

Emergency Preparedness and Response: School Dismissals to Reduce Transmission of Pandemic Influenza

Task Force Finding and Rationale Statement

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Task Force Finding and Rationale Statement

Intervention Definition

School dismissals during an influenza pandemic involve temporarily closing one or more educational facilities to students, and possibly staff, to reduce or delay transmission of pandemic influenza in schools and communities. School and public health officials decide whether to use school dismissals based on available information about the spread of infection, spectrum of illness, and perceived value of immediate action.

School dismissals can be categorized by the timing, coordination, and scale of the temporary closures in relationship to the pandemic.

- **Timing** describes when school dismissals are initiated. Pre-emptive dismissals take place before widespread transmission of pandemic flu has occurred either within the school system or the broader community. Reactive dismissals take place after considerable, if not widespread, transmission has occurred.
- **Coordination** refers to simultaneous or sequential closure of schools in a jurisdiction.
- **Scale** refers to the jurisdiction affected by the dismissal decision. Scale could be nation-wide, state-wide, region-wide, city- or county-wide, school district-wide, a cluster of schools, or a single school.

Context

During an influenza pandemic, the coordinated closure of schools could be an important community-wide public health action. If implemented efficiently and maintained for an appropriate duration, school dismissals could reduce or delay transmission of infection; reduce the burden of illness on communities, health systems, and providers; provide time to implement additional public health actions (such as distribution of an effective vaccine); and reduce morbidity and mortality caused by the pandemic. The closure of educational facilities for the required duration, however, will involve costs to households and communities, due to social disruption and related economic effects. Against these costs, benefits from reduced morbidity and mortality (and related social and economic effects) could vary, depending on how easily the infection is spread, the severity of illness, and effectiveness of the overall public health response.

In conducting this review, the Community Preventive Services Task Force considered the available evidence regarding benefits and costs of coordinated school closures for an extended duration (weeks to months). The Task Force finding is an assessment of the overall value of coordinated school closures to the community during an influenza pandemic. Many dismissal decisions will be made locally, by school and public health officials who incorporate local considerations and information. Although the decision to close individual schools (especially schools with students at elevated risk for complications of influenza) during high or increasing rates of illness, absenteeism, or public concern remains a local option, such actions alone are unlikely to affect community-wide transmission of pandemic influenza.

Task Force Finding (August 2012)

The Community Preventive Services Task Force recommends pre-emptive, coordinated school dismissals during a severe influenza pandemic (a pandemic with high rates of severe illness such as that experienced in 1918) based on sufficient evidence of effectiveness in reducing or delaying the spread of infection and illness within communities. Evidence was considered sufficient based on findings from retrospective assessments of public health actions taken during the 1918 pandemic and results from modeled simulations indicating that the benefits of timely, coordinated, and sustained dismissals outweigh the expected societal and economic costs of these actions. Effectiveness of school closures during an influenza pandemic may vary with unique characteristics of the pandemic, and with the abilities of national, state, and local decision makers, health care providers, and the public to quickly implement and sustain a broader set of mitigation responses over an extended period of time (weeks to months).

The Community Preventive Services Task Force finds insufficient evidence to determine the balance of benefits and harms of pre-emptive, coordinated school dismissals in the event of an influenza pandemic of moderate or less severity (pandemics without high rates of severe illness). Evidence is considered insufficient because few studies provided information relevant to an overall assessment of potential benefits and costs of school dismissals for pandemics without high rates of severe illness. Although some studies evaluating school dismissals during the 2009 H1N1 pandemic reported lower rates of infection or illness, short term follow-up and the absence of data on societal costs limit the interpretation of these results. In addition, level of public concern would be unlikely to support or sustain the extended duration of school dismissals (weeks to months) and the broader set of community actions necessary for meaningful reduction of levels of infection and illness within the community.

During an influenza pandemic with low rates of severe illness, social and economic costs of community-wide dismissals would likely exceed potential benefits, especially for some segments of the population, such as families in which both parents work and no other child care is available. Across pandemic scenarios with elevated rates of severe illness, the potential benefits of achievable (duration, combination, and coordination) school dismissals and community actions may be limited to slowing transmission of infection and reducing peak burden of illness on health care resources. Available evidence provides little information to inform current or future determinations of threshold parameters for school dismissal actions (characteristics of both the pandemic and the pandemic response which affect the balance of benefits to costs).

