



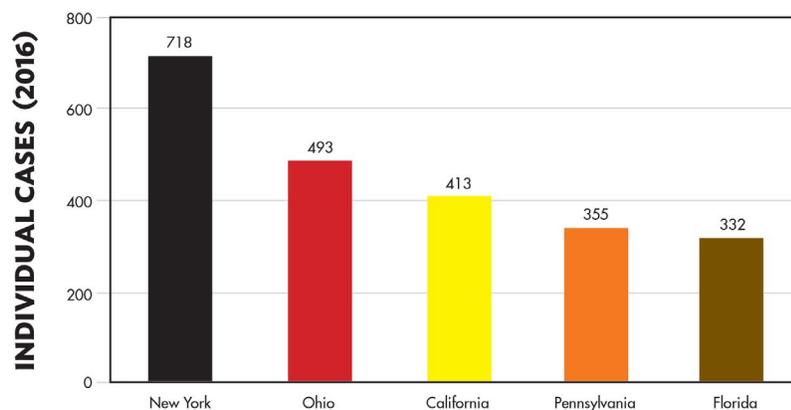
Alliance to Prevent Legionnaires' Disease

MISGUIDED HEALTH POLICY PUTS PUBLIC
AT RISK FOR LEGIONNAIRES' DISEASE

ASSESSMENT OF NEW YORK REGULATIONS TO PREVENT LEGIONNAIRES' DISEASE ENACTED IN AUGUST 2015

CASES OF LEGIONNAIRES' DISEASE BY STATE

SOURCE: Center for Disease Control



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EXECUTIVE SUMMARY

A large outbreak of Legionnaires' disease in the South Bronx during the summer of 2015 prompted New York City and New York State officials to enact emergency regulations. Unfortunately, these regulations ignored issues with the public water system and instead narrowly focused only on water-cooled air conditioning systems with cooling towers. This was because water-cooled air conditioning systems were quickly declared to be the source of the bacteria causing the outbreak without an investigation of the public water supply and without following the Centers for Disease Control and Prevention's (CDC) investigation protocols.

Long before the events of 2015, the New York City Department of Health and Mental Hygiene (DOHMH) disregarded New York City's long history with Legionnaires' disease (hundreds of reported cases annually) and failed to address or put any focus on known issues with the drinking water infrastructure. Rather than seizing the opportunity that the outbreak of 2015 presented, New York officials both failed to acknowledge and take specific action to address New York's long-term water distribution system issues—the root cause for the vast majority of Legionnaires' disease. Instead of taking the time to formulate a comprehensive and effective policy, they drove the investigation toward a politically expedient end.

During the South Bronx outbreak, DOHMH not only ignored *Legionella* experts, but in at least one case, actively silenced those who tried to expose the truth. In doing so, the department continues to put New Yorkers at risk of becoming infected with Legionnaires' disease. The narrow focus of the regulations seems intentional as they are at odds with the scientific consensus on the root causes of Legionnaires' disease. As so often is the case with political solutions to technical problems, the regulations enacted to reduce Legionnaires' disease are not effective.

Most egregiously, all their effort has had zero impact on the disease rate across the state. More than 1,000 cases of Legionnaires' disease have been reported statewide since the regulations took effect. With specific regards to New York City: Since all cooling towers are registered, it's clear that the overwhelming majority are located in Manhattan. Yet the data shows residents of the Bronx are contracting Legionnaires' disease at a much higher rate. If cooling towers are the issue, wouldn't residents of Manhattan be most at risk?

Despite the evidence, officials have not indicated any intent to address the real issue at hand—the public water supply and distribution system. Instead, officials are choosing not to reconsider the abundance of evidence to chart a new direction on Legionnaires' disease prevention, but rather seem bent on continuing to promote a flawed and failed public health policy.

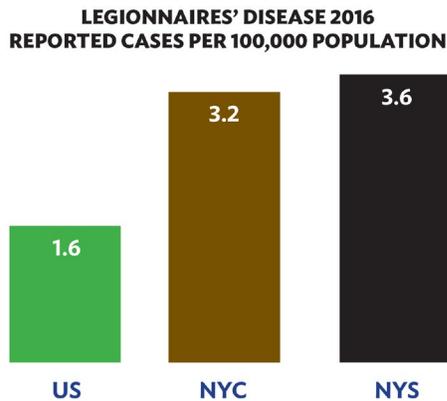
The contents of this report establish a complete set of facts leading up to the Bronx outbreak in 2015 and the events that followed and clarify the historical infection rates in New York and the above-average rates that followed despite new regulations. This report also explores the political and economic motivations behind New York's public officials' actions to pacify public interest while taking few meaningful actions to protect the public's health. It concludes with recommendations that, taken together, will have a much greater and effective impact on preventing Legionnaires' disease and other waterborne pathogens throughout New York State.

SYSTEMIC LEGIONELLA PROBLEM IN THE NEW YORK DRINKING WATER SUPPLY

Years before the summer 2015 outbreak, there was evidence of a systemic *Legionella* problem in New York. In fact, almost 300 cases of Legionnaires' disease are reported annually in New York City alone, and another 400 more reported in New York State. These rates are much higher, on a per-capita basis (Figure 1), than the national average. However, this high disease rate is considered "normal" and is tolerated as long as outbreaks can be pinned on an individual building's plumbing system or a specific water-fixture (e.g., spas, fountains, condensers). The municipal supplied drinking water can then be called "safe," avoiding waterborne outbreak status. If the municipal drinking water was identified as the cause of a Legionnaires' disease outbreak then NYC could lose its exemption to the Safe Drinking Water Act (SDWA) filtration rule and would be required to build filter plants for the entire municipal water supply.¹ Note that 99% of surface drinking water supplies nationwide are

filtered and that unfiltered supplies are eight times more likely to be the cause of waterborne disease outbreaks.²

Figure 1. Per Capita rates of Legionnaires' disease in NY more than double the national average³



The vast majority of reported cases, both nationwide and in New York City, are sporadic incidents not associated with outbreaks. These cases largely go unnoticed beyond the patients themselves and their loved ones. In these cases, the health department fills out a questionnaire, but does not undertake any environmental sampling as part of its investigation. Recognition as an outbreak triggers an environmental investigation which includes sampling of potential sources. Only 4 percent of Legionnaires'

disease cases are associated with outbreaks.⁴ Classification as an outbreak requires either multiple cases among residents within in a single building or a wider community case rate above the (already high) baseline value. These outbreak definitions are rigidly held so links between single cases are rarely made and there are no attempts to remediate the most common source of these infections, the drinking water supply. Infections continue unabated in sporadic cases. These illnesses are simply accepted even though Legionnaires' disease is a largely preventable illness.

