

# Community Crisis Management Lessons from Philadelphia's 1793 Epidemic

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## ABSTRACT

Public health organizations, including the Centers for Disease Control and Prevention, the World Health Organization, and the U.S. Department of Health and Human Services, are greatly concerned that a new influenza type A outbreak will result in a rapid spread of infectious disease, overwhelming existing medical response infrastructures. Each of these organizations has published planning guides that call upon local and community organizers to begin planning for such an event. To establish insight and provide context for these organizers, this paper presents a case analysis of the Philadelphia yellow fever outbreak of 1793.

## Keywords

Case, epidemic, pandemic, community crisis management, community engagement, community empowerment, infectious disease.

## INTRODUCTION

Epidemics are regionalized infectious disease outbreaks that merit further consideration for crisis management, similar to the response and decision making of other natural disasters, such as hurricanes and earthquakes. Although infectious disease outbreaks are only a moderate threat when occurring in conjunction with these natural disasters (Gayer, Connolly, & Watson, 2007), they can be a much greater threat when occurring separately.

Response to contagious outbreaks uniquely benefit from local system considerations that enhance early analysis of an epidemic, manage public concern, assist treatment, and restrict the spread and impact of the disease.

The urgency to plan and implement local crisis systems for epidemics has never been greater:

1. The Centers for Disease Control and Prevention (CDC) believes the United States is entering a "post-antibiotic era," where little or no drugs are available to fight a growing number of bacteria. The CDC has begun organizing these illnesses into three categories: urgent, serious, and concerning. The CDC estimates that a lack of effective antibiotic treatments in the U.S. will sicken more than two million people, killing at least 23,000 (*Antibiotic Resistance Threats in the United States, 2013*, 2013, p. 6)
2. Three twentieth century influenza outbreaks were responsible for more than 43 million deaths. These widely-spread epidemics, or "pandemics," were the serious 1918-1919 Spanish flu pandemic (more than 40 million deaths), and two more moderate pandemics, the 1957-1958 Asian flu (more than 2 million deaths) and the 1968-1969 Hong Kong flu (approximately 1 million deaths) (*WHO Outbreak Communication, 2005*, p. 1).
3. The next pandemic involving a new Influenza Type A exposure is expected to infect up to 30% of the world population. The mortality rate of those infected would depend on the specific virus strain. One of several likely candidates is the H5N1 avian influenza virus. This strain has already spread widely among Asian and European domestic and migratory fowl, and can no longer be contained by controlling or destroying the animal reservoirs of the disease. As of 2011, this virus had infected 566

people with a 59% mortality rate by direct transmission from animals, in a process called zoonosis ("Cumulative number of confirmed human cases for avian influenza A (H5N1) reported to WHO, 2003-2011," 2011). The concern is that transmission between humans would be enabled by an antigenic shift that combines the avian influenza with seasonal human influenza, leading to world pandemic ("HHS Pandemic Influenza Plan," 2005).

The basic reproduction number  $R_0$ , (pronounced "are-naught"), is used to estimate the number of new infections each case will subsequently generate. More infectious diseases have a higher  $R_0$ , and spread faster. Previous pandemics, and current studies, reveal that public and medical health facilities would become overwhelmed and ineffective in a pandemic. It is estimated that in less than one year, a disease could spread around the world in multiple waves of regional outbreaks, each lasting two to three months.

For example, it is estimated that a major influenza outbreak in the U.S. could require more than five times the current capacity of 100,000 intensive care unit (ICU) beds, as well as twice as many existing ventilators (Mason, 2007, p. 4). According to the Department of Health and Human Services, "It is clear that pandemic influenza has the potential to pose disease control challenges unmatched by any other natural or intentional infectious disease event" (*HHS Pandemic Influenza Plan*, 2005, p. B-6).

The only solution to meet medical demand is to improve local community planning and response. Even without planning, unfortunately, the burden of responsibility in a pandemic will still default to the community, as existing medical processes could not handle expected case volumes. Both moderate and serious outbreaks are expected to infect 30% of the population, requiring half of those to seek outpatient treatment. The number requiring hospitalization, and the mortality rate, will vary with the severity of the disease ("HHS Pandemic Influenza Plan," 2005).

