphis had 43.49 miles of sewers, compared to just 4.25 miles of private sewers before

⁹² Memphis Board of Health, *Fifth Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1883* (Memphis: The Board, 1884), 8; Memphis Board of Health, *Seventh Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1885*, (Memphis: The Board, 1886), 5; Memphis Board of Health, *Tenth Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1888* (Memphis: The Board, 1889), 8.

⁹³ Memphis Board of Health, *Second Annual Report*, 6; Memphis Board of Health, *Sixth Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1884* (Memphis: The Board, 1885), 5.

⁹⁴ Memphis Board of Health, *Eighth Annual Report of the Board of Health of the Taxing District of Shelby County, for the Year 1886* (Memphis: The Board, 1887), 5.

⁹⁵ Waring, "The Memphis System of Sewerage," 156-7, 164.

the epidemic, 198 flush-tanks, and 35.09 miles of subsoil drain. In total, this work had cost \$316,000, an economical sum covered by the city's special sewer tax.⁹⁶ Most significantly, the sewage and drainage systems drastically improved Memphis's sanitary condition. As decaying privies were filled in and replaced by 7,535 new water closets connected to the sewers, Memphis eliminated the "wholesale and indiscriminate pollution of the soil" and "converted the old, smelly Bayou Gayoso from a lengthy cesspool" back into an effective channel for drainage.⁹⁷ Furthermore, consistent flushing of the system and proper ventilation prevented deposits of sewage or noxious "sewer-gas." For health authorities, these steps ensured that infectious miasma, disease-causing vapors thought to arise during decomposition, posed no health threat to the people of Memphis. In sum, the sewers were a complete success, with George Waring noting that the new system was "popularly credited with the conversion of Memphis from a pest-hole to a habitable town."⁹⁸ Indeed, Memphis's new systems of sewerage and drainage, which the city continued to expand, significantly improved conditions in the city and, for historian John Ellis, ultimately represented "Memphis's most significant sanitary achievement of the 1880s."⁹⁹

As Memphis resolved its other sanitary issues, especially its lack of an effective sewer system, the wretched conditions of the city's water supply only grew increasingly unbearable. Although Memphis heeded the recommendations of the NBH survey and reorganized the Memphis Water Company as a public waterworks in 1880, the supply from the Wolf River remained unwholesome, "thick with mud, mineral, and vegetable matter."¹⁰⁰ As the Board of Health continued to condemn defective wells and cisterns, polluted by the soil, as unfit for use, the Wolf River supply became the only option for many Memphians. Even the construction of

⁹⁶ Ellis, *Yellow Fever and Public Health*, 114; Thornton, "Six Years' Sanitary Work," 446.

⁹⁷ Ellis, *Yellow Fever and Public Health*, 115.

⁹⁸ Waring, "The Memphis System of Sewerage," 154.

⁹⁹ Ellis, *Yellow Fever and Public Health*, 115.

¹⁰⁰ "Bad Water versus Good Sewerage," *Mississippi Valley Medical Monthly* 4 (Jan 1884), 36.

the new sewer system provided no relief. Since the city drew its water only half of a mile upstream from where the sewers emptied into the river, backflow constantly contaminated the water supply.¹⁰¹ Despite the pleas of the public and the disapprobation of the medical community, including the Board of Health, the government did little to resolve the problem. The costs of filtering the Wolf River water remained prohibitively high in the city's eyes, and a supply from the Mississippi River seemed to offer no sanitary improvement. In 1886, the Taxing District appointed a committee to investigate the city's water supply with hopes of a solution. In its report, the committee recommended drawing Memphis's water from the Wolf River at Raleigh, a point farther upstream from the current waterworks; however, the city took no action on the committee's report.¹⁰² Therefore, Memphis's abysmal water supply, for which the public could find no discernible solution, continued to hamper the city's public health throughout the early 1880s despite other sanitary successes.

However, the fortuitous discovery of underground reservoirs in 1887 and the subsequent implementation of artesian wells offered not only a viable source of water, but one of exceptional quality. As discontent with the Wolf River supply continued to grow, public interest grew in the potential drilling of artesian wells, which tapped into aquifers deep below the earth. In 1883, the Bohlen-Huse Machine and Lake Ice Company began experimental drilling for ice production, but had poor results. Then, in May 1887, the company's well on Court Street "suddenly gushed forth clear, cool, good-tasting water" at a depth of 354 feet.¹⁰³ R.C. Graves, manager of Bohlen-Huse, sent samples of the surprising discovery to Dr. Charles Smart, the same chemist who had analyzed Memphis's water for the NBH sanitary survey in 1879. Smart found both samples to be clear, odorless, and pleasant-tasting; moreover, Smart detailed his surprise at "the unusual

¹⁰¹ Memphis Board of Health. *Third Annual Report*, 14.