The truth is that many of these cases are linked by the drinking water supply and steps to remediate could have mitigated the 2015 outbreak and the 1,000+ cases of Legionnaires' disease reported in New York City and the state since the regulations were initiated in August 2015.

Indeed, the water distribution system was demonstrated quite clearly to be responsible for the higher levels of Legionnaires' disease in Flint, Michigan. In the end, two distinct increases in the rate of Legionnaires' disease occurred in Flint in 2014 and 2015 (Figure 2). These burned themselves out without remediation, as outbreaks do.

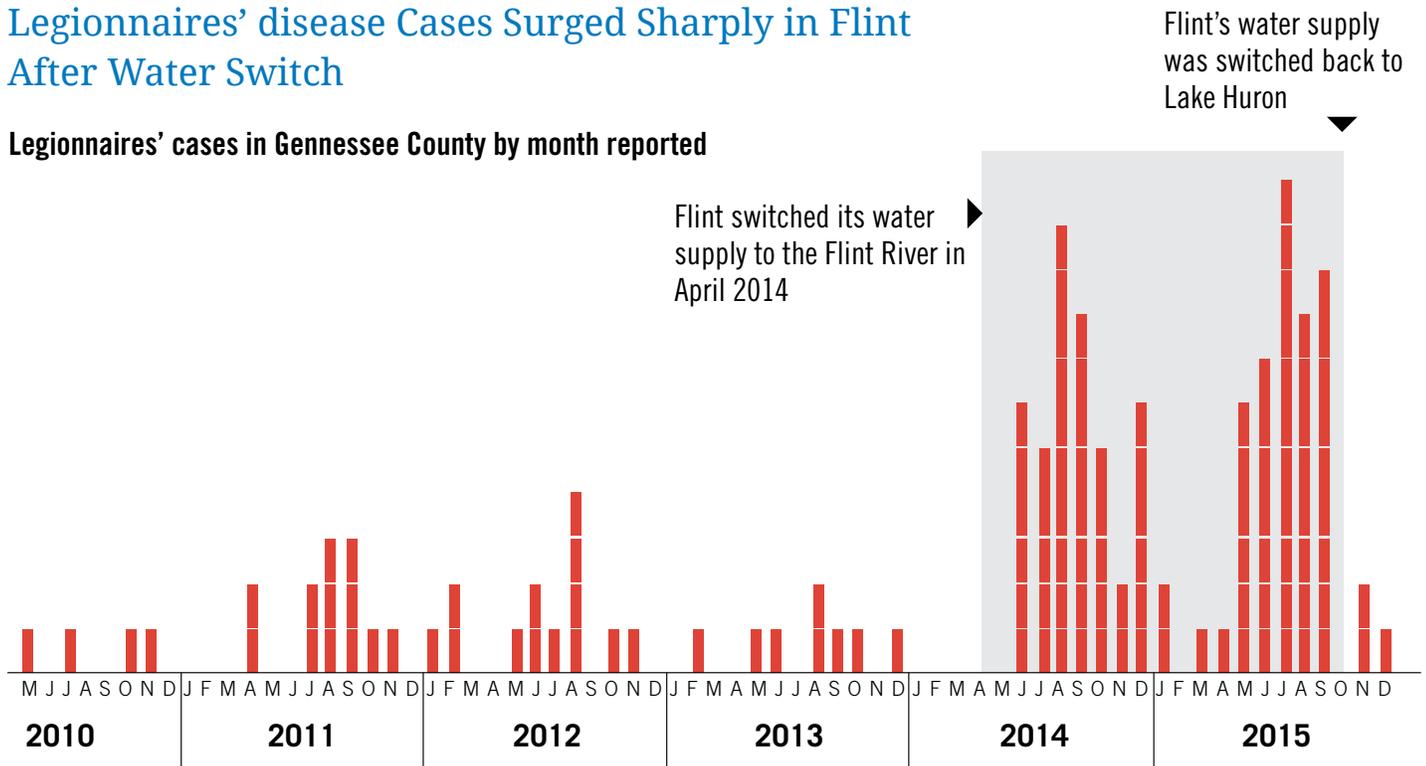
SURGE IN LEGIONNAIRES' DISEASE CASES IN FLINT, MI & NEW YORK CITY

Notice the similarity of the Flint, MI data to the annual pattern of reported Legionnaires' disease cases in New York City (Figure 3). New York City Legionnaires' disease cases spike annually. Three hundred people each year are affected by this unforgiving disease. Ten percent succumb to the disease. Many more never fully recover. This is not normal. Our elected and health officials must take responsibility for the safety of the municipal water.