To benefit community planning and response, and help identify system interventions, this paper presents a case analysis of the Philadelphia yellow fever epidemic of 1793. This outbreak has been well documented and studied from historical, social, and political perspectives, but also offers substantial crisis management insights.

This purpose of this case is to study the community impact of a contagious disease affecting a region similar in size to an area directly impacted by an earthquake or hurricane. As such, Philadelphia's 1793 epidemic provides useful insight into crisis management for an infectious disease at the community level, and serves as a foundation for subsequent research considering compounding issues from a full pandemic.

## PHILADELPHIA 1793

In 1793, Philadelphia represented the height of American Enlightenment, serving as the capital of both Pennsylvania and the recently formed, though still factious, government of the United States. William Penn had carefully designed the city into four spacious quadrants, each with a major park at its center, to intentionally avoid the urban labyrinths found in Europe.

With fifty thousand residents, Philadelphia was the largest metropolitan in the United States, and its port handled one fourth of the nation's shipping. Although work had begun planning the capital at its current location on the Potomac, a few political leaders held out hope that the capital could take permanent residence in Philadelphia (Smith, 2013).

As part of the American Enlightenment, Philadelphia was the center of the country's modern medical practices, including an organization called the College of Physicians of Philadelphia. The two-dozen founders of this college were private practitioners that aligned to share medical knowledge and experiences influenced by common English traditions, and refined between 1775 and 1783 during the revolutionary war.

In his informative and entertaining history of this Philadelphia outbreak, John Harvey Powell alludes to three phases through which the community passed: panic, resolution, and hope. These phases will be used to present this case, and subsequent recommendations for crisis support and intervention (Powell, 1949).

### Phase I: The Panic

In July of 1793, heat and drought had turned Philadelphia into a dust bowl. The air was putrid with foul odors the absent rain could not wash away, such as animal parts left from open air butcher markets, waste dumped on streets, and sewage from the city's numerous outhouses. Waterways had receded, creating swamps of stagnant water. From a mosquito-borne infectious disease perspective, the city had become a veritable powder keg. Mosquitos thrived, and were a constant nuisance. The role of the mosquito in transmitting yellow fever, however, would not become known for over one hundred years, when Army physician Walter Reed would

conduct his famous experiment.

Despite these unpleasanties, the city bustled with the commerce befitting a capital and major seaport. Farmers brought goods to the marketplace, and merchant ships brought goods from Europe. The city had appointed a respected harbor physician responsible for inspecting the numerous incoming ships, and holding ships in quarantine as needed. It is not clear whether it was duty fatigue, carelessness, or an act of compassion that allowed into port the ships carrying infected refugees from the West Indies' rebellion with France. From this oversight it is apparent that yellow fever suspicion was not a concern. Philadelphia had not experienced an outbreak in thirty years, leaving yellow fever forgotten by most. Lack of exposure also left most citizens susceptible to the disease.

It is now understood that at least one of these ships brought the female *Aedes aegypti* mosquito in its cargo, along with individuals currently infected with the fever. The eastern waterfront of the city was known as "Hell Town," a rough area where the poor lived day-to-day in squalor, and rough sailors took advantage of bars and other social diversions. It was here in July that yellow fever claimed its first victims, and might have gone unnoticed if not for a fortuitous circumstance. Also living in this area was a successful sea merchant that had taken into his home a sick passenger. As a person of means, on August 19<sup>th</sup>, he was able to arrange for the famous Dr. Benjamin Rush to visit.

Rush was perhaps the country's most regarded physician, having been one of the founders of Philadelphia's College of Physicians, and also a signer of the Declaration of Independence. At the age of fourteen, the brilliant Rush had graduated from the institution now known as Princeton, and in his twenty's completed medical training in Edinburgh with the support of Benjamin Franklin. The self-confident Rush had served as army physician in the war where at one point he incurred the wrath of George Washington by filing a written complaint of inferior army medical practices. The pious Rush took frequent solace and inspiration in his faith, and belief in divine guidance.

Dr. Rush was not able to save the merchant's wife, but he was able to diagnose symptoms resembling yellow fever relatively early in the outbreak. Although yellow fever had been forgotten, it was not unknown, and greatly feared.

