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A Tale of Many Cities: A Contemporary Historical Study of the Implementation of School Closures during the 2009 pA(H1N1) Influenza Pandemic

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Abstract

Applying qualitative historical methods, we examined the consideration and implementation of school closures as a nonpharmaceutical intervention (NPI) in thirty US cities during the spring 2009 wave of the pA(H1N1) influenza pandemic. We gathered and performed close textual readings of official federal, state, and municipal government documents; media coverage; and academic publications. Lastly, we conducted oral history interviews with public health and education officials in our selected cities. We found that several local health departments pursued school closure plans independent of CDC guidance, that uncertainty of action and the rapidly evolving understanding of pA(H1N1) contributed to tension and pushback from the public, that the media and public perception played a significant role in the response to school closure decisions, and that there were some notable instances of interdepartmental communication breakdown. We conclude that health departments should continue to develop and fine-tune their action plans while also working to develop better communication methods with the public, and work more closely with education officials to better understand the complexities involved in closing schools. Lastly, state and local governments should work to resolve lingering issues of legal authority for school closures in times of public health crises.

Keywords

pA(H1N1) influenza; nonpharmaceutical intervention; school closure; pandemic preparedness

The social disruption and economic costs that accompany protracted school closures often make it a contentious nonpharmaceutical intervention (NPI) to implement during influenza

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

pandemics (Aiello et al. 2010; Cauchemez et al. 2009). Controversies aside, many health officials consider school dismissals to be an important community mitigation strategy for influenza pandemics (Kelso, Milne, and Kelly 2009; Johnson et al. 2008). Several modeling and historical studies have found that school closures may contribute to the temporary reduction of influenza transmission among susceptible school-aged children, their families, and their communities (Heymann et al. 2004; Bootsma and Ferguson 2007; Hatchett, Mecher, and Lipsitch 2007; Markel et al. 2007; Lipsitch et al. 2009; Sypsa and Hatzakis 2009; Halder, Kelso, and Milne 2010; Jackson et al. 2013). One epidemiological study of winter school breaks on influenza-like illness (ILI) in Argentina suggests that closures can significantly reduce visits for ILI to health care providers for both children and nonelderly adults (Garza et al. 2013). A modeling study of school closures in Alberta, Canada, during the spring wave of the 2009 pA(H1N1) influenza pandemic suggests that the use of school closures may reduce transmission of influenza by more than 50 percent among school-aged children (Earn et al. 2012). Further, a study of the use of school closures in Dallas and Fort Worth during the 2009 pandemic determined that school closures in these cities were associated with a reduction in both self-reported acute respiratory illnesses and emergency department visits for ILI (Copeland et al. 2013).

More than 1,300 public, charter, and private schools in 240 communities across the United States closed during the spring wave of the 2009 pA(H1N1) pandemic (personal communication from US Centers for Disease Control and Prevention, October 12, 2010). The vast majority of these closures followed the guidance issued by the United States Centers for Disease Control and Prevention (CDC). Disseminating the information via its website and through communications with state and local health departments, the CDC issued three sequential sets of guidance for schools during the spring wave of the pandemic. During April 27–30, the CDC recommended that communities consider dismissing students for seven days in schools with either a confirmed or probable case of pA(H1N1). On May 1, the CDC increased the recommended closure period to fourteen days. On May 5, with clearer epidemiologic data on the severity of pA(H1N1), the CDC withdrew its school closure recommendations, while continuing to stress that ill students and staff remain out of school while sick and potentially infectious to others. Throughout the pandemic, the CDC noted that school closures were left to the discretion and jurisdiction of state and local officials.

Historiographic Methods

Unlike researchers in other scholarly disciplines, historians do not first develop a hypothesis to be tested, but rather piece together an interpretive picture of an event after gathering, considering, and contextualizing fragmentary information from diverse textual and oral history sources. Historians have long utilized these methods to document and better understand past events, actions, and public policies (Fox and Markel 2010; Benison 1965; Charlton, Myers, and Sharpless 2006; Berridge and Stewart 2012).

To evaluate the decision-making process, social factors, and political concerns surrounding school closures during the spring pandemic wave, we studied the experiences of thirty US cities from April to June 2009 (see table 1). We chose these thirty cities to reflect variations

in region, response, administrative structure, population, and demographics. We then collected and analyzed a wide variety of publicly available documents related to pA(H1N1) in these cities, including pandemic preparedness plans by health departments and school systems, media coverage, press releases and community service announcements from state and local health departments and school systems, transcripts of conference calls made by public health and educational officials, after-action reports, and scholarly publications related to the 2009 pandemic.

To supplement and add further context to this research, we conducted semi-structured oral history interviews with local education and public health officials. We asked both open-ended and directed questions about their community's experience during the spring wave of the 2009 pA(H1N1) pandemic, particularly with respect to the decision of whether to close schools. We included questions on pandemic preparedness guidelines and planning activities prior to the spring wave of pA(H1N1), the existence and development of school closure guidelines, and whether decisions in the spring of 2009 were based on these guidelines; how epidemiological data was gathered and analyzed during the pandemic; the degree and quality of contact between public health, public education, and elected officials during the crisis; the rationale used for making the decision whether or not to close schools; how that decision was reached, what officials or agencies were involved, and which agencies had authority to make such decisions; the ease or difficulty of implementing school closures (if issued) and the reaction of the public and the media to such measures; the impact CDC revisions to school closure guidance had on local decision making; what lessons were learned from the experience of dealing with the spring wave of pA(H1N1); and related follow-up questions.

As a result of high rates of turnover and shifting of personnel to new positions in school administration and local health departments, interviews were difficult to obtain. Ultimately, we were able to conduct only twenty-four interviews with twenty-eight public health and education officials in thirteen of our study cities. Furthermore, we conducted these oral history interviews several years after the events of the 2009 pA(H1N1) pandemic. Memories fade, mythologies increase, and, with the passage of time, the desire to protect one's position, status, and reputation can slant recollections. As a result, our oral history interviews do not represent a singular truth, but rather a collection of truths as experienced and remembered by a group of specialists who participated in these events. Nevertheless, we believe that these interviews, limited as they may be, are valuable as partial explicators of the events and as an important supplement to the other data we gathered.