Figure 2. Reported incidents of Legionnaires' disease in Flint, MI⁵

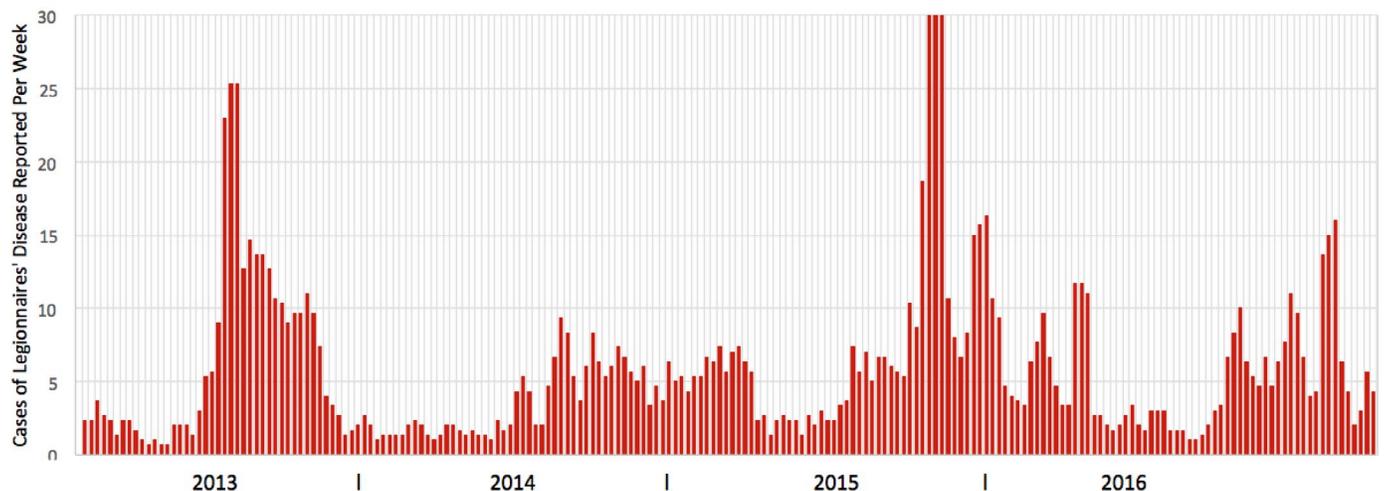
Legionnaires' disease Cases Surged Sharply in Flint After Water Switch

Legionnaires' cases in Genessee County by month reported



Note: Monthly case values are approximated for May/June 2015 and August/September 2015.

Figure 3. Annual Cycle of Reported Legionnaires' disease in NYC⁶



LEGIONELLA IN PUBLIC DRINKING WATER

“Potable (drinking) water is the most important source of Legionella.”

-US Environmental Protection Agency

Legionnaires’ disease is a bacterial pneumonia caused by inhaling or aspirating *Legionella* bacteria into the lungs. It is transmitted through inhalation of contaminated water droplets in the environment, as from a sink or shower, or by aspiration of *Legionella* bacteria when swallowing (“going down the wrong pipe”). *Legionella* can be found in water heaters, faucets, showers, ice machines, hot tubs, decorative fountains, grocery produce misters, dental hoses, CPAP machines, cooling systems, street washers, car washes, and even automobile windshield washer fluid reservoirs. The common link between all of these is the drinking water supply.

Legionella bacteria and other pathogens are naturally occurring organisms in water. The problem is current water treatment practices do not effectively address these waterborne bacteria or the nutrients on which they live.⁷ The EPA has issued drinking water regulations that include *Legionella*; however, there is no requirement for testing of *Legionella* and, as a result, there is no regulatory limit. The EPA believes that if *Giardia* and viruses are inactivated, according to the treatment techniques in the Surface Water Treatment Rule, *Legionella* will also be controlled.

This is a serious weakness of the system. While *Giardia* is harder to kill, *Giardia* will only grow in a host; *Legionella* grows very well in the water distribution system. *Legionella* and other pathogens enter into the water distribution system where they get lodged and multiply in biofilm on the pipe walls. This problem is a particular concern for older water infrastructure systems, such as those throughout New York.

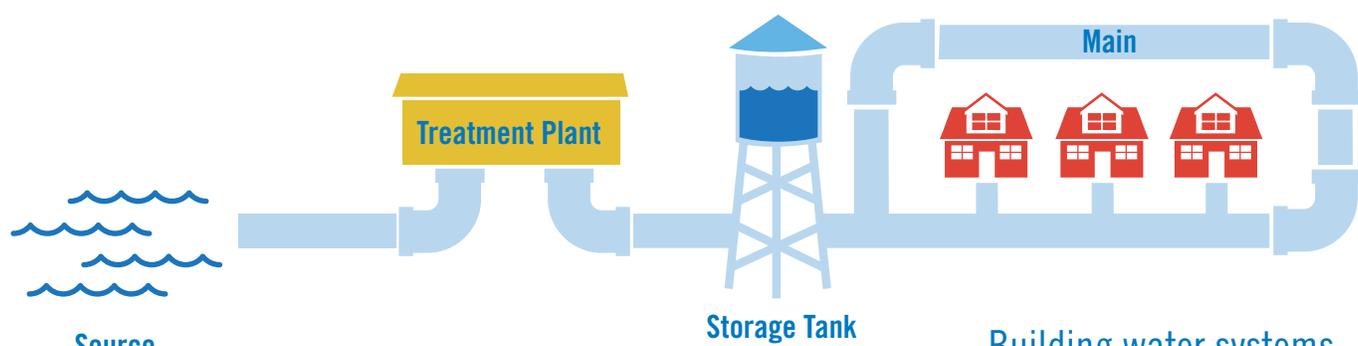
“[The EPA should] include Legionella in the final selection of contaminants of the Unregulated Contaminant Monitoring Rule (UCMR 4)...Nationally, we continue to see an increase in Legionella disease outbreaks, not from cooling tower exposure but from exposures within premise plumbing... Are water systems providing a continual “seeding” of Legionella bacteria and the bacteria getting into premise plumbing...?”

**- R. Ellingboe, Drinking Water Protection Section, Environmental Health Division at Minnesota DOH
February 9, 2016 letter to US EPA**

Pipe surfaces provide an ideal environment for bacteria, including *Legionella*, to thrive. Biofilms form when bacteria adhere to surfaces and excrete polymeric material known as ‘slime’. The slime traps nutrients from the flowing water and protects the growing bacterial community from disinfectants. Essentially, a biofilm may form on any surface exposed to bacteria and some amount of water. Once formed, these biofilms periodically release slugs of pathogens into the drinking water where they eventually come into contact with people.