Dr. Rush was to have an uphill battle convincing his distinguished brethren in the College of Physicians, including the harbor physician, that yellow fever had returned to the city. The few deaths at this point were written off as victims of the seasonal influenza that, although sad, were to be expected this time every year. The wealthy were aware of this cycle, and often retreated to rural homes to avoid the city's heat, as well as influenza. On August 25<sup>th</sup>, yellow fever rumors hastened several thousand of those with means to exit the city. It is estimated that twenty thousand residents, or forty percent of the total population, eventually fled the city. The poor of Hell Town, of course, not having this luxury, suffered the highest mortality rates from the fever.

The church bells that had normally tolled three or four times each day for the dead, had now climbed to ten. This increase frightened both the sick and the well, and as a result was ordered stopped on August 27<sup>th</sup> by the mayor. Concerned city officials demanded explanation, and more importantly guidance, from the medical community. Unfortunately, the College of Physicians could not agree on recommended action, or even, the cause of the disease. It was agreed that as the city's stench did not help, the city should certainly clean the streets and remove all decay, including a rotting pile of coffee wasting miserably on the docks (Smith, 2013).

Even Rush was anguished on how to treat the victims of what he was convinced was yellow fever. By now the deaths had spread a few blocks from Hell Town to wealthier areas, and included friends that he knew and for whom he cared. The disease had become personal to Rush and other physicians, as well as civic leaders, who were themselves falling ill.

This confusion among medical experts contributed greatly to the ensuing panic, including public misunderstanding that yellow fever was highly contagious. Scriptwriters refer to a bizarre, upside down world of normal, as the "antithesis," and Philadelphia in late August certainly met this description. In an early, feeble attempt at an official act, seven ill victims were ordered carted off to an unused circus tent, where they were unceremoniously dumped. Two patients died where they lay, while another stumbled into the street before dying. The neighbors of the tent demanded removal of the victims, or they threatened to burn it down. A stagecoach dumped an ill passenger along the road in New Jersey, where he died unattended. Neighboring communities set up shotgun brigades to block the increasing masses seeking refuge from Philadelphia.

Civic action was needed, but there were two main problems. First, there was no medical direction on what would halt the escalating death rates, and second, most city, state, and federal officials and employees had already fled their posts. As an example of the latter, in late August the assembly hastily adjourned and vacated the city when the statehouse door attendant died at his post. Even George Washington had removed himself to

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Mount Vernon a bit earlier than expected, and Thomas Jefferson stayed outside the city. The city's government ceased to operate, including all of the magistrates and half the Guardians of the Poor. The meager remaining official city infrastructure was impotent to enforce laws, treat the ill, or even bury the dead.

During this period, there was inevitable crime and profiteering, as well as unfathomable stories of inhumanity, including spouses abandoning each other, or parents abandoning children. The sick and dying lay where they fell, on the street or in houses, with no one willing to help for fear of catching the disease. Out of desperation, residents pursued cures and preventatives that ranged from burning fires, shooting canons, wearing rope dipped in tar, bloodletting, and drinking mercury.

Panic, of course, is not sustainable. As Powell so eloquently states, "Panic burned itself out. It was replaced in most hearts by a calloused, blunted acceptance of the horror, and by the determination to live with it" (Powell, 1949, p. 119). It is at this time that members of the community finally turned to a resolute determination to do what could be done.

## Phase II: The Resolution

In addition to problems from yellow fever, a collapsed government, and the loss of thousands of fleeing citizen, the poor of the city were now facing an immediate threat in the form of hunger. As the single elected civic leader still working, Mayor Matthew Clarkson ran a notice in the newspapers on September 10<sup>th</sup> requesting that benevolent citizens should apply to his office to contribute aid as needed. Twenty volunteers responded, and together on September 14<sup>th</sup> formed an ex officio and unsanctioned "committee" that began by meeting continuously for forty-six straight days. For almost six months, member of the committee oversaw various subcommittees that provided oversight and management for the city's basic needs.

The committee was organized with Mayor Clarkson as president, and carefully recorded their activities ("Minutes of the proceeds of the committee, appointed on the 14th September, 1793," 1848). These minutes were published for historical record, providing important insight into the need to record actions even during calamitous events. As a publisher and active member of this committee, Matthew Carey separately published a detailed record of city events during the epidemic (Carey, 1794).