School Closures

During the earliest days of the 2009 pA(H1N1) pandemic, public health agencies and public and private school officials had to decide whether to close their schools as well as consider the timing, duration, and rationale of those closures. Of the thirty cities we examined, eleven (Colorado Springs, El Centro, Indianapolis, Knoxville, Milwaukee, Salt Lake City, San Diego, San Jose, Seattle, Tampa, and Washington, DC) closed one or more schools after one or more confirmed or probable cases of pA(H1N1) influenza appeared in those schools. In Colorado Springs, school officials closed an elementary summer school program for two days (June 9–10) after an employee contracted pA(H1N1), thus utilizing CDC's initial

guidance but implementing it more than a month after that guidance had been revised. In Salt Lake City, no public schools closed, but two private schools with adjacent campuses closed on April 30 as a precaution after a guest lecturer with a suspected case of pA(H1N1) visited one of the schools earlier in the week. In Washington, DC, one private school closed by order of its principal, as did one public charter school when it was discovered that a student was ill. The school reopened the next morning after city health officials determined that the ill student did not have influenza. Chicago occupies two of our closure categories (categories 1 and 3) and will be discussed in greater detail below.

Three cities (Boston, New Orleans, and New York City) closed schools on the basis of high levels of ILI absenteeism. It should be noted that Boston did not see cases of pA(H1N1) influenza in schools until after the May 5 shift in CDC guidance away from the confirmed/probable case rubric and to one based on student absenteeism. Sixteen public and public charter schools were closed in Boston, with an additional three private schools opting to close as well. In New Orleans, one public charter school closed its two campus locations for two days. School administrators made this decision after the disclosure to parents of the existence of a probable case on one campus triggered 50 percent absenteeism the next day.

Four cities (Chicago, Dallas, Huntsville, and Fort Worth) implemented a mixed rationale or a different closure strategy altogether. In Chicago, health officials recommended closing public schools on April 29 due to the presence of a probable (later confirmed) case of pA(H1N1) before switching to a new strategy. Under this plan, health and education officials closed two additional public schools. In addition, two private schools closed. Officials in Dallas weighed and considered a combination of factors, such as the presence of a confirmed case, the presence of a cluster of probable cases, absenteeism data, and the likely incubation period of the virus (seven to fourteen days), to determine if a particular school should be closed and, if so, for how long. As a result, officials closed only two Dallas public schools in the spring of 2009. Huntsville and Fort Worth opted to go beyond the initial CDC guidance. Huntsville closed its entire school district on April 30 as a precaution when two cases of pA(H1N1) influenza were identified in a school in the neighboring city of Madison. Fifteen private schools in the city also closed. Fort Worth closed all of its 141 public schools for a week beginning April 30 after a single case of pA(H1N1) influenza was discovered in a middle school student.

The remaining 12 cities included in our study did not experience any school closures (either public or private) during the spring 2009 wave of pA(H1N1) influenza. In most of these cities, health and education officials were poised to act on the initial CDC school closure recommendations but had no confirmed or probable cases among schoolchildren until after the May 5 revision of the guidance and no large-scale absenteeism thereafter. We found two notable exceptions, however. In Honolulu, officials learned of one confirmed case of pA(H1N1) in an Oahu school before May 5 but opted to keep the school open after confirming that the student had contracted influenza out of state and had not attended class while ill. In Tucson, Pima County health officials did not believe that targeted school closure was an effective community mitigation strategy (that is, closing only those schools affected by influenza would not reduce the transmission of the disease in the greater community) and

thus did not recommend this NPI be used, despite the presence of confirmed cases of pA(H1N1) influenza in several schools.

Education, Public Health, and Issues of Jurisdiction

In the United States, public health, public education, and city government seldom share the exact same jurisdictional and administrative boundaries. Some cities have their own public health departments, while others utilize county health departments. Public school districts and city borders are not always coterminous, resulting in some school districts that extend beyond city limits or cities with multiple, independent school districts. In Hawaii, both public health and public education are administered solely at the state level. This patchwork of jurisdictions, combined with the widely (and dearly) held values of home rule and federalism in public health and public education, undoubtedly played a role in the 2009 influenza pandemic preparedness and response (Oliver 2006; Ogden 2012).

The issue of which agency and at which level of government has the legal power to issue school closure orders is exceedingly complicated. A 2008 analysis found that legal authority to issue school closures during nonemergencies resides in health departments in twenty-six states, in departments of education in eighteen states, and in both in three states. In the remaining three states, there appear to be no laws formally authorizing a school closure by any governmental department in the absence of a declared state of emergency. Further confounding the issues of legal power, some states seem to authorize only state agencies to close schools during nonemergencies, while others seem to authorize such closures by either state or local authorities. Even in those states where jurisdiction for closures resides with state-level agencies, state departments of health or education may further allow their local counterparts to issue school closures. Local ordinances and policies add yet another layer to this confusing mix (Hodge, Bhattacharya, and Gray 2008).

A 2012 study of the law and public health preparedness and response discovered a large disconnect between actual legal conditions and perception of the law, and found that the primary motivation for action in public health events was the *perception* of legal authority (Jacobson et al. 2012). Similarly, our research found that officials tended to respond to the pandemic according to their perception of legal authority and their understanding of the most effective method to produce the desired public health goal. Thus, despite where legal authority for closing schools during the pandemic may have actually rested, all personnel and agencies involved universally turned first and foremost to their local public health department for advice on how best to proceed. Public health departments, in turn, preferred to recommend rather than mandate school closures when they felt such NPIs were necessary, thus dodging any potential legal issues.

It is impossible to quantify or even effectively qualify the closeness of interaction between a local health department and the school district(s) under its jurisdiction, and thus we cannot determine precisely how varying levels of cooperation between public health and education impacted the decision whether or not to close schools. Every health and school official we interviewed categorized the level of cooperation during the pandemic as excellent, and many of them noted their long-standing collaborations. As a result of these close relationships,

public health officials generally had excellent school absenteeism data on which to base their decisions, and school officials likewise placed a high level of trust in the guidance public health officers gave them. The result was that the legality of which agency issued any closure orders mattered very little.

For example, the New York City Department of Health and Mental Hygiene incident commander for emergency response during the pandemic acknowledged in an interview with our team that he was unsure which administrative entity had the legal authority to close schools. In practical terms, however, it was inconsequential. As Adam Karpati told us, "The decision making around a school closure was one that we made in the department [of health], and then discussed with the Department of Education" (interview 13).[1] Department of Education officials then implemented the actual closure(s).

