Few issues in the policy response to the coronavirus disease 2019 (COVID-19) pandemic have inspired as impassioned debate as school reopening. There is broad agreement that school closures involve heavy burdens on students, parents, and the economy, with profound equity implications, but also that the risk of outbreaks cannot be eliminated even in a partial reopening scenario with in-school precautions. Consensus largely ends there, however: the approaches states and localities have taken to integrating these concerns into school reopening plans are highly variable.

This variability is driven partly by differences in values and priorities. More concerning is that it may reflect inattention to or underweighting of key epidemiological considerations. In particular, the intense focus of school reopening discussions on in-school mitigation measures has tended to underplay relevant features of the surrounding community and the relationship between school and community transmission of COVID-19. To succeed, school reopening efforts must account for salient characteristics of the communities within which schools are embedded and engage with fundamental questions regarding intergenerational risk and benefit tradeoffs.

Three community considerations are especially important. First, school reopening increases the risk of transmission within schools but also within households, workplaces, and the community at large. Second, community disease prevalence affects in-school transmission risk, and third, other community characteristics drive the potential impact of increased spread. We elaborate on each of these considerations.

First, a recent modeling study\(^1\) from the United Kingdom suggests that school reopening increases out-of-school transmission because students and staff mix with others and because reopening increases parents' mixing as they return to work and spend more time outside the home. Based on assumptions about the magnitude of these changes, the modelers estimated that unless accompanied by a community-wide test-and-trace strategy, school reopenings would contribute substantially to a large subsequent wave of COVID-19 cases. In parts of the United States where baseline prevalence is higher, such effects may be worse.

Second, a recent multicountry review\(^2\) concluded that the effects of school reopening on disease transmission depend heavily on prevalence in the surrounding community, and this interaction helps to distinguish Israel's negative experience with more positive experiences in Scotland, Taiwan, and the Netherlands. Our work modeling COVID-19 in California's counties points in the same direction: while some areas have promising trajectories, those in which incidence is not well controlled are at risk of becoming substantial hot spots if schools reopen.

Some states' decisions to reopen schools reflect attention to community prevalence. California and Oregon condition reopening in particular counties on trends in local case counts or hospitalizations. However, many other states and localities have not made this link. Guidance from the US Centers for Disease Control and Prevention (CDC)\(^3\) is maddeningly vague: it suggests that schools' decisions should be "based on available data including levels of community transmission and their capacity to implement appropriate mitigation measures," without offering any clear advice on how they may be linked to inform reopening decisions.

Finally, research suggests that other community characteristics are pivotal to the health effects of school reopening. The array of community mitigation measures in place and the strength of adherence to those measures are critical. Foreign experience shows that successfully maintaining in-person schooling depends on the success of measures taken in the wider community, including...
masking and closure of certain work and recreational facilities. In our modeling of California counties that have experienced declining COVID-19 incidence, when both in-school and community mitigation measures are in place and largely followed, school reopenings still increase incidence in the community, but the increases are relatively small and do not spark widespread epidemic growth; by contrast, substantially wider community spread is estimated when reopening occurs amid relaxed mitigation measures.

A community's age structure is another important factor. Transmission risks increase with the size and density of the school-aged population, and older individuals experience more severe disease when infected. This means that, other factors being equal, communities with relatively large school-aged population proportions, relatively large elderly population proportions, or both face higher risk from school reopening. These distributions differ markedly across some communities: in California's San Francisco County, for instance, 9% of residents are aged 5 to 18 years, in Tulare County, 23% are; in Los Angeles County, 14% of residents are aged 65 years or older; in Marin County, 22% are.

Other relevant characteristics that differ across communities include population density, race/ethnic composition, and the prevalence of comorbidities known to elevate the risk of severe disease. These factors appear to have had little or no prominence in local discussions about reopening schools.

In sum, a decision-making framework for in-person learning should start with a threshold requirement of strong in-school mitigation measures and then give closer consideration to several factors operating beyond the school gates—namely, looking for flat or declining community incidence over a defined period and demonstrated willingness to implement and enforce community mitigation measures (eg, social distancing, masking). Additionally, the framework should include consideration of distinctive local characteristics that influence community transmission and risk of severe disease. An unusually high or low proportion of school-aged children, population and housing density, and other distinctive features, such as high-density workplaces, will influence community transmission, while the prevalence of key comorbidities, an unusually high or low proportion of older individuals, and an unusually high or low proportion of individuals belonging to minority racial/ethnic groups will influence the risk of severe disease.

These criteria should be evaluated through a deliberative, multistakeholder process that ensures that school officials receive support from public health officers, local leaders, and others with appropriate knowledge to assess these factors. Ideally, a decision framework like the one we propose would be promulgated by the CDC and implemented at the local level.

Although there are compelling public health rationales for expanding the considerations informing school reopenings, this information alone cannot deliver clear answers about when reopening should occur. Because the greatest aggregate risk associated with school reopening falls on adults outside school settings, reopenings provoke distributional justice questions that are fundamentally ethical. How much disease risk is a community willing to expose its most vulnerable members to in order to confer benefits on the young? How should a community weigh children's needs against protection of older individuals and the medically frail?

Weighing prized social goods against each other is difficult, and the calculus is even more difficult when it pits benefits to 1 generation against risks to another. The problem is not new: it has long played out in policy debates about environmental hazards, such as climate change. School reopening decisions involve distributional choices of this kind, regardless of whether they are explicitly acknowledged. We believe there is value in confronting and grappling with them while also paying more attention to the details of local disease epidemiology that give rise to them. This requires a substantial shift in the national conversation.
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