

In the midst of the Covid-19 pandemic, what lessons from the urban past can be learnt with regard to the future design and management of cities?

No one—not modern urbanites battling Covid-19 nor Philadelphians fleeing yellow fever in 1793—wants to live in a disease-ridden city. The modern battle cry, “wash your hands!” echoes a late 18th century refrain, “wash the streets!” and the demand for water in both eras reveals an opportunity to learn from the urban past about how to better handle the future, through Covid-19 and beyond.¹ The yellow fever epidemics of 1793-1798 prompted Philadelphians to pressure their municipal administration to provide plentiful and clean water so urban planners quickly constructed America’s first major public waterworks.”² This snapshot of urban history—Philadelphia responding to yellow fever by constructing the Schuylkill and Fairmount Waterworks—can teach modern urban designers and managers many lessons, but only three are discussed here:

1. A plentiful and clean municipal water supply significantly reduces the impact of disease in a city. (An obvious lesson, but worth repeating.³)
2. Not including socioeconomically disadvantaged urban areas in municipal water supply is highly detrimental to a city’s public health.
3. Prioritizing municipal water resources also contributes to urban wellbeing by promoting civic pride.

The importance of plentiful and clean water to a city’s wellbeing and prosperity has been demonstrated throughout history: the earliest cities blossomed near rivers and reliable water sources, ancient Greek cities featured lavish bath houses, and thriving Roman cities often had incredible aqueducts to supply them.⁴ Although access to plentiful clean water did not (and will not) eradicate risk of disease in urban places, *lack* of water, sanitation, and hygiene facilities is

¹ This is not the only example of urban history and disease being linked. “The history of cities is the history of disease.” Ian Morley, “Rethinking Past Green Space Manufacture to Boost Equitable Future Urban Recovery,” *The Journal of Public Space* 5, no. 3 (2020): 148; Ian Morley, lectures in HIST5592, September-October 2021.

² Howard P. Chudacoff and Judith E. Smith, *The Evolution of American Urban Society*, 6th ed (Upper Saddle River, NJ: Pearson Prentice Hall, 2005), 56.

³ As of July 2021, “safely managed sanitation services reached [only] 62% of the world’s urban population.” “Progress on Household Drinking Water, Sanitation and Hygiene 2000-2020,” United Nations and WHO/UNICEF, last modified July 1, 2021, <https://www.unwater.org/publications/who-unicef-joint-monitoring-program-for-water-supply-sanitation-and-hygiene-jmp-progress-on-household-drinking-water-sanitation-and-hygiene-2000-2020/>

⁴ Paraphrasing Ian Morley, lectures in HIST5592, on September 14 and September 21, 2021. Note: Medieval cities were comprised mainly of narrow dirt roads and wooden buildings and often neglected water-focused infrastructure beyond local wells and moats. Consequentially, Lewis Mumford describes pigs as the Medieval “Board of Health” and *fire*, not water, as the “ultimate municipal germicide.” Lewis Mumford, *The City in History* (New York: Harcourt, Inc., 1961): 292-293.

highly detrimental to public health.⁵ Philadelphia of the late 18th century learned this first urban-history lesson the hard way.

Yellow fever descended upon Philadelphia in 1793, when the conditions were ripe for an epidemic. William Penn's 1682 ideal of a "wholesome" city led to the initial design of Philadelphia, a city where "logic and geometry would rule geography" through spacious grid-lined blocks and the occasional park.⁶ However, after a century of development and the sudden rise of industrialization, Philadelphia consumed its own suburbs and became thriving metropolis for 51,000 people, still dedicated to extending the grid-plan, but neglecting the spacious blocks and parks in service of commerce and efficiency.⁷ As Philadelphia expanded during the United States' "mania of city building,"⁸ the city also embodied the salient characteristics of other contemporary American cities like rapid commercial expansion, economic competition, racial and ethnic segregation, interpersonal anonymity, and polarization between wealthy and poor.⁹ Although public health was an earlier American priority than services like policing and firefighting, "the rapidity of change tended to overwhelm urban health codes."¹⁰ One shortcoming of urban design and early health codes was the inability to widely distribute water resources, and yellow fever thrived in these filthy conditions.