Rationale

Basis of Finding

The Task Force findings are based on a systematic review of the published scientific literature up through February 2011. The Task Force considered evidence and information contained in 67 papers. These included five retrospective analyses of public health actions taken by different cities during the 1918 pandemic, 31 studies of actual school actions (dismissals, holidays, or openings) in the setting of pandemic influenza or seasonal influenza outbreaks, and 31 papers based on results from community simulation models. Thirteen of these studies or models provided estimates on economic effects of school dismissal interventions, either alone or as part of a combined pandemic response.

Five studies used historical sources to reconstruct community mitigation actions taken by major cities in the United States and Australia during the 1918 pandemic. The type, combination, timing, and duration of these public health actions (such as school closures, public gathering bans, and isolation or quarantine) were analyzed in relationship to deaths associated with the pandemic. In the United States, school closures were implemented in 40 of 43 major cities

(New York City and Chicago were prominent exceptions) with a median total duration of closures of 6 weeks. In general, cities adopting combinations of interventions early experienced lower regional death rates (by as much as 30-40%), although relaxation of these policies was frequently associated with secondary peaks in pandemic-related mortality.

Thirty one studies examined pandemic or seasonal influenza transmission in relationship to school operations. Most of the included studies described limited evaluations of short term reactive school closures in response to cases of 2009 pandemic H1N1 (21 studies) or outbreaks of seasonal influenza (3 studies). Although several of these studies observed reductions in school or community illness, only two studies examined rates of illness in comparison to an open school or school district. Of the remaining evidence, five studies of seasonal influenza examined changes in rates of household or community illness associated with planned or unplanned school breaks and, in general, observed reductions in illness suggesting that school breaks reduced transmission within the community. Finally, two studies documented an association between school semester ending and opening in 2009 with substantial increases in illness attributable to the 2009 H1N1 pandemic. The results of these studies suggest that school sessions accelerated the second wave of the pandemic in the United States and Canada, and that delays in school openings might be an important intervention option in response to a future pandemic.

The Task Force review included thirty-one published papers describing computer-based modeling of community actions and outcomes during a simulated influenza pandemic. Although models are based on artificial constructs and incorporate multiple assumptions regarding the disease, the community, and the pandemic response interventions, the Task Force considered this information based on 1) the paucity of evidence from actual pandemic influenza responses, 2) the fit between the focus of the included modeling studies and the research questions for this review, and 3) the increasing sophistication and importance of models in public health decision-making. In general, across a range of simulated pandemic scenarios, pre-emptive, extended duration school dismissals were effective in reducing transmission, delaying and blunting peak rates of illness, and reducing both hospitalizations and mortality. The combination of school dismissals with additional interventions such as anti-viral distribution programs or additional changes in social distancing, demonstrated an even larger impact on pandemic influenza transmission, morbidity, and mortality.

Economic Evidence

The economic evidence included 11 studies of actual school dismissals focused on household costs during short term closures, and 9 modeling studies which examined societal economic costs and benefits from extended school dismissals across a range of influenza pandemic scenarios. In general, the simulation models identified substantial costs to school districts, students, parents, and employers with extended school closures irrespective of the impact of the closures on pandemic influenza transmission and illness. In simulations of pandemics with low severity of illness, the costs of extended duration closures exceeded the economic benefits accrued from reduced transmission and illness in the community. In scenarios where transmissibility, severity of illness, and case fatality were high, however, school dismissals averted substantial morbidity and mortality leading to reduced health care costs, reduced productivity losses associated with work absences, and greater overall quality adjusted life years for the population. Two economic simulations of school dismissals combined with additional interventions in response to severe pandemics reported net cost per quality adjusted life years within the accepted cost-effectiveness threshold.

Applicability and Generalizability Issues

The Task Force notes several limitations in the applicability of the available evidence to school and public health decisions. A central concern is that unique characteristics of the next pandemic may influence the effectiveness of

school dismissals or other public health actions. Additional concerns included 1) the applicability of public health actions and effects during the 1918 pandemic to current era, 2) the applicability of findings from modeling studies to real world decisions, 3) the applicability of findings from studies examining costs and benefits of short term school dismissals to an assessment of costs and benefits of extended duration closures, 4) the applicability of studies evaluating seasonal influenza to an assessment of pandemic influenza actions, and 5) the applicability of evidence on influenza transmission associated with school openings to school closure decisions.