BUILDINGS ARE INFECTED BY THE DRINKING WATER DISTRIBUTION SYSTEM

The treatment plant is where the water utility controls *Legionella*.



Legionella live and multiply in storage tanks and water mains.

Building water systems become points of exposure.

Ignoring the drinking water distribution system results in water tanks and premise plumbing (buildings) being inoculated with pathogenic bacteria without any warning. Recent EPA studies have found *Legionella* in 67 percent of water storage tanks and 50 percent of cold water taps in the US.^{8,9} With *Legionella* growing in the drinking water mains, any pressure fluctuation can release a large quantity of the bacteria. These pressure fluctuations can be due to a water main break, or even simply opening a fire hydrant or a distribution valve. Annual “chlorine burns,” aggressive chlorine treatments intended to trim biofilm in the water mains, also move large quantities of bacteria from the pipe walls into the water and eventually into water tanks and buildings which are situated downstream.

“Water operators need to understand that when water service is disrupted, the risk of Legionnaires’ disease can go up and the community should be notified.”

- Dr. Janet Stout, Director, Special Pathogens Lab, Research Professor, University of Pittsburgh

Periods of heavy rain flush silt and bacteria into surface water reservoirs and can overwhelm drinking water treatment plants, particularly if that water is not filtered. In fact, facility managers at a prominent New York City hospital have recorded increases in *Legionella* in the hospital’s water after such events. Now, hospitals step-up monitoring and prevention activities for two weeks after a heavy rain, at significant cost, in an effort to protect vulnerable patients from infection. Should all building managers at every apartment complex and senior living center do the same, or should the public reliably receive safe water?

Once in the building, and particularly large buildings with complex piping, *Legionella* again find lodging in biofilm and reproduce within the building water system. The building is now “infected.” The transmission mode to humans can then be from almost any point inside the building including showers, faucets, misters, fountains, and hot tubs. According to the CDC, two-thirds of all drinking water related outbreaks are caused by *Legionella*.¹⁰

CHEAP SOLUTIONS TO LIMIT DISINFECTION BY-PRODUCTS ARE NO BARGAIN

*“Maintenance of an adequate disinfectant residual throughout the (water) distribution system plays a key role in controlling the growth of pathogens and biofilms and is a treatment technique that serves as one of the final barriers to protect public health. Lack of an adequate residual may increase the likelihood that disease-causing organisms such as *E. Coli* and *Legionella* are present.”*

**- Pennsylvania Environmental Quality Board,
Disinfection Requirements Rule, 2/20/16**

The fact is the risk of Legionnaires’ disease (and other waterborne infections) could be significantly reduced if a concerted effort was made to minimize regrowth in water distribution systems. One effective way to minimize this growth is to maintain a higher minimum level of disinfectant (chlorine) throughout the distribution system. However, the disinfectant by-product regulations make maintaining disinfectant levels throughout the system difficult.

Disinfection by-products are hazardous substances formed when high quantities of chlorine react with organics. The sensible solution is to filter the organics out of the water before adding the chlorine; the higher risk

solution, and one used by New York City, is to minimize the quantity of chlorine added. The state of New York has among the lowest requirements for disinfectant residual in the nation.¹¹ The result is insufficient chlorine levels in many sections of the water distribution system, but acceptable disinfection by-products. It is in this water distribution system with very low levels of chlorine that *Legionella* bacteria can flourish. Is it coincidental that the implementation of disinfection by-product regulations in the United States occurred over the same timeframe as a four-fold increase in the incidence of Legionnaires’ disease?

IGNORING THE WATER DISTRIBUTION SYSTEM PUTS MANY NEW YORKERS AT RISK

New York City DOHMH's investigation of the South Bronx Legionnaires' disease outbreak of 2015 is highly questionable. The Department repeatedly declined to test the drinking water for *Legionella*, violating its own protocol for sampling buildings with multiple affected residents. They ignored public calls for testing by *Legionella* experts. Despite the lack of critical testing, they claimed repeatedly that "the drinking water is unaffected." An infectious disease doctor was fired, effectively silencing him for taking it upon himself to test the water in patients' homes.¹² Then months later, despite evidence to the contrary, DOHMH stated in public forums that they had tested the drinking water for *Legionella* and the infectious strain was not found.^{13, 14}

CANARIES IN THE COAL MINE

The Legionnaires' disease rate in New York City was even higher than usual throughout the early part of 2015—months before the summer outbreak. DOHMH Alert 21, which was released on July 29, 2015, confirms that much of this increase was centered in the Bronx.

- A resident of the Melrose Houses apartment complex became infected with Legionnaires' disease in March 2015. This illness was neither investigated nor remediated, putting 2,000 residents at risk. Two more cases occurred during the South Bronx outbreak in July and, because the Melrose Houses complex is located less than 0.4 mile from the Opera House Hotel (alleged source of the 2015 outbreak), these cases were included in the overall outbreak. These cases were never investigated until late August 2015 when a fourth resident became infected after all cooling towers were disinfected and after the July outbreak was declared over. The drinking water within several complex buildings was sampled and was positively identified as the source of the infections, dramatically disproving City officials' claims that "the drinking water is unaffected."
- In April, James Rouse, an apparently healthy teacher at the Urban Science Academy, located less than a mile from the Melrose Houses, contracted a fatal case of Legionnaires' disease and passed away on April 30, 2015. James' family, desperate for answers, was unable to persuade the health department to investigate the source of his illness by sampling the drinking water at his home and workplace. The school's location, at the epicenter of the large South Bronx outbreak only four months later, prompted the teachers' union to step in. In August 2015, authorities finally allowed the school's drinking water to be sampled. At this point it must be noted that just two days before the tests occurred, the school's drinking water system had been disinfected. The timing of the school's disinfection relative to the allowed sampling is suspicious. Nevertheless, all drinking water samples taken at the school tested positive for *Legionella*.¹⁵ The day the water was finally sampled, August 17, 2015, was coincidentally the same day New York City's emergency regulations specific to cooling towers were issued.