Philadelphians, like most American city-dwellers, prior to 1800 drew water from local sources like wells, neighborhood streams, or a handful of municipal pumps. Unfortunately, these sources were easy to pollute, often as a result of privy drainage from their adjacent homes.¹¹ Americans were accustomed to dealing with many diseases,¹² but when yellow fever struck Philadelphia, there was very little public infrastructure to prevent the spread. Consequentially, half the city's population fled west while 9-12% of the remaining people (most of whom were

⁵ "Billions of People Will Lack Access to Safe Water, Sanitation and Hygiene in 2030 Unless Progress Quadruples—Warn WHO, UNICEF," WHO, UNICEF Joint News Release, last modified July 1, 2021. <https://www.who.int/news/item/01-07-2021-billions-of-people-will-lack-access-to-safe-water-sanitation-and-hygiene-in-2030-unless-progress-quadruples-warn-who-unicef>

⁶ Emma Jones Lapsansky, *Neighborhoods in Transition: William Penn's Dream and Urban Reality* (New York: Garland Publishing, Inc., 1994), 4. See image 1.

⁷ Lapsansky, *Neighborhoods in Transition*, 14; Mumford, *The City in History*, 327, 554.

⁸ Chudacoff and Smith, *The Evolution of American Urban Society*, 43.

⁹ Chudacoff and Smith, *The Evolution of American Urban Society*, 43-49

¹⁰ Gerald N. Grob, *The Deadly Truth: A History of Disease in America* (Cambridge, Mass.: Harvard University Press, 2002), 98.

¹¹ Grob, *The Deadly Truth*, 98.

¹² These diseases included tuberculosis, malaria, smallpox, influenza, dysentery, pneumonia, and diphtheria.

poor and living near the wharves) died.¹³ Although germ theory was undeveloped, many Americans believed “cleanliness was the only way to prevent or minimize disease.”¹⁴ During the yellow fever pandemic, “Matthew Clarkson, Esq., the Mayor of the city, issued most peremptory orders to have the streets properly cleaned and purified by the scavengers, and all the filth immediately hauled away. These orders were frequently repeated,”¹⁵ which demonstrates a degree of municipal interest in public hygiene. Yet these early public street-cleaning services were unsatisfying: pedestrians were forced to dodge spontaneous deluges from the back of mule-carts and didn’t appreciate wasting good, local drinking water on the dirty streets.¹⁶

The remaining (and surviving) Philadelphians needed a stronger, more lasting response to the threat of yellow fever and future diseases. Thus, the Select and Common Councils of Philadelphia hired Benjamin Latrobe in 1798 to design a pump system that could bring water from the Schuylkill River to Centre Square, an easily accessible high-ground reservoir.¹⁷ Despite there being “little or no desire expressed...for any other than their *good* pump-water,”¹⁸ before the epidemic, Philadelphians quickly grew accustomed to considering water a public utility and embraced the updated Fairmount Hill waterworks in 1811. Even the War of 1812 did not hamper the development of urban water technologies and maps from 1815 show fifty-four pumps between Chestnut and Markets Streets.¹⁹ By 1822, Philadelphians consumed an average of “2,000,000 gallons in winter and 3,000,000 in summer, ‘when the streets are washed.’”²⁰ Although the positive impact of the Fairmount Waterworks wasn’t seen until after yellow fever naturally dissipated, its impact was clearly reflected during the cholera epidemics of 1832 and 1849.

¹³ Grob, *The Deadly Truth*, 102.

¹⁴ Chudacoff and Smith, *The Evolution of American Urban Society*, 55; Grob, *The Deadly Truth*, 98. Note: Some scholars like Charles E. Rosenberg in *Cholera Years* (p. 18) and Simon Finger in *The Contagious City*, (p. 104) argue that people in the 19th century attributed disease more to moral vices than physical cleanliness. Others, like Ronald Rainger, critique these views as oversimplified. This debate is beyond the scope of this paper.

¹⁵ James Rees, *Mysteries of City Life; Or, Stray Leaves From the Worlds Book*, (Philadelphia: J.W. Moore, 1849), 266.

¹⁶ See Image 2

¹⁷ Chudacoff and Smith, *The Evolution of American Urban Society*, 56.

¹⁸ John Fanning Watson, *Annals of Philadelphia and Pennsylvania, in the Olden Time, Vol. 2*, Philadelphia: King and Baird Printers, 1850: 457.

¹⁹ Laplansky, *Neighborhoods in Transition*, 20

²⁰ Charles King, *A Memoir of the Construction, Cost, and Capacity of the Croton Aqueduct* (New York: Charles King, 1843): 78.