An early critical act was attending to the sick and dying on the streets and in homes. The mayor issued an appeal for assistance to the city's several thousand "people of color." Members of the first free black church in North America combined with the Free African Society to courageously and selflessly volunteer to do the dangerous work of carting the sick and burying the dead. In addition, they patrolled the city, and provided nursing duties to the sick and indigent (A. Jones & Richard, 1794).

Next, the committee needed to improve conditions at Hospital Bush Hill. After the failed attempt to convey patients to the circus tent, the city confiscated and converted into a hospital William Hamilton's unoccupied Bush Hill mansion, located on the northwestern edge of the city. This hospital was initially so mismanaged that its poor reputation caused sick to jump from the cart when they discovered its destination. The talented and French-born Stephen Girard stepped up to provide his organizational insights to improve the hospital, beginning with a change in medical supervision. Among the significant changes, Girard replaced three visiting doctors with one resident physician, Dr. Jean Devèze. Dr. Devèze also happened to be French, but more significantly had previous experience with yellow fever while practicing in the French army. The French method of treatment focused on rest and fluids, and contrasted significantly with the English approaches of Benjamin Rush and other members of the College of Physicians. In addition, needed bedding was obtained from the Philadelphia prison. Employees were hired to attend to the sick, build caskets, and bury the dead at the hospital. When people passed away, their property was given to the committee to record and attempt to return to family members. Significantly, the hospital now kept careful records needed to track patient progress and methods of treatment (Powell, 1949).

Caring for orphans was second only to Bush Hill in complexity and expense. An orphan committee was formed, and by September 25<sup>th</sup> had organized and staffed an asylum. Special provisions were made for babies that were still nursing. Costs to meet supplies and clothing ran about \$20 per child, as opposed to \$11 per patient at Bush Hill (Powell, 1949, p. 198).

Money was needed to pay for services, provisions, equipment (e.g., carriages, carts, wagons, and hearses), and to lend support to poverty-stricken families. To meet these needs, three members of the committee signed personal notes to obtain an initial interest free \$1,500 loan from the Bank of North America. A subcommittee for distribution was formed on October 9<sup>th</sup> to locate families in need, record their location and disposition, and allocate weekly assistance.

Brown's newspaper, the Federal Gazette, continued to publish daily. In doing so, the newspaper provided in effect a calming reassurance. Publishing was no minor task, given shortages in supplies and laborers. The newspaper provided information and notices to the community, as well as encouragement. On the other hand, the paper also provided direct appeals from physicians wanting to publicize drastic cures in which they felt confident, as well as the expected ads from charlatans.

October was the height of the disease, with deaths reaching over one hundred each day. Fortunately the efforts of the committee kept abreast of the demands. It is interesting to note that during this phase residents still clung to home remedies they now knew to be useless. The aroma of garlic, nitre, vinegar, and tar apparently provided some comfort.

### **Phase III: The Hope**

Mayor Clarkson's committee met the immediate needs of the city's stricken and indigent inhabitants, providing money and firewood, but to achieve hope required aid from other communities. Philadelphia had shortages stemming from the failed crops due to the drought. The city in quarantine raised issues on how to safely communicate requests with the outside, or to receive aid. Neighboring communities, still believing yellow fever to be contagious, cleverly found ways to safely communicate with Philadelphia, such as sterilizing letters in vinegar. They also provided supplies by shipping to ports near Philadelphia, as well as forwarding checks. Boston raised \$2,500, and sent a ship to nearby Wilmington loaded with vinegar, candles, and jugs of lemon juice to hydrate the stricken poor. New York sent a check for \$5,000, and Germantown raised \$2,500 (Powell, 1949, p. 261).

The death rate did not begin to decline until November, when the temperature dropped, and the frosts began. Families began to return to the city marking a return to a new normal, as it is impossible to return to the prior state. The crisis served as a basis for attack in subsequent recriminations and politicking. In addition, Philadelphia had lost its most favored city allure, along with any hope of remaining as capital of the United States.

On a related note, France pulled its armies out of the West Indies, unable to squelch the rebellion while simultaneously battling yellow fever infections among its troops. Without the West Indies, France no longer needed New Orleans. In the Louisiana Purchase, Napoleon sold France's significant land holdings at a steep discount to the United States. In addition, one of the ships that may have brought yellow fever into Philadelphia and held accountable for other calamities, was eventually burned as a precautionary measure off the coast of England (Smith, 2013).