In Seattle, where state law grants local health officers the authority to implement disease control measures deemed necessary and where a preexisting pandemic preparedness plan was developed in conjunction with stakeholders such as the local school districts, health officers still preferred to request school closures when necessary, allowing school officials to actually implement those closures. As Jeffrey Duchin, the chief of Communicable Disease, Epidemiology, and Immunization Section for Public Health, Seattle and King County, told us in an interview, specific school closures were recommended to education officials based on the health department's understanding of CDC guidance. "It was certainly relatively easy for us to ask schools to close, specific schools," he told us. "I mean, we make the requests. All the hard work is done at the school level and then in the families. So administratively it was extremely easy" (interview 5).

In Washington, DC, the health officials we interviewed stated that they believed legal authority for closing public schools resided with the school chancellor, but noted that, through a prior agreement, public health and education officials would discuss possible school closures jointly before any action would be taken (interview 6). In San Diego, both state and county officials issued a declaration of emergency, granting the county public health officer, Wilma Wooten, the legal authority to close schools if she deemed it necessary. San Diego's three school closures, however, were issued in collaboration with education officials (interview 11). Similarly, Paul Hutcheon of the Central Connecticut Health Department told us that, through close collaboration with schools, he's "never had a [school] superintendent not do something that I suggested they do" (interview 12).

School officials generally agreed with this approach. "I guess I had the authority to close the schools," William Andrekopoulos, superintendent of Milwaukee Public Schools during the pandemic, told us. "But I based my authority on the health department telling me it was in the best public health interests of the school and the children and the community to close the schools. I mean, how do you argue with that? When a medical expert tells you that?" (interview 1). Dee Fowler, superintendent of Madison City Schools (a city neighboring Huntsville, Alabama) put it more bluntly. "If a kid comes to me with a broken arm, I don't try to set it. I get a health professional. So when I have health professionals saying,

[1]A complete list of cited interviews can be found in the appendix.

‘You[’ve] got to close your schools,’ and that’s the guidelines of the CDC, and if you don’t and then there’s some pandemic [that] happens, it’s on your shoulders. I’m like, ‘Well, that’s a no-brainer’” (interview 10). Melody Johnson, superintendent of the Fort Worth Independent School District, echoed this sentiment when she issued a district-wide school closure order based on health department recommendations: “I’m not going to question the person whose job it is to ensure the health and well-being of the community. I think my job is to support that call” (interview 8).

Public vs. Private Schools

Generally speaking, private schools are not as closely connected to local departments of health as are public schools, where decades-long institutional relationships have resulted in surveillance systems as well as protocols for the dissemination of information and the swift closing of schools if necessary. In addition, the majority of private schools are typically single and independent institutions, or, if parochial, perhaps a small collection of schools operated by the Catholic diocese or other religious administrative unit. As a result, in the absence of a declared state of public health emergency, decisions on whether or not to close a private school generally are made by officials at that particular school, with input from the local health department only if requested. Through the monitoring of electronic communication, social media, and other important announcements, private school officials often receive much of the same information from state and local health departments as do public schools, thus allowing them to make decisions regarding the functioning of their schools during disease outbreaks.

Despite the substantial and often stark racial and socioeconomic differences between public and private education in the United States, the special pressures facing public school officials (e.g., working parents less able to care for children during school closures, school breakfast and lunch programs, etc.), and the closer connection public school systems have to local public health departments, we did not find a significant difference in the probability of school closures between the two types of schools. Performing a relative risk (RR) calculation, we found that public schools in the thirty cities in our study were only 5 percent more likely to remain open compared to their private counterparts (RR = 0.95; 95% CI = 0.94–0.96). This statistic is driven in large part by the fact that Fort Worth and Huntsville each closed their entire public school district. Removing these two outliers reduced the RR of public schools remaining open to 0.99, or a 1 percent greater likelihood of remaining open (95% CI = 0.98–0.99). Even in cities such as Chicago and Milwaukee, where the public school systems are heavily segregated, we found little differences in the probability of school closures by school type (no difference in Chicago, and 5 percent greater chance for public schools to remain open in Milwaukee relative to private schools; see table 1).

Closure Rationales: Developing and Implementing Policy

The issues surrounding the implementation (or lack thereof) of school closures in several of the cities in our study—namely, New York, Chicago, Dallas, Honolulu, Tucson, Fort Worth, and Milwaukee—warrant further discussion, as they reveal critical themes that our categorizations alone cannot express. With the exception of Milwaukee, each of these cities

quickly adopted a school closure policy or protocol independent of CDC's initial guidance. In the case of Milwaukee, complications over school closure policy ensued as a result of mismatched community mitigation goals and NPI implementation.

New York City was one of the first and hardest-hit communities in the United States. On April 23, 2009, administrators at the St. Francis Preparatory Academy in Queens notified the New York City Department of Health and Mental Hygiene (DOHMH) of an extremely high number of students presenting with influenza-like symptoms. After testing, a DOHMH investigation quickly confirmed the presence of pA(H1N1). Due to the uncertainty of the clinical course of the virus and the explosiveness of the outbreak, St. Francis administrators closed the school effective April 27, on the recommendation of health department officials (Hartocollis 2009).

The influenza outbreak in New York quickly spread to other schools, both private and public. Through extensive epidemiologic monitoring of schools and hospital intensive care units and in consultation with CDC pandemic response team leaders, DOHMH officials swiftly determined that, for the general population, the morbidity and mortality of pA(H1N1) did not appear to be significantly more severe than that of seasonal influenza. As a result, DOHMH officials recommended public and private school officials close only those schools with high levels of ILI-based absenteeism or where medically vulnerable student populations were at risk. As former DOHMH deputy commissioner and incident commander, Isaac Weisfuse recalled, "At the end of the day, we didn't feel that we could stop the transmission within [a] school, but we could try to take whatever measures we could to protect vulnerable people…. We evaluated schools on a case-by-case basis so we didn't make any sweeping judgments about a school" (interview 4). This data-driven approach resulted in the closure of fifty-six public and public charter schools and ten private and parochial schools during the spring wave of pA(H1N1) influenza (Lessler, Reich, and Cummings 2009).