During the first epidemic, “Philadelphia prided itself on having a death rate from cholera that was one-quarter that of New York and one-twelfth that of Montreal,”²¹ a success which was “due not to the superiority of the medical aid received but to the ready availability of an unlimited supply of clean fresh drinking water from the Fairmount reservoir.”²² New York had the opposite problem: “a standing joke maintained that [New York] city water was far better than any other, since it served as a purgative as well as for washing and cooking.”²³

	City	Population	Cholera Deaths	Percentage
1832	New York	202,589	~3,500	~1.73%
	Philadelphia	161,410	935	<0.58%
	New Orleans	46,310	>6,000	>12.96%
1849	New York	515,547	5,000-15,219*	0.96%-2.95%*
	Philadelphia	340,045	1,012	0.29%
	Boston	136,881	611	0.45%

*Discrepancy due to contradicting sources.

The positive impact of plentiful clean water in Philadelphia during the cholera epidemics teaches modern urban designers the importance of water-supply for city planning and exemplifies how a plentiful and clean urban water supply significantly reduces risk of disease.

Unfortunately, water supplies were not equitably distributed in 19th century Philadelphia, nor are they equitably distributed within cities today during Covid-19. As of July, 2021 over 3.6 billion people lacked safe sanitation and 3 in 10 people could not wash their hands within their homes. Although many of these people live in rural areas, of the 50% of the global population currently residing in urban places, just under 1 in 3 people live in a slum household²⁵ and it is

²¹ John B. Osborne, “Preparing for the Pandemic: City Boards of Health and the Arrival of Cholera in Montreal, New York, and Philadelphia in 1832,” *Urban History Review / Revue D'Histoire Urbaine* 36, no. 2 (2008): 30.

²² Osborne, “Preparing for the Pandemic,” 30.

²³ Rosenberg, *Cholera Years*, 18.

²⁴ Population statistics from G.F. Pyle, “The Diffusion of Cholera in the United States in the Nineteenth Century,” *Geographical Analysis* 1, no. 1 (1969): 61, 62, 67; citing U.S. Surgeon-General’s Office and U.S. Secretary of State. Cholera death statistics from the following sites: Baruch College NYC Data,

<https://www.baruch.cuny.edu/nycdata/disasters/cholera-1832.html> ; William Watson,

<https://muse.jhu.edu/article/368677/pdf> ; Los Angeles Herald,

<https://cdnc.ucr.edu/?a=d&d=LAH18840821.2.22&e=-----en--20--1--txt-txIN-----1>.

²⁵ Hannah Ritchie and Max Roser, “Urbanization,” *Our World in Data*, Sept 2018, last modified November 2019 <https://ourworldindata.org/urbanization#urban-slum-populations>.

clear that “the socioeconomically disadvantaged [in urban environments]...are the ones hardest hit in emergencies or adverse events,”²⁶ like COVID-19. Therefore, disease often enters urban centers through regions with poor sanitation due to poor socioeconomic resources.

Although early theories of disease claimed the “moral condition” of “vicious and dissolute” Americans as a prevailing cause, cholera increasingly proved the significance of environment: “the city and the tenement assumed leading places in the list of cholera’s predisposing causes.”²⁷ The maps of pump distribution in 1815 Philadelphia noted fewer access points in the southern regions of the city where the black and Irish communities were established.²⁸ It is no coincidence that these areas also reported a disproportionate number of cholera cases when compared to the rest of the city. In John Snow’s 1851 study of cholera in London, affluent houses supplied by Lambeth Co. experienced only 461 deaths in 14 weeks, while houses supplied by the Broad Street pump in Southwark and Vauxhall suffered 4,093 deaths in the same period.²⁹ Modern scholars acknowledge many instances where disease thrives in poor conditions: cholera devastated the Five Points district of New York in 1832, and the Irish and German populations of Buffalo were severely impacted in 1849.³⁰ Even in modernity, Brazil’s rudimentary conditions of sanitation in urban areas led to cholera outbreaks in 1991,³¹ and the poor sanitary conditions of wet markets in Wuhan led to the outbreak and spread of Covid-19.³² History teaches, and modern experts agree: “slum health cannot continue to be ignored if efforts to control disease and infection on the global front are to succeed.”³³

Positing comprehensive solutions to the poor public health status of people slums is beyond the scope of this paper, but there are clear parallels between sanitary conditions and

²⁶ Chung GKK, Chan S-M, Chan Y-H, Woo J, Wong H, Wong SY, et al, “Socioeconomic patterns of COVID-19 clusters in low-incidence city, Hong Kong,” *Emerging Infectious Diseases* 27, no. 11 (2021):

<https://doi.org/10.3201/eid2711.204840>

²⁷ Rosenberg, *The Cholera Years*, 133.

²⁸ Laplansky, *Neighborhoods in Transition*, 20.

²⁹ R.J. Morris, *Cholera 1832: The Social Response to An Epidemic* (New York: Holmes & Meier Publishers, 1976.): 209.