## **COMMUNITY INSIGHTS TO IMPROVE OUTBREAK MANAGEMENT**

There are many useful insights to assist modern crisis management from an analysis of Philadelphia's 1793 epidemic. These insights can be enhanced when evaluated in conjunction with more recent outbreak experiences for which data are available, beginning with the 1918-1919 "Spanish Flu." There are six meaningful lessons to be considered, which are grouped here into civic leadership, medical expertise, societal impacts, local engagement, information dissemination, and home treatment perspectives.

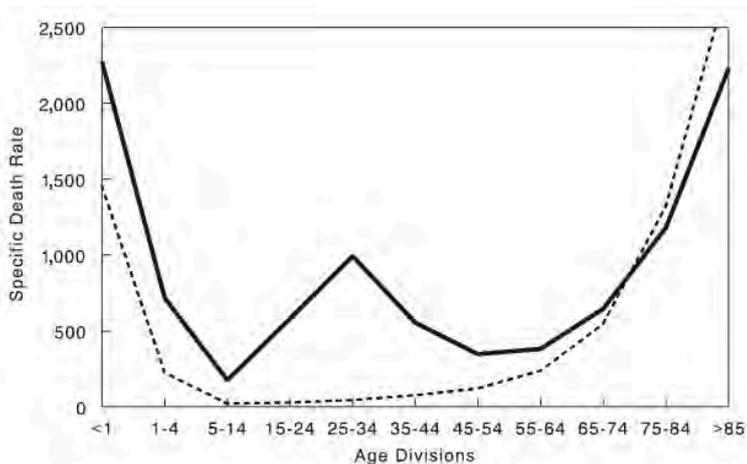
First, the early collapse in sense making and civic leadership greatly contributed to Philadelphia's ensuing panic. Since the community leaders had no previous experience or exposure to yellow fever, it is understandable when they did not offer practical guidance or recommendations. It is more difficult to understand or explain the self-preservation instincts that prompted all levels to abandon posts and flee the city, including some of the physicians. It is enough to expect that absence will be unavoidable, whether attending to personal or family illness, or driven away through fear. Further, a pandemic is a particularly perverse crisis that increases demand for special services, such as transporting the sick or burying the dead, while decreasing aid from similarly burdened neighboring communities. Just as Mayor Clarkson responded by enlisting community volunteers to fill responsibility gaps, it is conceivable that similar efforts should be expected during any major outbreak. In 2005, federal funds were allocated to a national association of county planners to develop a local response-planning guide. This guide advocates local preparation and response, including development of community partnerships, including non-traditional partners ("Local Health Department Guide to Pandemic Influenza Planning," 2006). It is not clear whether these recommendations have been extensively implemented or tested, including reduction in staff scenarios from illness and fear, or whether interest in planning ebbs with federal funding motivation.

Second, the medical community also contributed to Philadelphia's confusion and panic due to a lack of expertise exacerbated by petty jealousies and an inability to work together. Benjamin Rush could not derive benefit from

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a fortuitous early detection of the disease. Dr. Rush could not convince distinguished College of Physicians peers that an outbreak was at hand, or that yellow fever was in their midst. Further, Dr. Rush himself was prevented by self-confidence and ego to ever consult with city physicians more experienced with yellow fever. Rush's confirmation bias blocked contradictory evidence to his treatment plan, allowing him to ignore personal failures. Of course, in two hundred years much has been learned much about infectious disease and hypothesis testing, along with an understanding that interventions may not be necessary, or that the best response might simply be isolation, rest, and hydration. In the early stages of an outbreak, when time is critical, the local community depends upon effective disease detection by medical professionals. Early detection is more difficult for diseases, such as influenza, that are often not "reportable." As an example, Spanish Flu deaths have been variously estimated between 20 and 100 million (Johnson & Mueller, 2002). As an outbreak worsens, local communities may need to create of Bush Hill-type emergency facilities offering intensive care and ventilators for more severe cases. Challenges to adequately accomplish this include a lack of available facilities (Mason, 2007), compounded by supply shortages from just-in-time inventory management practices (Barry, 2006). As with civic leaders, health professional absences at all levels should be expected, beginning with the first wave of infections. This illustrates the need for local communities, businesses, and families to independently anticipate and prepare for prevention and treatment.