In Chicago, health department epidemiologists concluded that following the CDC's initial guidance would result in too many school closures. On April 29, school officials, based upon the recommendation of the Chicago Department of Public Health, closed one school under CDC's confirmed case rubric. Department of Health epidemiologists quickly realized that this approach was problematic. "We questioned whether this was a sustainable approach to mitigation, shutting down every school where a kid pops up and whether that really made any sense if we suspected that there were more cases and that many, many individuals were not necessarily going to show up on our radar because of testing," Roderick Jones, a communicable disease epidemiologist told us (interview 9). In addition, in a city where public schools serve as safe havens for many children and where a significant number of students receive free or reduced-price lunches, health officials understood that large-scale school closures might actually endanger the well-being of children. Epidemiologist Cortland Lohff said, "We felt like there might be harm in [shutting schools] in a city school district. School is not just school. It is a safe place where people can eat. And so it had to be looked at in a cost/benefit scenario" (interview 9).

Chicago Department of Health officials therefore swiftly developed a plan designed to keep public schools open whenever possible. After calculating a prepandemic baseline absenteeism level for each public school in Chicago, city epidemiologists determined which schools had higher than usual absenteeism and thus were likely sources of influenza transmission. Parents of children attending these schools were informed of the groups considered to be medically vulnerable for developing complications from influenza (e.g., those with asthma or other respiratory issues; neurological and neurodevelopmental conditions; metabolic or endocrine disorders, kidney, blood, or liver disorders; or the morbidly obese) and were asked to consult their health care provider to determine if their child should be kept home as a precaution. Febrile students were excluded from school for at least seven days. Health officials developed this new plan on April 30 and, with agreement from Chicago Public School officials, put it into effect starting May 1. As a result, Chicago school and public health officials closed only one additional school, a small high school for cognitively impaired students. As health officials told us in an interview, school closure was not their focus. According to Lohff, “We were far more focused on understanding the likelihood of cases in the school and then informing people so they could make a decision, like about whether they wanted to—let’s say their child has an underlying illness, you know—make that choice to keep the kid [at home] rather than dropping the hammer and saying, ‘The school is closed for seven days because everybody’s at risk’” (interview 9).

In Dallas, county health officials took multiple factors into consideration before recommending that a particular school close. Working with the public school systems, health officials monitored both general as well as ILI-based school absenteeism rates. The data revealed that influenza transmission seemed to be occurring mostly within a handful of elementary schools, rather than at the district or community level. Laboratory tested confirmed cases of pA(H1N1) in two schools that were also experiencing elevated absenteeism. As John Carlo, former medical director of the Dallas County Department of Health and Human Services told us, “The absentee data is a real key indicator. Because I think that without that, you are just acting on lab-confirmed data. And some of these schools are huge in terms of size. And so closing just for one case was kind of a hard decision to make” (interview7). Based on this combined data, and with the knowledge from prepandemic experience that absenteeism above 10 percent made it increasingly difficult for schools to continue their educational mission, health officials made the determination to recommend that only two affected schools close.

Honolulu is unique among our study cities in that all public health and public education functions are organized and administered at the state level. On May 2, health officials discovered a case of pA(H1N1) influenza in a school-aged child living on Oahu who had recently returned from a trip to California. State epidemiologist Sarah Park concluded that closure of the school was not warranted because the child had not attended class while ill. Over the next several weeks, additional Oahu schoolchildren were diagnosed with influenza. Health officials did not recommend school closures, however, stating that such interventions would only become necessary should the pA(H1N1) outbreak become more severe or if a school’s function was impaired by high levels of absenteeism due to ILI. Instead, parents were notified of school outbreaks and were asked to keep their sick children at home until they were afebrile and asymptomatic. Affected schools were thoroughly disinfected but

remained open. On May 14, 35 percent of the students at one Oahu school were reported absent. A health department investigation determined that the absences were primarily due to parents concerned about the risk of their children contracting influenza rather than actual illness. As a result, the school was not closed (Roig 2009). By June 8, when all Hawaii schools closed for their regular intersession break, eleven Oahu schools had reported student cases of pA(H1N1), but no schools had been closed due to influenza.

Similarly, health officials in Arizona's Pima County Health Department (PCHD) did not believe that targeted school closures were an effective community mitigation strategy and would do little to slow the transmission of influenza among the general public. As a result, when two confirmed cases of pA(H1N1) appeared on May 2 in two separate middle schools in Tucson, PCHD officials did not recommend that the schools close, and Tucson Unified School District officials kept classes in session. Tribal health officials from the nearby Tohono O'odham Nation (located predominately in Pima County), on the other hand, viewed school closures as a way to protect children and thus decided to close the entire tribal school district effective May 4 after four cases of pA(H1N1) appeared in the nation's Oasis-Baboquivari Unified School District.

The Challenges of Large-Scale School Closures

The challenges of implementing school closures as an influenza community mitigation strategy might be best encapsulated by the experiences of Fort Worth, which closed its entire school district on April 30 after one case of pA(H1N1) influenza was discovered in a single school. At the time, school superintendent Melody Johnson was criticized for overreacting. In an interview, Johnson explained the delicate position in which she was placed. Texas is one of three states without laws that address the issue of where legal authority to close schools resides. Responsible for more than eighty thousand students and eleven thousand teachers and staff, Johnson had little to go on other than the strong recommendation of Tarrant County Medical Director Sandra Parker that the entire Fort Worth school system be closed immediately. Furthermore, Johnson had to close the district's schools on very short notice and with little consideration for the significant work the order would entail, the impact it would have, or the complexities and sensitivities involved in dealing with schoolchildren:

> If you tell a parent that a child in the school has been exposed—that their children have been exposed to a disease that is yet unknown—and you've got media saying how many fatalities and all this kind of stuff, and then you tell them we'll know within twenty-four hours if your child is okay and then you wait three days…. We had to have three phone lines installed. Dealing with children is vastly different than dealing with adults in the public. (interview 8)

Receiving the closure recommendation from the health department on the evening of April 29, Johnson had to discuss the closure first with state education and public health authorities as well as the mayor. She also had to disseminate the information quickly so that parents—the majority of whom work in positions with little flexibility in hours—could make daycare arrangements for their children. Other details, such as dealing with the stocks of perishable food in school refrigerators and suspending deliveries for school breakfast and lunch

programs, required immediate attention as well. At the other end of the spring influenza wave, Johnson recalls how health officials expected that schools could reopen on similarly short notice, not realizing that the halted food and supply deliveries had to be scheduled once again before children started attending classes (interview 8).