³⁰Grob, *The Deadly Truth*, 105-6.

³¹ Maria Therezinha Martins, “Water as a Vehicle for Cholera,” in *Cholera on the American Continents*, ed. A.F. Pestana de Castro and W.F. Almeida (Washington DC: ILSI Press, 1993).

³² Jason Gale, “Delayed Wuhan Report Adds Crucial Detail to Covid Origin Puzzle,” *Bloomberg Businessweek*, August 17, 2021, <https://www.bloomberg.com/news/features/2021-08-17/where-did-covid-come-from-report-on-infected-wuhan-wild-animals-sheds-new-light> .

³³ National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Global Health, and Forum on Microbial Threats, *Urbanization and Slums: Infectious Diseases in the Built Environment: Proceedings of a Workshop*, (Washington, D.C.: National Academies Press, 2018): ProQuest Ebook Central.

access to clean water. *Our World in Data* defines a slum household as “a group of individuals living under the same roof lacking one or more of the following conditions: *access to improved water, access to improved sanitation*, sufficient living area, and durability of housing.”³⁴ To include a slum in the municipal water supply would be to remove two of the four conditions which define a slum household and would reduce the spread and impact of disease. This is not an easy feat. Rapid modern urbanization often brings the same problems Philadelphia suffered during the 19th century when demand for water-treatment facilities exceed their city’s economic resources,³⁵ particularly if modern demand includes low-socioeconomic regions. Fortunately, there are many modern techniques for improving water efficiency which can help, “delay the need to invest in costly water supply and wastewater treatment facilities, thus reducing energy demand for pumping, treating, and heating water.”³⁶ Furthermore, the consequences of ignoring poor water quality in slums weigh heavily on urban environments and history teaches just how detrimental neglecting these regions can be to a city’s overall health.

Prioritizing water resources in urban environments also has beneficial effects beyond controlling disease because the presence of plentiful, clean water promotes civic pride. Philadelphia commissioned the Fairmount Waterworks in service of a cleaner, healthier city, and they achieved their intended goal. James Stuart remarked, in 1829, “There is a great air of neatness, and of almost peculiar cleanness, about the city itself.”³⁷ Yet the benefits continued—the waterworks became a way to draw people *into* the city. Stuart continued his account to say, “no stranger should visit Philadelphia without seeing the water-works.”³⁸ Lafayette, Frances Trollope, and Charles Dickens all visited and wrote about Fairmount Waterworks³⁹ and paintings of the lovely scene abounded.⁴⁰ By 1840, “American Scenery” described the Fairmount waterworks as ranking, “among the most noble public undertakings of the world.”⁴¹

Although yellow people had sent people fleeing from the city, locals now had a way to draw people in and something to boast about. In 1833, Thomas Hamilton, remarked that

³⁴ Ritchie and Roser, “Urbanization,” *Our World in Data*.

³⁵ Carl Smith, *City Water, City Life: Water and the Infrastructure of Ideas in Urbanizing Philadelphia, Boston, and Chicago* (Chicago: The University of Chicago Press, 2013): 209.

³⁶ Lisa Maddaus, William Maddaus and Michell Maddaus, *Preparing Urban Water Use Efficiency Plans: A Best Practice Guide* (London: IWA Publishing, 2014): xix.

³⁷ James Stuart, *Three Years in North America Vol. 1*, New York, J. & J. Harper, 1833: 236.

³⁸ Stuart, *Three Years in North America*, 236-237.

³⁹ Smith, *City Water, City Life*, 146.

⁴⁰ See Image 3.

⁴¹ N.P. Willis, *American Scenery; Land, Lake, and River*, vol 2. London: George Virtue, 1840: 71.

Philadelphians, “pride themselves far more on their water-works than on their state-house...a dozen times a day was I asked whether I had seen the water-works, and on my answering in the negative, I was told that I positively must visit them; that they were unrivaled in the world.”⁴²

Unrivaled though they may have been, they were also inspiring and other cities quickly followed suit by constructing their own public waterworks systems. Civic pride contributes to the wellbeing of a city and excellent water supplies give residents a reason to be proud.⁴³