NEW YORK'S RESISTANCE TO TEST DRINKING WATER AMIDST MASSIVE OUTBREAK

In early summer of 2015, the stage was set for the largest Legionnaires' disease outbreak in New York's history. The Legionnaires' disease rate in the Bronx had been high throughout the early part of 2015. Multiple *Legionella* infections had been reported among residents living or working in the South Bronx. The new Croton filtration plant was brought online in May, undoubtedly accompanied by pressure changes in the connecting lines as valves were opened and water began flowing from different reservoirs. Chlorine readings in the distribution system began increasing in June. Perhaps the annual chlorine burn had begun. The increase was large enough for residents to note the chlorine odor emanating from taps. Again, New York has among the lowest required disinfectant residuals in the nation and, as such, biofilm in the water mains may have been quite advanced. The unfiltered surface water provided a steady supply of nutrients for bacteria to grow.

Early *Legionella* infections, which would later be tied to the South Bronx outbreak began in early July. The infection rate peaked in late July then tapered off, without remediation, by the end of July.

Three of those affected were residents of The Brook, an affordable housing residence. Standard practice for DOHMH is to investigate the potable water in a building with multiple cases. Oddly, the health department did sample the water, but not for *Legionella*. The testing that was done indicated there were very low to non-detectable residual disinfectants in the water including no detectable disinfectant from all of the showers tested.¹⁶

Infections continued while Public Health Commissioner Mary Bassett and Mayor de Blasio held town hall meetings, repeatedly claiming, "the drinking water is unaffected" to concerned citizens living in buildings with multiple affected residents. Dr. Yu, a prominent *Legionella* researcher with the University of Pittsburgh and Medical Director of the Special Pathogens Laboratory, publicly called for the health department to test the drinking water and even offered his laboratory services for free. Dr. Stephen Edberg of Yale University is quoted as saying "The only way to be sure *Legionella* is not posing a risk is to test for it. I don't see why you wouldn't test." This provides additional evidence that the outbreak investigation by the DOHMH Bureau of Communicable Disease, at its inception, focused exclusively on cooling towers rather than the public water supply and distribution system.

"It seems as though, if the cooling towers are contaminated, the water [supply] towers would be contaminated... The only way to be sure Legionella is not posing a risk is to test for it. I don't see why you wouldn't test."

- Dr. Stephen Edberg, Public Health Microbiologist at Yale University

NEW YORK CITY FIRES DR. MICHAEL SKELLY FOR TESTING

Dr. Michael Skelly, an infectious disease doctor employed by Lincoln Hospital, had multiple patients infected with *Legionella* under his care. He agreed with the *Legionella* experts and believed that bacteria was likely to be found in drinking water, and thus could be a source of some of the infections that had been reported. He obtained permission from patients to test their drinking water and samples were obtained from some of their homes. Upon learning of these activities, the response from DOHMH was swift. According to the lawsuit filed by Dr. Skelly against NYC, Dr. Skelly's superior received a call from the health department. The caller stated "we know what he is doing and we expect it to stop." By the end of that day, Dr. Skelly's employment at Lincoln Hospital, a hospital run by the New York City Health and Hospitals Corporation, had been terminated.

New York City officials had arbitrarily decided that a cooling tower would be identified as the source of the infectious *Legionella*. Surely, if enough towers were sampled they would eventually find a match to patient isolates. This is quite plausible since cooling towers use the same water supply as the rest of the building. If the drinking water is contaminated then the cooling tower will receive contaminated water. New York City eventually attributed the South Bronx outbreak to a cooling tower at the Opera House Hotel. This decision was made mainly because they found a specific *Legionella* bacteria clone (identified as O-1) in the Opera House Hotel cooling tower that was a genetic match to isolates from patients who were tested. However, officials have repeatedly stonewalled about the quantity of bacteria found in the tower.

What was also not disclosed is that this strain, ST 10-0351, is unique and endemic to New York City, and has been responsible for previous outbreaks and sporadic cases since 2010.

*"There is a need to update and expand the standard dogma that water heaters, indoor plumbing, and source water are the reservoirs of *Legionella*, while community outbreaks require an air-dispersal source. Public health investigators should not exclude the community water system from consideration as the disease transmission vector. Maintenance and disinfection of water distribution mains must also be included, particularly in community water systems supplied by surface water, where summer temperatures and nutrient levels can create conditions conducive for the amplification of *Legionella* growth in biofilm."*

- NJ Department of Health, Community Outbreak of Legionellosis and an Environmental Investigation into a Community Water System, 2014

2015 NEW YORK CITY & NEW YORK STATE REGULATIONS HAVE FAILED: 1,000+ NEW CASES OF LEGIONNAIRES' DISEASE SINCE IMPLEMENTED

NEW YORK CITY

Regulations were enacted in August 2015 in the midst of the South Bronx outbreak. As preordained, these regulations focus exclusively on cooling towers and do nothing to address the root cause of the disease. They immediately proved they were not going to be effective at protecting the public.

As early as September 14, 2015, less than one month after city-wide mandated disinfection of cooling towers, another outbreak of Legionnaires' disease began—this time in the East Bronx, where thirteen individuals were infected and one died. If cooling towers were the source, then cleaning of all towers in the city should have immediately arrested the disease and no additional disease should have occurred.

DOHMH's statistics on disease rate by census tract clearly showed a high incidence of Legionnaires' disease in the Morris Park neighborhood of the Bronx from July 2 through August 3 (10x to 40x the city average)—a full month before the East Bronx outbreak officially began.¹⁷ Several other neighborhoods were similarly affected, yet no steps were taken toward remediation.