Paul Biedrzycki of the Milwaukee Health Department agreed that health officials frequently do not understand how closure orders can produce a ripple effect. “We had no idea that eighty percent of the kids in the public schools avail themselves of breakfast and free lunch programs. That just blew us away” (interview 3). Speaking more broadly, Wooten, of San Diego County Health and Human Services Agency, spoke of “the dramatic social disruption caused by a school closure” (interview 11).

The Importance of Clear School Closure Guidance, Planning, and Rationale

In each of these cities, local health officials quickly determined that initial CDC guidance did not fit their community’s needs and that local conditions required a different approach to the epidemic. In Tucson, county health officials did not believe in the efficacy of targeted school closures as an NPI for community mitigation, and thus did not recommend its use. In the case of Fort Worth, the goal was community mitigation, a much broader rationale that required a concomitant sweeping measure. In New York, Chicago, Dallas, and Honolulu, health officials quickly realized that closing targeted schools on the basis of a confirmed or probable case of pA(H1N1) would have negligible impact on their epidemics. Instead, they focused on school closures as a method of protecting children, and closed only specific schools if and when high absenteeism impacted the educational mission. It was this approach that the CDC recommended after May 5, 2009, and throughout the subsequent fall wave of the disease. In each of these examples, local school closure protocols were developed swiftly and with rationales that were clearly expressed and employed by local officials.

In contrast was the experience of Milwaukee. There, officials attempted to reconcile various school closure strategies and rationales and thus shifted protocols several times in a short period, leading to some pushback from the public. On April 29, cases of pA(H1N1) influenza appeared in several public schools across the city. In accordance with initial CDC guidance and a local pandemic preparedness plan that allowed for school closures, city health and education officials closed the fourteen affected public and public charter schools as well as two public daycare centers for one week. In addition, seven private schools that had student cases also closed. On May 1, with a significant increase in confirmed cases of pA(H1N1) across the city, four additional school closures, and rising absenteeism across the district, Milwaukee Health Department officials increased the closure to two weeks and recommended issuing a district-wide closure to slow community transmission of the disease. The recommendations were based on their interpretation of CDC guidance, school closure modeling studies, research suggesting that earlier interventions have a larger impact on slowing influenza transmission, and the city’s unfolding influenza situation.

The public, however, balked. As local and national media reports began to reveal that the pandemic was less severe than initially feared, parents started to question the efficacy of the

school closure policy. “So we’re saying that everyone’s susceptible, the disease is widely distributed, yet only certain schools are being closed. So that upset parents pretty much,” recalled Biedrzycki, Milwaukee’s director of disease control and environmental health. Parents were also upset that health officials strongly recommended that children from the closed schools remain at home and away from local malls, theaters, libraries, and other public places. “I think that’s when the light bulb went off,” Biedrzycki told us in an interview. “It was the economic impact associated with the public health decision in a recession” (interview 3). The recommendation to close the entire school district only served to draw more public ire.

The growing unrest placed Milwaukee mayor Thomas Barrett in a difficult position. Facing opposition from parents and the media, as well as some city officials, he resisted his health department’s recommendations. On May 2, Mayor Barrett met with Milwaukee and Wisconsin health officials and CDC epidemiologists to develop an appropriate response to the city’s pandemic. Based on new information about the severity of the disease, the administrative difficulties of keeping children from congregating in public spaces, the financial impact of school closures on working parents, and the lack of definitive guidance from the CDC, Mayor Barrett overruled his health department’s recommendation for a sweeping school closure order. On May 4, Barrett reopened all currently closed schools and stated that individual schools would close in the future only if student or staff absenteeism made efficient administration difficult. Wisconsin is a home-rule state, and legal authority for public health interventions in Milwaukee rests with the city commissioner of health, a position appointed by the mayor. With these orders, authority for issuing school closures effectively was taken out of the hands of the health department—which still recommended school closures—and given to Milwaukee Public Schools.

The Role of the Media and the Public

The reopening of Milwaukee’s closed schools and the shift in policy did not placate everyone, however, and the tension spilled onto the pages of the local press. The most vocal critic of school closures was Milwaukee School Board member Terence Falk. In a May 4, 2009, editorial appearing in the *Milwaukee Journal Sentinel*, Falk criticized the Milwaukee Health Department for focusing on school closures as a community mitigation strategy while still allowing public gatherings. “Why tell schools to close but not tell the Brewers [the local Major League Baseball team] to play in an empty stadium? Because schools can’t fight back and businesses will…. It takes no courage to close a handful of schools, and, even worse, it gives the illusion that something is being done when what is being done isn’t going to be very effective” (Falk 2009a). Several weeks later, on May 28, Falk wrote a second editorial claiming that the Milwaukee Health Department reflexively followed the “directives of the CDC to close schools but did little else,” while lambasting the city’s lack of pandemic preparedness (Falk 2009b).

The media played a role in how other cities and health departments reacted to the pandemic as well. Following the closure of Fort Worth’s schools, Dallas County Health and Human Services officials faced increasing pressure from local media and the public to explain the department’s decision not to follow suit. Carlo, of Dallas County Health and Human

Services, recalled how he and his colleagues worried about the public's reaction to reports of the area's first pA(H1N1) influenza-related death, especially because they were operating outside the CDC's guidance: "Then we had to be aware of the effect that [death] would have on the overall strategy for what we were doing. And so it really did impact. I mean, you have one death in a community of 2.3 million people and you worry. You've got the data. You're moving forward with what you think your approach is. And then you have to readdress what your approach is based on that single case." Carlo also stated that the scrutiny of the media made him and his department more keenly aware of the need to explain carefully to the public the school closure plan they had developed:

> Reporters were asking me questions as to why we were doing things that didn't seem to be part of the CDC guidance. But we were very clear of the reasons. And … it made us more keenly aware of how we can make our decisions so that we were not closing the school, for example, because it simply had a confirmed case. We knew we had to answer that question and so we were very diligent about making sure we were watching the absentee rates. (interview 7)

In Seattle, officials suggested that media reports played a role in the decision to follow initial CDC guidance and close three of the city's public schools. As manager of safety and security for Seattle Public Schools, Peggy McEvoy stated in an interview, "Given the lack of epidemiological knowledge and the media frenzy, I do not think that there was a choice [not to close affected schools]" (interview 2).