Modern urban designers, when considering how best to move forward with water management during and after Covid-19, can look to the urban past case-study of Philadelphia’s constructing a massive waterworks in response to yellow fever. Philly started out filthy, but they were able to wash away the sludge on their streets *and* reputation by constructing the Fairmount Waterworks. Covid-19 is unlikely to be the last pandemic of the 21st century, but just as Philadelphia fared better than New York during the cholera epidemics, cities with plentiful and clean municipal water systems will fare far better than cities without.⁴⁴ Of course, in order to take advantage of the benefits of a city’s great water-system, that city must also ensure that the nearby socioeconomically disadvantaged urban areas have access to clean water as well. If this is neglected—in addition to the disproportionate amount of suffering and death experienced by poorer urban residents—the overall public health of the city will suffer. This was demonstrated in several cities, historically, and holds true to this day. Fortunately, when municipal water resources *are* prioritized, citizens have an opportunity to express civic pride, which, in turn contributes to the wellbeing of the city. Who *wouldn’t* want to visit the Fairmount Waterworks after hearing so much positive commentary about it? Water is the keystone of human life, and history shows how making water supply a municipal priority can improve urban life and reduce

⁴² Thomas Hamilton, “Men and Manners in America,” *The American Quarterly Review* vol. XIV (Philadelphia: Carey, Lea & Blanchard, 1833): 543

⁴³ This pride in water resources can even extend to nations: “The United States has one of the safest water supplies in the world,” brags the Center for Disease Control. “Water Quality and Testing,” Centers for Disease Control and Prevention. https://www.cdc.gov/healthywater/drinking/public/water_quality.html

⁴⁴ It should be noted that this argument primarily focuses on waterborne vectors of disease. Covid-19 can live for 2-3 days in sewage water and up to 10 days in tap water, which means it can be transmitted through fomite, faecal and droplet vectors. Roshan Wathore et al. “Understanding air and water borne transmission and survival of coronavirus: insights and way forward for SARS-CoV-2,” *The Science of the Total Environment* vol. 749 2020: 141486. doi:10.1016/j.scitotenv.2020.141486. Furthermore, anomalies in modern data can be caused by humans. For example, many Americans have *access* to clean water for hand washing, but apparently lack sufficient judgement to wash their hands and wear their masks. Addressing this problem requires several books including Judy Mikovits and Kent Heckenlively’s *The Truth About Masks* and Dean Hashimoto’s *The Case for Masks*. It is beyond the scope of this paper to discuss.

disease. The future will be brighter, cleaner, and safer if urban designers keep in mind the lessons learnt in Philadelphia and ensure clean water flows freely through new and improved cities.

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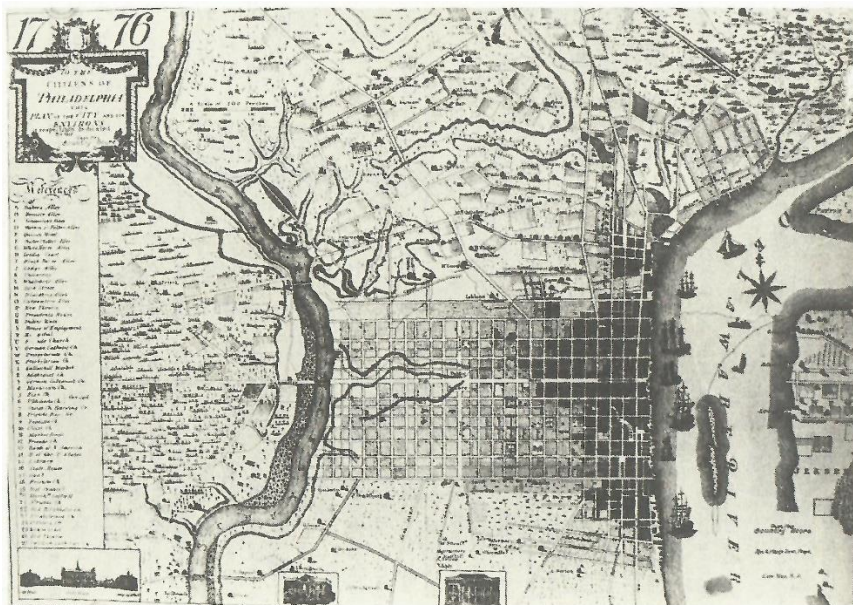
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Images:

1. Laplansky, *Neighborhoods in Transition*, 17: “Philadelphia, 1802”



2. Chudacoff and Smith, *The Evolution of American Urban Society*, 64: “Hazards of Street-cleaning.”

Hazards of Street-cleaning. Early nineteenth-century city streets became littered with debris and animal droppings, so that one of the earliest urban services was street cleaning. But as this drawing depicts, the service could be hazardous, as pedestrians who got into the way of spraying mechanisms could find themselves unwitting targets.



3. Doughty, Thomas, *View of the Fairmount Waterworks, Philadelphia, from the West Bank of the Schuylkill River*, 1826, Philadelphia Museum of Art, <https://www.philamuseum.org/collection/object/343835>

