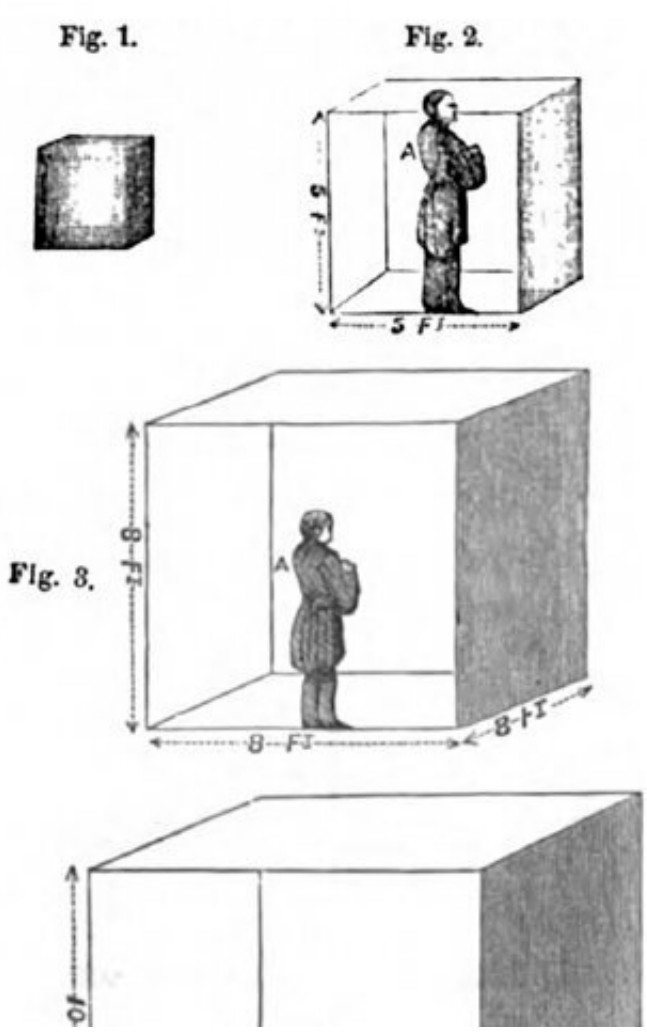
Density, equity, and the history of epidemics in New York City

June 30 2020, by Richard Plunz and Andrés Álvarez-Dávila



Comparative volumes of air as metric for sustaining human health. Credit: Report Upon the Sanitary Condition of the City, by Citizen's Association of New York, Council of Hygiene and Public Health

New York City's current responses to COVID-19 have a lot in common with the long history of epidemics that have devastated the health and well-being of the city's population. Today, as during the epidemics that scourged New York in the 19th century, those most affected are those most essential to the functioning of the economy. Also revived is the question of the efficacy of "social distancing" and the effect it might have on the future of cities and of urban density in general. Some affluent New Yorkers have fled the city for the suburbs and rural areas, and some urban planners are left wondering to what degree urban density should be reduced in order to protect residents from contagious diseases. And we see a revival of questions related to equity of response across the population and its relationship to the city's economy.

As the old aphorism goes, "public health is public wealth." And "public wealth" depends on urban density. It cannot be credibly argued that large cities anywhere—New York included—have ever planned density reductions based solely on public health issues; nor that they have advocated for equitable public health access independent from larger economic considerations.