¹⁰² Ellis, *Yellow Fever and Public Health*, 116.

¹⁰³ *Ibid.*, 117; "Water," *Mississippi Valley Medical Monthly* 7 (Aug 1887), 372.

purity of the water,” which contained no organic debris and little sediment.¹⁰⁴ The sandy aquifer that held the water sat beneath a thick layer of firm clay, preventing any surface pollution from contaminating the water. Therefore, Smart wholeheartedly endorsed the artesian well water as a wholesome supply for Memphis, stating that “a plentiful supply of water like this would be a god-send to any city.”¹⁰⁵ After a study confirmed that the underground source held more than enough water to sustain Memphis’s needs, in July the city contracted the newly formed Artesian Water Company to provide the municipal water supply. Graves quickly ordered 32 wells drilled and connected to surface pumps that distributed water throughout the city, supplying between 8 and 9 million gallons of water daily by the end of 1888.¹⁰⁶ Furthermore, the water remained of the highest quality and showed no signs of exhausting its underground supply. By providing a plentiful supply of what the *Memphis Avalanche* named “the cleanest, purest, and best water of any city in the South,” R.C. Graves and the Artesian Well Company completed the city’s transformation from a hotbed of disease into a sanitary leader.¹⁰⁷

In demonstrating the severe consequences of Memphis’s failure to address its sanitary weaknesses, the 1878 yellow fever epidemic prompted Memphis to undertake a radical program of public health reforms. By creating a powerful Board of Health and pursuing numerous sanitation improvements, most notably a new system of sewers and a clean water supply, Memphis’s response to the epidemic shaped the city into a model for innovation and success in public health. In stark contrast to its previous apathy to reform, Memphis continued to expand upon its initial health improvements through the end of the nineteenth century. In 1898, the Artesian Water Company had 40 wells and 3 surface pumps in Memphis that provided a supply

¹⁰⁴ “Water,” 372.

¹⁰⁵ Ibid.

¹⁰⁶ “Memphis’s New Water Supply,” *Memphis Medical Monthly* 8 (November 1888), 528-9.

¹⁰⁷ *Memphis Avalanche*, September 16, 1888, quoted in Ellis, *Yellow Fever and Public Health*, 117.

of 30 million gallons daily, an amount three times the city's demand.¹⁰⁸ Similarly, by 1900 Memphis had 152 miles of working sewer, a considerable departure from 4 miles just over twenty years earlier.¹⁰⁹ As the city had hoped, its sanitary programs slashed Memphis's mortality rate from 35 deaths annually per 1,000 citizens in pre-epidemic years to 23.8 deaths per 1,000 in 1886.¹¹⁰ The mortality rate dropped further to 18.9 deaths per 1,000 in 1893, likely due to the improved water supply.¹¹¹ Furthermore, these public health improvements succeeded in their original goal of reducing Memphis's vulnerability to yellow fever, although health authorities were incorrect in supposing a direct connection between filth and yellow fever. The new sewers, which eliminated the saturation and pollution of the soil and turned the Bayou into a flowing stream, and the improved water supply, which resulted in the disuse of wells and cisterns, eliminated many sources of standing water in the city. Therefore, Memphis eradicated many of the breeding grounds for the *Aedes aegypti* mosquito; subsequently, the city only experienced one more bout of yellow fever, a mild spell in 1897. Finally, Memphis's sanitary improvements offered leading innovations in public health reform, again through its sewage system and artesian wells. Memphis had been the first city to implement Waring's plan for separate sewage and drainage systems, and their success fueled the introduction of the "Memphis system" of sewerage in cities across the world. Similarly, the artesian wells offered one of the purest water supplies in the country, a supply that continues to serve Memphis today with equal success. Therefore, Memphis's post-epidemic public health reforms not only succeeded in

¹⁰⁸ Capers, *Biography of a River Town*, 211.

¹⁰⁹ *Ibid.*, 210.

¹¹⁰ Thornton, "Six Years' Sanitary Work," 449.

¹¹¹ Ellis, *Yellow Fever and Public Health*, 164.

making the city “an impossible field for the invasion of yellow fever in an epidemic form,” but also transformed Memphis into a model of sanitary triumph.¹¹²

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¹¹² Waring, “Sewerage and Drainage,” 40.

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