Similar concerns emerged in Knoxville after health officials closed one middle school for a week beginning on Monday, May 4, after a probable case was identified in a student the previous day. On May 5, a case in a second school was also identified. This discovery, however, chronologically followed the shift in CDC guidance away from school closures. The change of guidance policy, unfortunately, presented Knoxville officials with the challenge of explaining why the first school was ordered closed while the second school remained open. Anticipating such questions, officials decided to issue a one-day closure of the second school so as to appear as consistent as possible. Nevertheless, local media quickly questioned the move, with at least one media outlet asking how a weeklong shutdown of one school could so quickly evolve into a one-day closing of another when the diagnosis of the ill students was exactly the same (Boyd 2009).

Health officials in Chicago were similarly aware that the public and the media might misinterpret or criticize their approach. As the medical director of Chicago's immunization program, Julie Morita, explained to us:

> [Identifying schools with higher levels of ILI absenteeism] led to some hysteria as well, or potential hysteria, and people feeling like, 'Okay, so we know that there's absenteeism here. Why aren't you doing more than what you're doing right now? Why aren't you closing the school?' So we actually did go to several schools, a handful of schools, to talk to the parents to reassure them that the schools are taking this seriously and that we didn't think school closure was actually the best and most appropriate means for decreasing transmission during the pandemic. So we did, and part of what was in the back of our minds was also would these parents then go to

> the media because there were always these threats. ‘We’re going to use the media to say that CPS or Chicago Department of Public Health is not taking this seriously and it’s racist or is it there’s some other motivation behind why we’re not closing this school when we closed another school in the past.’ And so we were concerned that our work would be misinterpreted by the media or by parents. We didn’t really go public and issue a press release and say that this is our methodology and we’re shifting our approach away from school closure and more to high risk [populations] …. We were concerned that the media would take this and use it in a negative way.” (interview 9)

Likewise, in Madison, Alabama, school superintendent Dee Fowler recalled how, after CDC released its revised guidance on May 5, officials had to manage the public’s perception of the new policy. In order to allay parental concerns that sending children back to school was not yet safe, school officials arranged for photographs of principals and custodians disinfecting school buildings to be published in the *Huntsville Times*. “It was a great public relations thing and it made everybody think, ‘Okay, they’re doing everything they can do,’” Fowler said (interview 10).

Conclusion

The spring wave of the 2009 pA(H1N1) influenza pandemic was the nation’s first opportunity to actuate the plans that federal, state, and local governmental agencies had been developing since the international recognition of the risks of A(H5N1) influenza in 2005. The 2009 pandemic, therefore, represents a vital learning experience in pandemic preparedness and response. Consequently, a key health policy issue becomes one of capitalizing on the lessons learned from 2009 and applying them to future pandemic preparedness planning, especially as we analyze the recent US experience with Ebola.

All NPI efforts are only as good as the community’s response, and, furthermore, all politics are local. Civic leaders should prepare the public on a frequent basis about the challenges of managing future influenza pandemics. In the case of the 2009 pA(H1N1) influenza pandemic, several cities faced either real or perceived pushback from residents and media outlets over what was seen as a disproportionate response to the pandemic or over rapid shifts in school closure policy. In reality, the shifts in policy were the result of a quickly evolving understanding of the severity and transmissibility of the pA(H1N1) influenza virus and a better epidemiological appreciation of how best to respond. The iterations in federal, state, and local guidance were influenced by timely and frequent communication between public health agencies at all levels and the sharing of frontline experiences with the evolving pandemic in their jurisdictions. This constant communication was critical in crafting updated national and local guidance.

As the experiences of these cities discussed above demonstrate, the importance of having clearly articulated and localized school closure guidance cannot be overstated. Local health officials should carefully consider their pandemic preparedness strategies and their local needs and conditions before implementing NPIs such as school closures. They should also feel free to reject or modify federal guidance if they believe it does not adequately suit their

local situation. As the example of Milwaukee demonstrates, having an unclear school closure plan—particularly one with the means (targeted school closures) at odds with the ends (community mitigation)—can make it challenging to change course as an epidemic unfolds. Modifying or altering a closure policy in an incremental or stepwise fashion (as occurred in Chicago) appeared much easier to explain to the public than was an approach of radically switching closure recommendations midstream. Likewise, it was easier to alter interventions during the 2009 pandemic in ways that made it less onerous on the public than it was to implement increasingly burdensome ones.

Many laypeople interpreted the 2009 federal influenza school closure guidance as inconsistent, ill conceived, or even politically motivated. Preparedness guidelines recommended by federal authorities therefore must be flexible enough to be tailored to local needs as more pertinent information about a particular influenza pandemic is gathered. The more severe and widespread the disease outbreak, the more standardized the guidance is likely to be; conversely, the more mild a pandemic, the more varied (and possibly contentious) individual community responses may become. As Roderick Jones of the Chicago Department of Public Health told us, “It’s undeniable that … we were not acting in compliance with [initial CDC school closure guidance]. So that places us in a real difficult situation, because we’re basically saying we know more than CDC, which we never want to be in that position. But the fact was that it was not practical for us to [follow CDC guidance]” (interview 9). Jeffrey Duchin, of Seattle and King County Public Health, put it another way: “I think standardization of guidance is very important in serious outbreaks where there’s good data to support the recommendations. I think that in situations where the strength of recommendation—the data on which recommendation is based—is less strong, then more flexibility is appropriate” (interview 5). This idea was echoed by nearly every public health and public education official we interviewed, as well as in other studies on the use of school closure during the 2009 pandemic (Jackson et al. 2013; Klaiman, Kraeme, and Stoto 2011; Jarquin et al. 2011).

The twin issues of standardization and local adoption of federal school closure guidance raises one of the main points of contention over the use of school closures as a nonpharmaceutical intervention during a pandemic. Retrospective historical studies of the 1918 influenza pandemic show that social distancing measures can be an effective community mitigation measure provided they are implemented early, are sustained, and are layered (Markel et al. 2007; Hatchett, Mecher, and Lipsitch 2007). Because so many communities in 1918 simultaneously utilized a host of NPIs (including school closures, public gathering bans, and other measures such as staggered work hours, quarantine and isolation, and limits on crowding on public transportation), however, it is impossible to determine the effect that school closure alone had on mitigating that pandemic in specific cities. Modeling studies and studies focusing solely on school closure using more recent historical data show that the effects of school closure on transmission rates of influenza vary greatly according to the level of disease transmission among schoolchildren, whether children can be kept from congregating outside of the classroom, and the duration of the closures (Cauchemez et al. 2009; Glass et al. 2006). At least one study has concluded that closures of less than eight weeks have little effect on transmission rates, and that closures of less than two weeks might actually increase the overall attack rate by returning susceptible

students to classrooms while a pandemic is still ongoing (Lee et al. 2010). Because the efficacy of short-term school closures is still unclear, the public health community is divided as to whether or under what conditions the measure should be used, particularly for less severe pandemic events.