Third, social dimensions such as income, race, age, and nationality played a role in the yellow fever that struck Philadelphia. Only chance brought Benjamin Rush into contact with Hell Town's poor, permitting an early glimpse of the yellow fever that would ravage the city. Unfortunately the medical peers of Rush had no Hell Town exposure, and thus were not convinced of the danger. The poor of Hell Town eventually suffered death rates significantly higher than other city areas. Wealthier citizens could afford attendants, and had the means to escape the city. Most of the victims were reported to be poor, young and middle-aged male adults, born in America. American born blacks were also vulnerable, despite early assurances they were not, as they were cajoled to voluntarily remove the dead. Possible prior exposure, however, provided protection to French and black immigrants from the West Indies and Africa (Smith, 2013). A significant concern in modern outbreaks is vulnerability in the young and healthy age divisions. Figure 1 shows that during the 1918-1919 pandemic, the death rate among young and healthy populations was much higher than normally expected. One explanation, referred to as a "cytokine storm," suggests that the virus attacks these healthy hosts by subverting the relatively stronger autoimmune system.



**Figure 1** Death rates among young and healthy age divisions spiked during 1918-1919 pandemic (Taubenberger & Morens, 2006)

Fourth, local engagement to monitor and assess victim needs did not begin in Philadelphia until October, almost three months after the outbreak began. At that point, Mayor Clarkson's committee organized volunteers to go door-to-door to ascertain and attend to family needs. The poor and elderly were particularly distressed, as well orphaned and nursing children. Prior to these measures, fear had limited the supply of available caregivers, resulting in preventable deaths had patients maintained hydration. During the 1918-1919 pandemic, the U.S. Surgeon General called upon the American Red Cross (ARC) to supply all needed nursing personnel and emergency supplies, when local authorities could not do so promptly (M. M. Jones, 2010). The results varied by community. Boston and Pittsburgh encountered pandemic influenza early and suffered higher death rates.

With four additional weeks to prepare, St. Louis was able to reduce the death rate by half. One of the immediate community challenges was to redirect a short supply of nurses, aides, and helpers from the war effort to local needs. Volunteers produced and distributed meals, gauze masks, convalescent gowns, pajamas, sweaters and socks. Pittsburgh confined locally manufactured casket shipments to Allegheny County, avoiding burial backlogs experienced by other communities. Volunteers monitored Pittsburgh's network of charity organizations to identify and transport victims to care facilities. Pittsburgh's response was later criticized, however, for discriminating service to its outlying communities. Non-traditional community partners supplemented the ARC response in Richmond. For example, in a door-to-door survey, Boy Scouts and Campfire Girls uncovered 1,755 previously unreported influenza cases (M. M. Jones, 2010). It is conceivable that implementing an Ushahidi-type social reporting system might get needed care quickly to the elderly and infirm. Both yellow fever in Philadelphia, and the pandemic influenza of 1918-1919, illustrates the unavoidable need to empower and engage a community-based response.

Fifth, the management and dissemination of public information during any crisis are critical. Increasing bells tolled the dead, providing early community notice of a problem in Philadelphia. Despite labor and supply shortages, the city's newspapers provided both information and the appearance of normalcy by continuing to print throughout the crisis. Mayor Clarkson successfully used the newspaper to enlist community volunteers on one hand, while on the other Benjamin Rush publicized his unorthodox "cure." During the 1918-1919 influenza, ARC chapters distributed multilingual flu prevention and treatment brochures, reaching groups that might otherwise have been neglected (M. M. Jones, 2010). Some public health and government organizations currently publish online flu information and guides as a form of "social Tamiflu." A few major health organizations specifically encourage early media involvement, including social media use, to encourage public flu preparation, as well as guidelines to speak truthfully and in lay terms during an outbreak ("HHS Pandemic Influenza Plan," 2005). There is a need to balance communications between informing and enflaming the public. During 1918-1919, governments considered fear a far greater threat than the actual illness, and censored early public discussion (Barry, 2009). Unfortunately, some of today's health messages seem to have become conflicted, making it difficult for the public to take serious the threat of a pandemic, or need for preparation (Lanard, 2005).