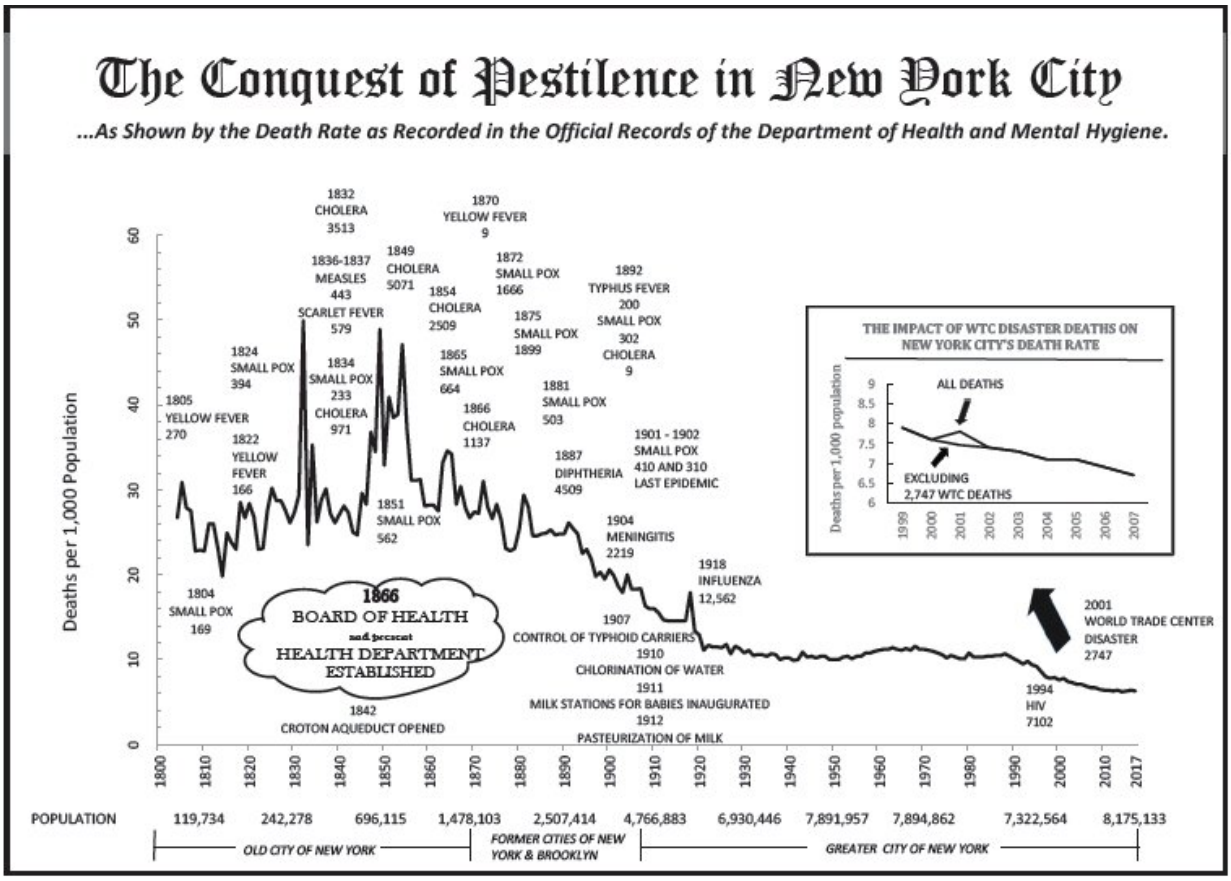
Below, we outline the historical evolution of New York City—the most crowded city in the U.S.—as it struggled with the relationship between density, economic growth, and public health concerns.

The Question of Density and Health

A definitive treatise on the relationship between density and health was published in 1866. The groundbreaking "Report upon the Sanitary Condition of the City" was sponsored by the Citizens Association, a private group that sought to ameliorate environmental conditions with an eye to maintaining the city's competitive business edge. It was an exhaustive survey of 29 "Sanitary Districts" in the city that explored correlations between disease and the spatial morphology of the urban

fabric. Like today, the question of "distancing" was addressed, defined as required volumes of air needed to provide safe conditions.

This study remains to this day one of the most comprehensive in understanding the relationship between health and urban form. It coincided with the cholera epidemic of that year, the latest in a long succession of epidemics dating from the 18th century. By 1866, New York City had become the North American metropolis, with a population of almost one million, not including Brooklyn, which had an additional 400,000 people. Its growth was exacerbated by the enormous industrial expansion related to the Civil War, which had concluded in the previous year. New York City was poised for another spike in growth, but there were serious questions about its resilience, focused on the myriad health and hygiene issues that accompanied its rise to power, and especially there was a need to ameliorate the unsanitary condition of a workforce that was of enormous importance to future growth.



History of epidemics and public health measures in NYC. Credit: New York City Bureau of Vital Statistics

Mortality as Health Metric

By 1866, an important metric was the rate of mortality that in New York had been recorded sporadically relative to the most important scourges. On the surface, the rate had drastically declined since the 1702 yellow fever epidemic (approximately 570 died, or roughly 10 percent of the total population of 4,937), but it was nearly double that of London or even Philadelphia. Although vital statistics for the first 60 years of the 19th-century are not comprehensive by modern standards, toward mid-

century, mortality records show that tuberculosis was the leading cause of death and general mortality was on the rise in New York, especially among the age group under 20 years of age. Indeed, epidemic diseases, even in years of outbreaks, generally accounted for a relatively small percentage of the mortality rate, but like today's COVID-19, they significantly altered mortality rates and caused widespread social disruption.

After 1825, the only disease to disrupt the city to the degree of earlier epidemics, such as the yellow fever outbreak of 1702, was cholera, which first spread to Europe and America in the early 19th century, when urban conditions were ripe for the disease's propagation. Cholera swept through New York in 1832, 1849 and 1866, killing thousands of New Yorkers and infecting thousands more. During cholera years in the 1830s and 1850s, mortality rates soared to heights almost double those of the beginning of the century and over quadruple current levels—killing more than 50 per 1,000 people, or approximately 1 in 20.