The Morris Park investigation centered on the Bronx Psychiatric Center campus. Infections among Beacon of Hope residents prompted New York State officials to step in as this is a state run facility. They sampled the drinking water and found that 46 percent of samples tested positive for *Legionella*, clearly showing that the building's water supply was infected.¹⁸ However, yet again a cooling tower was blamed.

The rate of Legionnaires' disease in New York City continued to be higher than average through the end of 2015. A string of 27 cases reported in one week in January and another string of 31 cases in October 2016 were never publicized, nor were the overwhelming majority of the remaining hundreds of other cases reported to DOHMH. Two cases of Legionnaires' disease in West Harlem, where drinking water was believed to be the source, did get some coverage in July 2016 with an article stating “this is the first acknowledgement of an investigation involving the disease since an outbreak last summer in the South Bronx.” However, at the time the article was written, DOHMH **had been notified of 275 cases** since the August 2015 regulations went into effect.

NEW YORK STATE

The regulations implemented by New York State did not fare much better with hundreds of sporadic cases and a series of outbreaks in Upstate New York. In October 2015, a Legionnaires' disease outbreak occurred at St. Joseph's Hospital in Syracuse. Tests confirmed *Legionella* bacteria had infected the hospital's water system.

A cluster of eight cases over a period of approximately four months in 2016 was reported in Lockport, a city on the outskirts of Buffalo. The Niagara County Department of Health stated that “these cases are not linked to potable water” though the drinking water was never tested. The source of these infections was never identified.

NEW YORK LEADS NATION IN LEGIONNAIRES' DISEASE CASES

Five residents, all residing in the same apartment complex in Plattsburgh, were infected between October and November 2016. With all cases residing in the same complex, the investigation focused on the drinking water.

Also in October 2016, a series of *Legionella* infections affected eleven residents and staff at the Wesley Health Care Center in Saratoga Springs and an additional seven persons not associated with the facility. The investigation considered recent water mains repairs as a possible contributor to the event. The cooling towers at the facility were found to be in compliance and drinking water samples returned low positive results for *Legionella*. It must be noted that, according to NYSDOH, the acceptable *Legionella* concentration in drinking water is the same as that in cooling towers, 10 cfu/ml, even though drinking water is intended for direct contact with people through drinking and bathing. The Wesley Health Care Center has stated they will install monochloramine treatment to disinfect the drinking water at its facility.

More recently, *Legionella* infections were associated with a Garden City Park fitness club located in Nassau County. The investigation is focused on the pool and spa water systems.

Notably, illness was actively avoided at Kingsway nursing home in Schenectady. The *Legionella* regulations implemented by New York State in 2015 included requirements for routine *Legionella* testing of drinking water in hospitals and nursing homes. This routine sampling, carried out in November 2016, showed that the building's drinking water system was colonized with *Legionella*. The facility was able to respond and take temporary steps to remediate the presence of the bacteria before any residents were infected. But this requirement only applies to Article 28 facilities—hospitals, nursing homes and medical centers. As such, it does nothing to protect those living in the community at large, the people who may be living with similar ailments as those at hospitals, nursing homes and medical centers, whose buildings and residences are being seeded with *Legionella* bacteria.

According to the CDC, 93 percent of *Legionella* infections are not associated with health care facilities.¹⁹ Is it necessary to routinely test the drinking water in all buildings for *Legionella*? What portion of those buildings would require continuous disinfection in order to compensate for the bacteria entering with the incoming water? What portion of those disinfection systems would be overwhelmed when a slug of bacteria breaks free during water main repairs? This problem cannot be solved as long as public water distribution systems act as breeding grounds for pathogens.

By the end of 2016, more than 1,000 cases of Legionnaires' disease had been reported across New York State since the 2015 Bronx outbreak. If cooling towers were a significant source of disease, the targeted regulations imposed by both the City and the State should have had an immediate effect. After being in place for over a year, neither NYC nor NYS can claim a disease reduction. Rather, the case load has been unchanged. Even with the 2015 Bronx outbreak skewing the numbers calculating the most recent five-year average, 2016 has proved to be an average year for Legionnaires' disease cases in New York City.