Sixth, effective home treatment strategies were difficult in Philadelphia. Only the wealthy could afford home caregivers, and even then there were issues of theft and exploitation. During 1918, there was no successful implementation of household quarantine on any significant scale. Going forward, effectively managing home care will be critical during outbreaks to offset medical facility shortages, as well as to meet "social distancing" goals. With advanced planning, schools, businesses, and homes can implement plans to suppress the spread of infectious disease. As part of the planning, home provisions of food, water, and medicines will need to be anticipated (Wu, Riley, & Leung, 2009). There needs to be more discussion on safe and effective use of quarantining within homes, including the use of facemasks (MacIntyre et al., 2009), and perhaps air control and ventilation (Atkinson et al., 2009). In addition, there is an opportunity to manage federal support of local housing and mass care assistance ("Emergency Support Function #6," 2008).

## CRITICAL REFLECTION OF THE FINDINGS

A review of the preceding lesson areas reveals that substantial learning has occurred since yellow fever first plagued Philadelphia over two hundred years ago. A pandemic is particularly challenging to local leaders who will need to respond with minimal assistance from neighboring communities, as they deal with similar issues. Much can be learned from the worst-case scenario of the 1918-1919 pandemic influenza, where one third of the world population became infected and suffered death rates over twenty times higher than subsequent pandemics. Although there is much more medical awareness of disease development and transmission, there is still much that is unknown (Morens & Taubenberger, 2011).

Two areas worth investigating from a community perspective are pre-pandemic planning and monitoring, as well as specific strategies during a pandemic to limit the basic reproductive number  $R_0$ .

Pre-pandemic planning is particularly challenging, since it is difficult to solicit interest for a threat that is largely unseen. In addition, it is not a simple task to envision plans that anticipate emergency operations constrained by reductions in force. Monitoring is important, as even a few weeks notice can afford a community time to make provisions that will greatly reduce death rates. Unfortunately, epidemiological analysis of disease is still somewhat complicated, with a variety of reporting standards, and only a few labs approved to evaluate different levels of disease infectivity. However, health organizations provide summaries for review (e.g., <http://www.cdc.gov/flu/>, <http://www.who.int/en/>, <http://www.flu.gov/>). There are also local tracking tools, such as <http://Healthmap.org> from Boston Children's Hospital, that enable users to plot outbreaks "near me." Data is

obtained from major medical sources, as well as socially sourced information. Google Flu Trends (<http://www.google.org/flutrends/us/#US>) has performed well, despite a recent glitch (Butler, 2013). The reality, however, is that communities will find a way to adapt and overcome with or without planning, although the cost may be high.

Limiting the basic reproductive number  $R_0$ , or the number of secondary infections from an ill person, is a tremendous opportunity for local communities. When confronted with a pandemic, lowering  $R_0$  is an incentive to facilitate social distancing in the face of social and economic pressure to conduct “business as usual.” These strategies are considered “nonpharmaceutical interventions” (NPIs), and are implemented at the community-level.  $R_0$  is not intrinsic to the infectious agent, but rather a social characteristic of infected individuals within a community. The goals of NPIs are to, 1) delay the spread of infection, and buy time, 2) decrease the total number of infections, and, 3) reduce the spread of infection by each individual (“Early, Targeted, Layered Use of Nonpharmaceutical Interventions,” 2007).

## CONCLUSION

It is difficult to imagine a contagion so devastating that it could infect almost one third of the world population, killing a large number. These rates defy normal medical interventions, as well as traditional bereavement and burial processes. Perhaps most significant is the realization that members of agencies responsible to assist others will also be victims and also have families in distress. The Philadelphia case reveals the need for community volunteers to step up and fill voids left vacant, even at great personal sacrifice. This case also reveals the non-medical levels of support needed, such as seeking out the stricken, attending to the needs of the elderly and poor, and caring for children. The goal is to move infected communities quickly through the inevitable panic phase to be better prepared to address an illness at its zenith. To this end, removing confusion and not allowing fear to take hold is important. Philadelphia relied on the use of information and communication from Mayor Clarkson, Steven Girard, Benjamin Rush and others to achieve these goals. This dependence on information, communication, and local management is still true today.

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