In general, the period between 1845 and 1865 saw health conditions in the city deteriorate dramatically, reflecting the impact of density on public health and the effects of recurring epidemics. Apart from the threat of cholera, deaths attributed to typhus, typhoid fever and dysentery increased as the century progressed, a situation aggravated by the influx of immigrants crowded in the city's tenements. Typhus became virtually endemic to the city's slums and associated with the poor. Deaths attributed to smallpox also increased around mid-century, with outbreaks becoming a fairly constant presence in the city, until legislation allowed public health officials to practice vaccination on a large scale. Scarlet fever and measles consistently claimed the lives of 100 to 200 children during non-epidemic years, and many more during outbreaks. And tuberculosis, the single leading cause of death, increased year-by-year, becoming visibly more virulent in the city's crowded tenements.

Cholera				
Year	Number of deaths from disease	Total deaths	Percentage of excess deaths from disease	Total death rate per 1,000 people
1832	3,513	10,257	54.4	50.6
1834	971	8,937	12.7	43.6
1849	5,071	22,605	28.9	43.9
1854	2,501	26,953	10.2	52.3
1866	1,137	26,815	4.5	34.9
Typhus / Tyhoid Fever				
Year	Number of deaths from disease	Total deaths	Percentage of excess deaths from disease	Total death rate per 1,000 people
1847	1,396	14,844	10.4	40
1848	953	14,892	10.4	40.1
1851	1,103	20,738	2.8	40.2
1864	1,425	25,792	2.4	31.5
1865	1,074	25,767	2.4	34.2
Smallpox				
Year	Number of deaths from disease	Total deaths	Percentage of excess deaths from disease	Total death rate per 1,000 people
1804	199	2,084	10.6	27.5
1824	397	4,224	10.7	32.5
1834	233	8,937	2.8	43.6
1835	351	7,096	5.7	24.5
1848	585	14,892	10.4	40.1
1851	586	20,738	2.8	40.2
1852	516	20,196	2.6	39.2
1853	681	21,979	3.3	41
1854	624	28,473	2.4	52.3
1865	674	25,767	2.4	34.2
1872	1,866	32,647	6.1	33.7
1875	1,899	30,709	6.6	29.4

New York City mortality from cholera, typhus/typhoid and smallpox in spike years, 1800-1899. Credit: Andrés Álvarez-Dávila; data from Gretchen A. Condrand, “Changing Patterns of Epidemic Disease in New York” in Hives of Sickness; Public Health and Epidemics in New York City, ed. David Rosner; Ira Rosenwaike, Population History in New York City

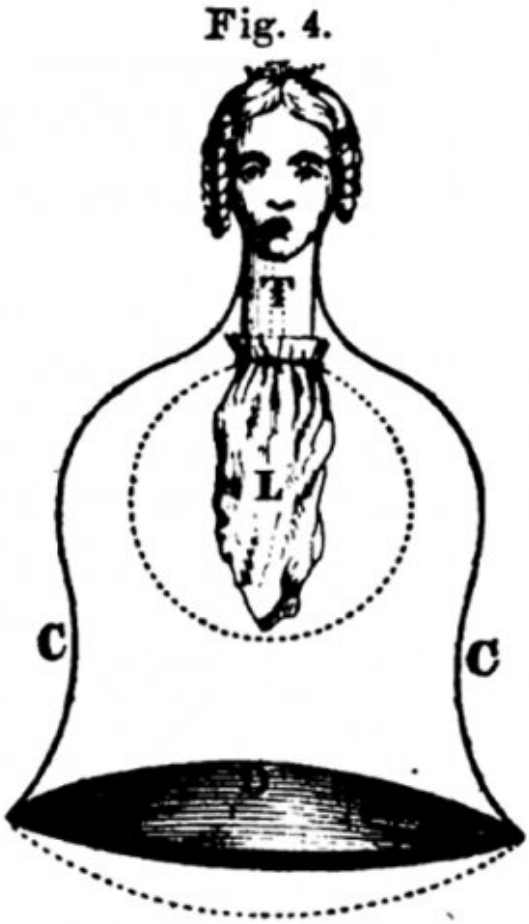
Health and Spatial Fabric

Three decades of data linking the city's worsening health conditions and the spatial fabric of the city had, by 1866, proven to be incontrovertible. Scientific studies relating worsening living conditions, proximity, and health proliferated. Already by 1790, disease-tracking studies began to identify areas, populations and conditions ripe for yellow fever outbreaks. The cholera epidemics led to early definitive data that correlated housing density and form with public health. Most exhaustive and influential was the work of John H. Griscom, a physician who in 1842 was appointed as city inspector and began long and significant initiatives on public health in New York that clarified the relationship between social class and disease vulnerability. In his treatise, The Uses and Abuses of Air (1854), he researched the importance of light and air in addressing hygiene in housing, and he was among the first to propose spatial metrics for the amount of air per person in order to overcome the negative consequences of high densities. In effect, his studies anticipated the current studies of the spatial "distancing" required to mitigate the spread of COVID.