NEW YORK REGULATIONS HAVE NOT REDUCED LEGIONNAIRES' DISEASE CASES

Figure 4. Reported Legionellosis 2016 compared to 5-year average New York City²⁰

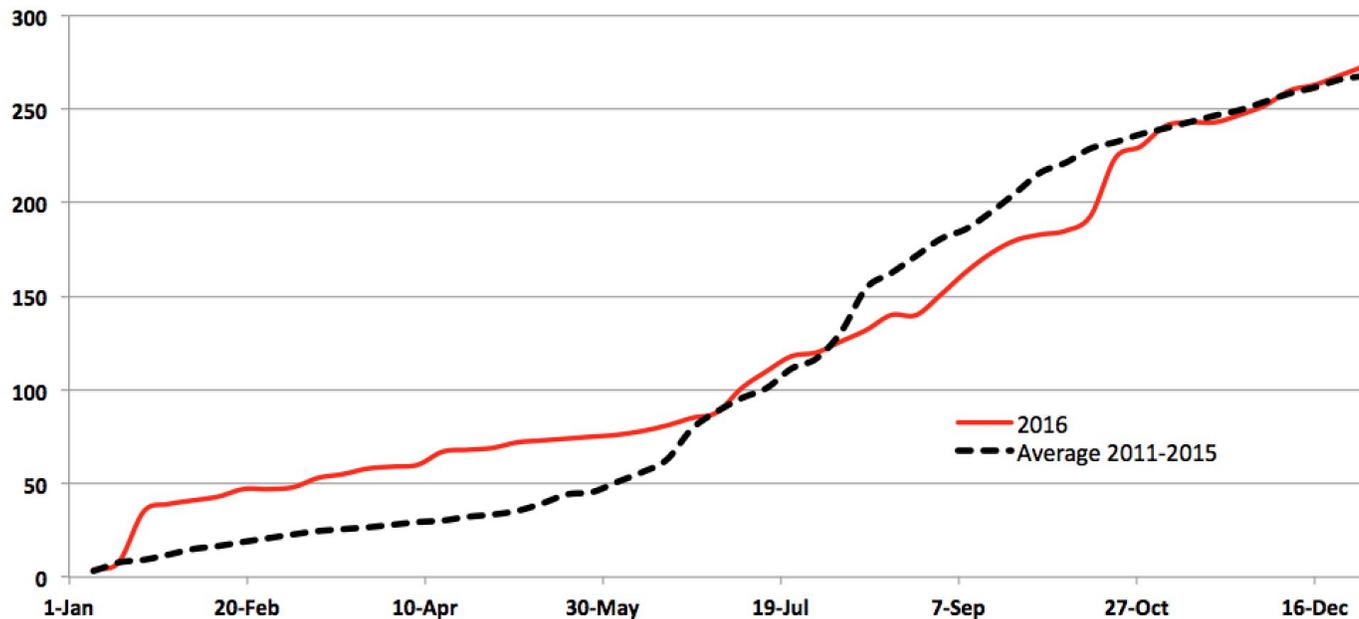
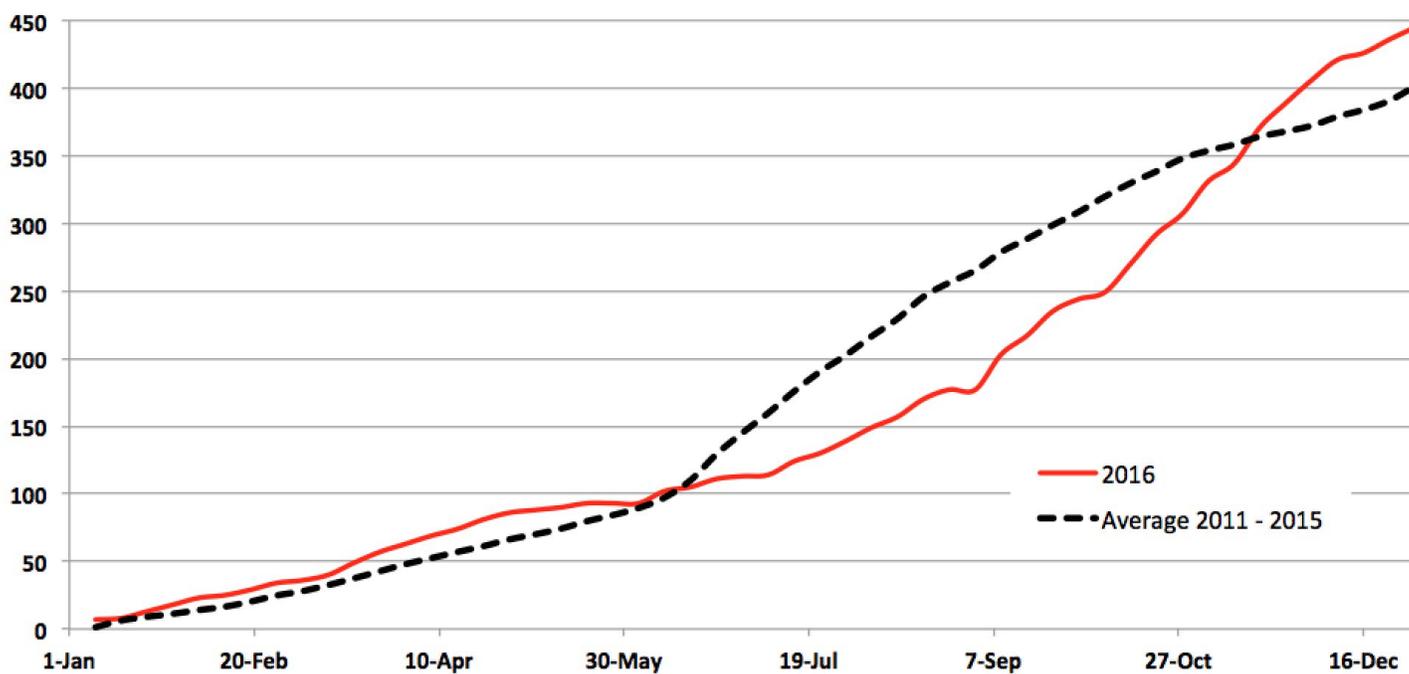


Figure 5. Reported Legionellosis 2016 compared to 5-year average Upstate New York²¹



THE NEW YORK PUBLIC REMAINS AT RISK

New York City's regulations call for DOHMH to report on the effectiveness of the regulations by March 1, 2017. While we would welcome a change in course, we see no indication it is imminent and regrettably expect an exercise in self-congratulation. Indeed, officials from DOHMH actively promoted their regulatory approach throughout 2016, speaking to health departments across the country, code agencies, and *Legionella* researchers. Meanwhile, health data clearly show that the regulations have failed at their stated goal—to prevent and reduce the rate of Legionnaires' disease in New York City. The fact that there have been no outbreaks on the scale of the 2015 South Bronx outbreak—yet the rate of cases remains the same—shows there is clearly a fundamental flaw with these regulations' approach. For forty years prior to 2015, there were thousands of cooling towers in operation in New York without outbreaks of this magnitude. The new variables presenting themselves over the past decade are worsening water quality and aging infrastructure. As a result, the public unfortunately remains at greater risk.

Now that all of the city's cooling towers are registered, DOHMH is mapping sporadic cases of Legionnaires' disease relative to cooling towers. No doubt they will claim there is a great correlation without regard to controlling for building size, a measure of plumbing complexity, or water mains health in space and time. There are 3.8 registered cooling towers per square mile in the Bronx and 155 per square mile in Manhattan. Isn't it odd that the disease rate in the Bronx is higher than in Manhattan?