In the early days of the spring wave of the 2009 pA(H1N1) pandemic, the virulence of the novel strain was difficult to determine, the disease had not spread across the United States uniformly and had not affected all communities equally. As a result, some local health departments chose to follow initial CDC guidance and close schools with confirmed or probable pA(H1N1) cases while others implemented targeted school closures based on ILI absenteeism. Still others implemented sweeping closures that shuttered entire school districts—going well beyond CDC guidance—while some chose to reject that guidance and keep all schools open even in the face of childhood cases. In short, the 2009 pandemic was a case study in federalism.

Federalism in the sphere of public health means that local health officials should feel free to accept, reject, or modify federal guidance per the needs of their community and their understanding of the likely trajectory of an unfolding pandemic event. They must do so while also realizing that their decision may open them to increased criticism. As our study shows, however, public health officials who had a clear and justifiable rationale for their approach and who effectively communicated that rationale to stakeholders (e.g., the general public, parents of schoolchildren, or other government or administrative officials) tended to face less public opposition. A recent analysis of government actions has demonstrated that public health officials are among the most trusted of all government officials and that the general public has a positive perception of the quality and honesty of their communications, even when dealing with the high levels of uncertainty involved in an emerging public health event (Quinn et al. 2013). Public health officials, therefore, need to capitalize on that trust in times of pandemic crisis through the deployment of a well-managed media strategy backed by a sound and justified policy of NPI implementation specifically tuned and tailored to local conditions and needs.

The decision whether to adhere to or break from federal guidance can be a difficult one to make. In addition to disseminating the latest virological and epidemiological information and evolving public health guidance, CDC often acted as a political backstop early in the 2009 pandemic, giving local health departments who chose to follow federal guidance a level of protection should those recommendations be perceived by the public as ineffective or unnecessarily burdensome. By not following CDC guidance, however, local health officials potentially opened themselves up to opposition from the media and the public had the situation taken a sudden turn for the worse. As Warren McDougle Jr., epidemiologist at the Hillsborough County (Tampa, Florida) Health Department, stated, “In my opinion, one can’t just completely ignore the CDC and do whatever you want to do, because you’re not going to be able to justify that, especially if things go wrong” (interview 14). Morita was relieved when CDC shifted its guidance on May 5 away from recommending school closures for probable or confirmed pA(H1N1) cases, bringing that guidance more in line with Chicago’s approach to school closure. “We felt far more comfortable that we knew that CDC was moving in that direction,” she told us. “So though it was issued after we came up with

our own policy, we definitely were comforted and reassured by the fact that they also had—that was their doing as well" (interview 9).

Although significant groundwork has been laid in recent years, much remains to be done in the area of interagency and intra-agency cooperation from the federal to the local level. Education officials need to better understand the nuances of pandemic preparedness and public health emergencies, while public health officials need to be better educated on the complexities of closing schools. Nearly every school official we interviewed stated they followed the recommendations of their local health department because they felt unqualified to question that counsel. Our interviews with public health officers, on the other hand, indicate a need to better understand the wide range of issues and complications surrounding the implementation of school closures, particularly among urban public schools. For many children, schools are safe havens as well as places where they receive free or subsidized meals. Many health department officials understood this. As some learned, however, closing these schools was not nearly as simple as merely shutting the doors.

Finally, state legislatures and state and local agencies have much work to do in clarifying the often murky lines of legal authority in implementing school closure orders in the absence of a declared state of emergency. In many cities in our study, the issues of legal authority were largely avoided through long-standing cooperative relationships between public health and public education officials. These relationships, while important, do not remove the need for clear legal authority and avenues for expressing that authority. Challenges to closure orders may be issued in future pandemics, and communities need to have the lines of legal authority and processes clearly delineated beforehand in order to avoid unnecessary complications, specifically at a time when decision makers can least afford them.

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Biographies

J. Alexander Navarro is the assistant director of the University of Michigan Center for the History of Medicine, where he oversees and coordinates the center's large-scale research projects. He received his doctorate in history from the University of Michigan. A diplomatic, political, and intellectual historian by training, Navarro has taught and conducted research on a wide range of topics, including US–Latin American history and US–Southeast Asian relations, Western labor history, twentieth-century urban history, race and racism, and issues of national identity. Since joining the Center for the History of Medicine, Navarro has focused his research on the historical, social, economic, and political ramifications of the 1918 and 2009 influenza pandemics. He is the coauthor of several articles on the 1918 influenza pandemic and is the coeditor-in-chief of *The 1918–1919 American Influenza Pandemic: A Digital Encyclopedia*.

Katrin S. Kohl is the deputy director in the Division of Global Migration and Quarantine (DGMQ) at the Centers for Disease Control and Prevention. She joined CDC in 1997 as a

medical officer in the Epidemic Intelligence Service (EIS) assigned to the Louisiana State Health Department. Following EIS, she completed her preventive medicine residency at CDC in the Division of STD Prevention. Prior to joining DGMQ, Kohl spent six years in immunization safety at CDC where she served as team lead for the US Vaccine Adverse Event Reporting System, the Clinical Immunization Safety Assessment network, and the Brighton Collaboration, a large global network to develop vaccine safety standards. Kohl received her medical degree and PhD in cardiology from the Free University of Berlin and her MPH in international health and diploma in tropical medicine from the Tulane School of Public Health and Tropical Medicine in New Orleans.

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Howard Markel is the George E. Wantz Distinguished Professor of the History of Medicine and director of the University of Michigan Center for the History of Medicine. He is the author of *Quarantine! East European Jewish Immigrants and the New York City Epidemics of 1892, When Germs Travel: Six Major Epidemics That Have Invaded America Since 1900 and the Fears They Have Unleashed*, and *An Anatomy of Addiction: Sigmund Freud, William Halsted, and the Miracle Drug Cocaine*, and over four hundred articles in the peer-reviewed literature and the popular press. From 2006 to 2015, he served as the principal historical consultant on influenza pandemic preparedness for the US Centers for Disease Control and Prevention. He is coeditor-in-chief of *The 1918–1919 American Influenza Pandemic: A Digital Encyclopedia* and editor-in-chief of the *Milbank Quarterly*. In 2008, he was elected as a member of the National Academy of Medicine and in 2015, awarded a Guggenheim fellowship.