Data Quality Issues

The major limitations of the evidence considered in this review include 1) the potential for gaps and errors in the retrospective historical examinations of the interventions, timing, duration, and outcomes during the 1918 pandemic, 2) the lack of concurrent comparison populations in most of the included school dismissal studies, and 3) the bases and validity of disease, intervention, and community-specific assumptions incorporated into modeled pandemic simulations.

Other Benefits and Harms

One important additional advantage of school closures is the opportunity to utilize school locations for essential pandemic services such as medical care and triage, anti-viral distribution, vaccine administration (once available), and distribution of meals to students and families. A number of potential harms of school dismissals were either evaluated in the included evidence, described in the broader published literature, or generated by the team and Task Force discussions. Modeled community simulations with economic outcomes, for example, recorded substantial reductions in productivity with extended duration closures including lost income by working parents staying home in order to care for their children. Although the household survey studies included in this review indicated that most families did not report lost income during short term closures, none of these evaluations examined closures of longer than 2 weeks. Additional potential harms described in the broader published literature or generated by the team and Task Force discussions include: 1) inadequate supervision of children during work days; 2) improvised day care arrangements increasing contacts among children and between children and higher risk adults (such as older family members); 3) absenteeism by parents who are health care workers reducing health care service capacity, 4) lost or delayed education of students with disruption of educational attainment, grade progression, graduation, and college entry, 5) lost or delayed services for students including school provided meals and health care, and 6) emergence or exacerbation of disparities in income, education, and receipt of school and social services across communities. Although this review identifies a number of potential concerns with the use of school closures, these harms should be considered in comparison to the substantial morbidity, mortality, social and economic disruptions attributable to the underlying pandemic. In addition, several potential harms could be reduced with appropriate pandemic response planning and implementation. For example, during the 2009 H1N1 pandemic, Congress provided authority for USDA to operate a Pandemic Supplemental Nutrition Assistance Program (P-SNAP) in order to protect the food security of children who were certified for free- or reduced – price school lunches that would be missed during a pandemic emergency that closed schools for 5 consecutive days.

Implementation Issues

Some of the basic elements of an emergent, extended duration closure of schools are routinely implemented and tolerated by households and schools in the United States. Households adjust to the childcare demands of annual summer breaks; many US schools have experience in implementing short-term school closures (in response to weather events); and some school districts have experience with the provision of meals to students over school breaks. U.S. experience with an emergent, extended dismissal of students and staff from schools during the school year, however, is extremely limited, and no recent examples provide a framework for an efficient, coordinated, and large scale response to an emerging influenza pandemic. The available evidence provides little information to inform the emergent timing of

coordinated dismissals, especially during the period in which the severity of an emerging pandemic remains unclear. The primary barriers to implementation of these interventions in the United States will be jurisdictional compliance with the timing, coordination, scale, and duration of school closures. Decision-making authority is likely to vary across jurisdictions creating the potential for additional delay in coordinated action. Although states have emergency powers, the authority may reside in different offices and respond to different local considerations. Additional barriers include social and political opposition to the implementation of other community actions, and resistance to maintaining school closures once the pandemic peak has passed. In 1918, a number of US cities experienced secondary pandemic peaks following the relaxation of community mitigation actions. To minimize pandemic relapses, the appropriate duration for school closures in the setting of a moderate to severe impact pandemic may depend on the time required to develop and distribute an effective vaccine.

Evidence Gaps

Findings of this review suggest several lines of study to inform future assessments of school dismissals as a pandemic response option. Studies documenting the transmission, clinical severity, mitigation actions, and economics of the 2009 H1N1 pandemic should provide information for use as comparison experiences in modeling simulations and economic assessments. Future simulations of influenza pandemics should explore the threshold margins of effectiveness of school dismissals (points at which the benefits to costs trade-offs change) based on differences in pandemic impact, school dismissal timing and duration, and the presence or absence of additional community mitigation actions. Additional studies should explore the potential value of school dismissals of shorter duration (1-3 weeks) implemented with the primary intent of reducing the peak burden on health care resources. Organized child care should be distinctly included as an additional contact location for modeling influenza transmission with closure triggers independent of school dismissal decisions.

The data presented here are preliminary and are subject to change as the systematic review goes through the scientific peer review process.

Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. Task Force evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

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