Cellar dwellings, the housing of last choice for the poorest population of the city, were recorded as having the highest overall infection rates. The origin of the cholera epidemic of 1849 was precisely pinpointed to one of the 29,000 cellars in the city, a cellar on Baxter Street with no light or air and filthy water pooling outside. Unsanitary water supply had already

been identified as an early culprit, especially for yellow fever and cholera. In 1835, more than a decade before, construction on the Croton aqueduct had begun in order to provide a sanitary public source of drinking water, as well as to provide for the growing requirements of New York's industrial sector. But after its completion in 1845, the differential between rich and poor only increased, with the decreased use of wells raising the water table, leaving the cellar dwellers in damper and more hazardous conditions. The cholera epidemic of 1849, only four years later, was said to claim 5,000 lives, mostly within the sector of the population that fed the economic engines of the city.

The racial dimension was also well-understood. In a report on the cholera epidemic of 1819, today's equity questions had already emerged. It was recorded that "out of 48 blacks, living in ten cellars, 33 were sick, of whom 14 died; while out of 120 whites living immediately over their heads in the apartments of the same house, not one even had the fever."



"Function of the human lung." Credit: : The Uses and Abuses of Air: Showing Its Influence in Sustaining Life and Producing Disease, with Remarks on the Ventilation of Houses, New York, by John Griscom

The Density Question

While density underlies all of the above, there was never a question about lowering density—in fact quite the opposite, given the need for proximity relative to manufacturing sites. Civic leadership argued that increased density was inevitable for the city's continued economic growth, but that its adverse effects on public health could be countered.

In a phrase, "Public health is public wealth."

Although the 1866 report exhaustively showed the immediacy of the situation, governmental response was slow, amounting to only tentative official recognition of the problem in the following year with a first Tenement House Act. While the Act attempted to address public health considerations in housing for the poor, its provisions were cursory, most visibly requiring the ubiquitous fire-escapes that characterize New York fabric up to the present. Only in 1879, the first comprehensive law related to housing form and health finally passed, with the invention of the so-called "dumbbell" tenements, which ensured each household access to a narrow dumbbell-shaped air shaft. This breakthrough codified a repetitive housing fabric relative to prior more "informal" spatial typologies. It solved the dilemma of increased density while producing a modicum of hygienic improvement. By 1900 some 60,000 such tenements were built.

In 1901, with changes in the economics of housing production, the "New Law" was enacted, requiring tenements to have larger light courts, and dictating that all rooms should have windows and each apartment should have a bathroom. Thus, the 1901 Tenement House Act increased hygienic standards to a level that provided an antecedent for today's low-cost housing design norms.

River Park Towers Covid-19 compared with Bronx and NYC. Credit: Data from Johns Hopkins University Coronavirus Resource Center; 2014-2018 American Community Survey; New York Times. Source: Andrés Álvarez-Dávila

Yesterday and Today

The inevitable question now becomes what is the same and what is changed today?

During the nineteenth century, medical science had yet to find "cures" to many of the diseases that plagued New York—a situation that is echoed by the current lack of vaccines for COVID. Surely the scale of the epidemic has changed, now with a population of millions in New York City rather than hundreds of thousands, as was the case during the cholera epidemics of the nineteenth century.

Despite advances in medicine and demographic changes, one thing remains the same: the nexus between social class and disease, and the excessive vulnerability of poor populations and people of color. The connection between housing and disease remains as relevant today as it was then, although our capacity to address the housing question has changed. In response to the public health crises of the nineteenth century, there were 60,000 Old Law Tenement buildings constructed between 1879 and 1901, the product of an economic context that had the capacity to produce "affordable" housing to scale. Primitive as they were, they did, to some degree, address issues of health and hygiene. After numerous attempts, the economics of housing production in New York City today shows no such capacity to adapt, and the present health crisis will demonstrate exactly the consequences of this inability.

While COVID data is yet incomplete, there are disturbing indicators that too little has changed. If the 1866 report were to be made today, surely the high concentration of COVID in the River Park Towers in the Bronx would be entirely consistent with the well-documented "fever nests" of 150 years ago, now echoed by the so-called "death towers" in the poorest congressional district in the nation. Embedded in this crisis is the question of resources. But there is the crucial component of public will in a city that has too long been unable to adequately address issues of equity in housing and health, and the inevitable intersections between the two.

Now is a moment of truth, when the consequences of the city's inability to properly deal with longstanding crises and the push and pull between public health considerations and economic interests have come into stark relief.

More information: Center for Systems Science and Engineering. COVID-19 Dashboard. Distributed by Johns Hopkins Coronavirus Resource Center. coronavirus.jhu.edu/us-map

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