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Appendix

List of Cited Interviews

All interviews occurred under the supervision of J. Alexander Navarro and were conducted using a set of questions he developed.

Interview 1 March 2, 2011. Telephone interview with William Andrekopoulos; superintendent of Milwaukee Public Schools; interview conducted by Adam Warner.

Interview 2 March 3, 2011. E-mail interview with Peggy McEvoy; manager of safety and security, Seattle Public Schools; interview conducted by J. Alexander Navarro.

Interview 3 March 8, 2011. Telephone interview with Paul Biedrzycki; director of disease control and environmental health, Milwaukee Health Department; interview conducted by Adam Warner.

Interview 4 March 29, 2011. Telephone interview with Isaac Weisfuse; former New York City Department of Health and Mental Hygiene deputy commissioner and incident commander; interview conducted by Maria Teresa Koreck.

Interview 5 April 27, 2011. Telephone interview with Jeffrey Duchin; chief of Communicable Disease, Epidemiology, and Immunization Section for Public Health, Seattle and King County; interview conducted by J. Alexander Navarro.

Interview 6 May 6, 2011. Telephone interview with Gabrielle Ray and Beverly Pritchett; health officials, Washington, DC; interview conducted by Adam Warner.

Interview 7 May 23, 2011. Telephone interview with John Carlo; former medical director of the Dallas County Department of Health and Human Services; interview conducted by Adam Warner.

Interview 8 June 3, 2011. Telephone interview with Melody Johnson; superintendent of the Fort Worth (Texas) Independent School District; interview conducted by Adam Warner.

Interview 9 June 8, 2011. Telephone interview with Roderick Jones, Cortland Lohff, and Julie Morita; epidemiologists, Chicago Department of Public Health; interview conducted by J. Alexander Navarro.

Interview 10 June 10, 2011. Telephone interview with Dee Fowler; superintendent of Madison City (Alabama) Schools; interview conducted by Joseph Nakhleh.

Interview 11 June 15, 2011. Telephone interview with Wilma Wooten; San Diego County public health officer; interview conducted by Maria Teresa Koreck.

Interview 12 June 16, 2011. Telephone interview with Paul Hutcheon; Central Connecticut Health Department; interview conducted by Joseph Nakhleh.

Interview 13 June 17, 2011. Telephone interview with Adam Karpati; incident commander for emergency response, New York City Department of Health and Mental Hygiene; interview conducted by Maria Teresa Koreck.

Interview 14 December 6, 2012. Telephone interview with Warren McDougle Jr.; epidemiologist, Hillsborough County (Tampa, Florida) Health Department; interview conducted by Brendan Flynn.

Table 1

Cities, School Closures, Relative Risk of Remaining Open, Range of Closure Dates, and Rationale for Closure for the 30 Cities in the Study

City	No. of Public Schools Closed	No. of Private and Parochial Schools Closed	Total No. of Public Schools	Total No. of Private and Parochial Schools	RR Open	95% CI	Range of Closure Dates	Rationale [a]
Anchorage	0	0	80	11	–	–	n/a	4
Atlanta	0	0	155	65	–	–	n/a	4
Battle Creek	0	0	31	6	–	–	n/a	4
Boston	16	3	128	22	1.01	.84–1.21	5/20–6/18	2
Chicago	3	2	664	273	1.00	.99–1.01	4/29–6/1	3
Colorado Springs	1	0	163	23	0.99	.98–1.01	6/9–6/10	2
Columbus	0	0	237	49	–	–	n/a	4
Dallas	3	0	224	84	0.99	.97–1.00	4/29–5/11	3
El Centro	3	0	22	2	0.86	.73–1.02	5/1–5/5	1
Fort Worth	141	0	141	48	0.00	–	4/30–5/7	3
Hartford	0	0	104	25	–	–	n/a	4
Honolulu (Oahu)	0	0	74	40	–	–	n/a	4
Huntsville	50	15	50	28	0.00	–	4/30–5/1	3
Indianapolis	2	0	60	79	0.97	.92–1.01	5/4–5/6	1
Kalamazoo	0	0	47	12	–	–	n/a	4
Knoxville	2	0	78	43	0.97	.94–1.01	5/4–5/8	1
Los Angeles	0	0	589	193	–	–	n/a	4
Milwaukee	18	7	157	100	0.95	.88–1.03	4/30–5/6	1
New Orleans	1	0	92	43	0.99	.96–1.01	5/4–5/6	2
New York City	56	10	1848	995	0.98	.97–.99	4/27–6/5	2
Pittsburgh	0	0	156	72	–	–	n/a	4
Portland, ME	0	0	24	9	–	–	n/a	4
Salt Lake City	0	2	103	31	1.07	.97–1.17	5/1–5/5	1
San Diego	3	0	226	69	0.99	.97–1.00	5/1–5/6	1
San Jose	2	1	236	65	1.01	.97–1.04	4/29–5/5	1
St. Paul	0	0	157	32	–	–	n/a	4
Seattle	3	1	91	77	0.98	.94–1.04	4/30–5/29	1

City	No. of Public Schools Closed	No. of Private and Parochial Schools Closed	Total No. of Public Schools	Total No. of Private and Parochial Schools	RR Open	95% CI	Range of Closure Dates	Rationale [a]
Tampa	3	0	190	64	0.98	.97–1.00	5/4–5/6	1
Tucson	0	0	359	55	–	–	n/a	4
Washington, DC	1	1	235	71	1.01	.98–1.04	5/1–5/7	4

Notes: Closure data for private and parochial schools is less standardized, and closures frequently went unreported in the media. As a result, private school closure data may not be entirely accurate.

[a]Key for Rationale:

1. Cities that closed schools on the basis of one or more confirmed or probable cases of pA(H1N1)
2. Cities that closed schools on the basis of high levels of absenteeism and/or ILI
3. Cities that implemented other closure strategies, or closed schools based on a combination of other political and social factors or rationales
4. Cities that did not close schools at all during the pandemic