Officials will argue that increased awareness caused greater reporting, though it seems unlikely that increased reporting exactly offset the reduction in actual disease to produce an exact average year. Reported incidence of Legionnaires' disease in the United States has quadrupled in the last decade.²² Some of this may be attributed to improved diagnosis and reporting; however, there is a growing body of evidence to show that a large part of this increase is real. Researchers and experts cite changes in municipal water treatment practices, deteriorating water infrastructure, aging population, and even emergence of more infectious strains as contributors to the increase.^{23, 24} Infections caused by other bacteria which thrive in the biofilm in our pipes, alongside *Legionella*, are also increasing.

"We believe that the increase is real and it's likely due to a combination of factors including the increasing number of people who are at risk for Legionnaires' disease because of the aging of the population, the increase in chronic illness, and the increase in immune suppression through use of medications to treat a variety of conditions. We also have an aging plumbing infrastructure and that makes maintenance all the more challenging."

- Dr. Tom Freidman, Center for Disease Control and Prevention. New Vital Signs Report Telebriefing Transcript

FOR THE 1,000 NEW YORKERS WHO WERE INFECTED

Truly, it is the 1,000 New Yorkers who have become infected since the regulation took effect—and the hundreds more in New York who will become infected in 2017 if state and city officials continue blaming cooling towers while ignoring the drinking water—that should be our primary concern. Frequently, those affected are the poor, the elderly, and those already struggling with medical issues. How many more people must be affected before our elected officials admit or grasp the reality that a new course of action is necessary? Now is the time to address the root cause of this disease. *Legionella* and other pathogens are multiplying in the public water distribution systems in increasing numbers and people are dying as a result.

It is simply not good enough to accept *Legionella* in our drinking water. The citizens of Flint, MI had no recourse with the appointed emergency managers, but in New York, the people have a voice and the ability to hold elected officials accountable to implement real solutions.

We hope this report, in addition to informing the public health discussion, will provide support to patients (and their loved ones) suffering from this preventable disease as they try to understand why they have become sick. The Alliance stands with you and we will continue to work to put an end to this disease focusing on the need for better water quality.

A NEW DIRECTION: REAL SOLUTIONS TO THE LEGIONELLA PROBLEM



Alliance to Prevent Legionnaires' Disease

Several steps must be taken in New York and beyond to reverse the increasing trend in Legionnaires' disease.

1. Maintain an adequate disinfectant residual at all points in the public water distribution system.

A higher free chlorine residual, maintained throughout the distribution system, could effectively limit growth of microbes—including biofilm microbes such as *Legionella* and other pathogens—in the distribution system. This level requires a number of strategies and considerations. Simply increasing chlorine at the distribution entry point may result in compliance issues with disinfection by-products.

- a) Improve drinking water treatment to reduce organic carbon content. Organic carbon reduction requirements of the Safe Drinking Water Act (SDWA) are frequently violated due to confusion over reporting, lack of enforcement, and scarcity of funding necessary to implement appropriate treatment. These organic nutrients react with disinfectants to form potentially hazardous disinfection by-products, extinguishing the biocidal effect of the disinfectant in the process.
- b) Establish chlorine booster stations to reduce the necessary increase at the entry point.
- c) Reduce water age (water residence time in the distribution system) by flushing systems, including water storage tanks. High water age is associated with low disinfectant residual.

2. Monitor water quality from the public drinking water supply and distribution system.

- a) Require community alerts from the public utility to changes in water supply, planned work, or disruptions to water systems which may release high levels of bacteria into the water.
- b) Regularly test disinfectant levels throughout the drinking water distribution system. Include dead ends and downstream of tanks. Initiate investigation when the required concentration cannot be maintained.
- c) Test drinking water for *Legionella* bacteria prior to it entering a building.
- d) Consider surface swabs for biofilm bacteria testing when lines are open for maintenance.

3. Increase infrastructure investment.

Governor Andrew Cuomo recently announced during his State of the State address that New York State would be committing two billion dollars to protect drinking water quality. This provides for great opportunity to have a real impact on preventing Legionnaires' disease as the issue of waterborne pathogen growth in our water systems begins at the treatment plant. Investments in treatment plant upgrades to reduce organic carbon in finished water are necessary to meet water safety goals. These problems are compounded by corrosion and water main breaks in the distribution system. The poor state of water distribution networks is well-known. Many pipes and mains are nearing the end of their service life and require replacement.

4. Investigate all cases of legionellosis using investigative tools for single cases and outbreaks already established by the CDC.²⁵

The CDC investigation tools call for all potential exposures to be evaluated. Outbreaks are relatively rare and offer an excellent opportunity to increase our scientific understanding of *Legionella* exposure and dose. In the case of community outbreaks which span multiple buildings, traditional epidemiology frequently causes investigators to disregard sections of the protocol and exclude community water systems as a potential source. The body of evidence for widespread distribution of *Legionella* from the public water system has grown sufficiently for this mode of exposure to be properly investigated. Thorough use of CDC investigation protocols in outbreaks, including comprehensive water sampling and testing for *Legionella*, will provide researchers, policy makers, and the public with the best possible data allowing for informed decisions.

5. Positively identify the source of *Legionella* bacteria after comprehensive investigation.

It is not sufficient to identify a single water source which contains genetically identical bacteria to patient isolates. Infectious strains of *Legionella* are endemic to many water distribution systems. If the water supply is colonized then many buildings served by that water supply will also be colonized. Ending an investigation prematurely, such as what happened in New York City, leaves the public at risk.

6. Manage building water systems according to best practices.

Critical water quality improvements will take time. Building owners and managers are encouraged to follow best practices related to water management in their buildings. ASHRAE Standard 188 and the CDC Water Management Toolkit are useful references.^{26, 27}



Alliance to Prevent
Legionnaires' Disease

ABOUT THE ALLIANCE TO PREVENT LEGIONNAIRES' DISEASE // OUR MISSION:

The Alliance strives to reduce the occurrence of Legionnaires' Disease by promoting public research and education on the disease and best practices and policy for its prevention.

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