Costs, Consequences, and Policy Responses of Vaccine-Preventable Disease Outbreaks

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Vaccine hesitancy poses a growing threat to the success of vaccination efforts worldwide. In the United States, support for routine childhood vaccination, as reflected in national vaccination rates, has remained very strong despite concerns among some parents over the necessity or safety of recommended vaccines. However, national vaccination coverage data mask the presence of clusters of large numbers of unvaccinated children in specific communities, which understates the risks of vaccine-preventable diseases for these individuals and those around them, as well as the magnitude of the challenge that public health officials face when outbreaks occur in these areas.

In this issue of *JAMA Pediatrics*, Rosen et al document the investigation and response to a measles outbreak in New York City, New York, in 2013. Of the 58 individuals with confirmed cases, 45 (78%) were unvaccinated because of parental refusal or intentional delay, and 12 (21%) were too young for routine measles vaccination. (The remaining individual had an ambiguous immunization history.) All were members of the same religious denomination, which was Orthodox Judaism. The outbreak investigation and response, which ultimately identified more than 3000 confirmed contacts, involved 87 staff members from the New York City Department of Health and Mental Hygiene (DOHMH) who spent a total of 10,052 hours working to control the outbreak at a total direct cost of $394,448 to the department, most of which was in the form of personnel salaries and benefits.

These results are consistent with other recent estimates of the economic and personnel burdens associated with health department responses to measles cases or outbreaks. The authors acknowledge that their findings understate the full economic burden of the outbreak response, because uncompensated hours worked by DOHMH staff and salaries of personnel funded by other agencies were not included. In addition to the costs incurred by public health agencies, calculating the full economic burden of the outbreak from a health system perspective would also require inclusion of the costs of clinical care for patients and contacts.

Even the conservative results reported by Rosen et al underscore the resource-intensive nature of public health responses to vaccine-preventable disease outbreaks. State and local health departments already face substantial budgetary pressures and
their departments resources comparable with those of the New York City DOHMH. Responses to disease outbreaks that may have been preventable (or at the very least, smaller) if not for decisions by some families to remain unvaccinated invariably divert attention and resources from the other work of state and local health departments, even if the direct or indirect consequences of those tradeoffs may be difficult to assess.

Calculations of the economic burden of vaccine-preventable disease outbreaks for health departments align with ongoing efforts to measure the full value of vaccination. This work has generally focused on the economic benefits of vaccination, including not only health care cost savings and care-associated productivity gains that result from vaccination, but also productivity gains associated with outcomes and behavior, community-level externalities, and other, broader benefits. More recently, discussions of the value of vaccination have looked further still, including the social benefits of vaccination and other harder-to-quantify considerations. Among the principal motivations for this work is to provide the most expansive—and, it is hoped, compelling—evidence for the return on investment for immunization efforts to encourage greater support for vaccination from policymakers, governments, and philanthropic groups. Attention to the costs incurred by health departments when responding to vaccine-preventable disease outbreaks fruitfully advances this work, even if it is a comparatively small contributor to the total societal costs of undervaccination.

In addition to the health risks that unvaccinated individuals pose to themselves and others, particularly those too young or otherwise unable to receive vaccines, the economic burden of public health responses to outbreaks is another lamentable consequence of individual decisions to reject evidence-based vaccination recommendations by delaying or declining vaccines for one's self or one's children. As such, the findings of Rosen et al hold relevance to the long-standing question in US vaccination policy regarding the availability and consequences of nonmedical exemptions from childhood vaccination requirements. In all states except for California, Mississippi, and West Virginia, parents may opt out of required vaccines for their children on religious grounds or because of nonreligious personal beliefs (although not every state with nonmedical exemptions permits both types).
outbreaks in those communities. \textsuperscript{10} (Rosen et al\textsuperscript{3} do not report the portion of the voluntarily unvaccinated, religiously homogeneous measles patient population that had formally received nonmedical exemptions from New York vaccination requirements.)

The future of vaccination requirements and exemptions is uncertain. Advocates of eliminating nonmedical exemptions, which was the legislative action taken by California in 2015, \textsuperscript{11} would likely view the potential savings associated with outbreak response as another reason, beyond the individual and community benefits of high vaccination rates, for more states to prohibit exemptions for any reason other than medical contraindications. But among advocates of vaccination and children’s health are those who consider nonmedical exemptions a valuable pressure-relief valve for families with the most serious objections, religious or otherwise, to vaccinations, for whom an accommodation might better serve the goals of vaccination programs overall. \textsuperscript{12,13} This view requires ensuring that nonmedical exemptions are reserved only for those with sincere objections, and legislators and health officials in many states are working to strengthen the integrity of these processes to reduce abuse and misuse. However, state legislators sympathetic to critics of vaccine requirements or safety have concurrently proposed broadening access to nonmedical exemptions, including in New York, \textsuperscript{14} the location of the measles outbreak examined by Rosen et al. \textsuperscript{3}

Even with reforms to school vaccination requirements and exemptions, outbreaks of vaccine-preventable diseases will continue to emerge. Health departments will respond quickly and aggressively to those threats, as they have for generations, diverting resources from other areas and priorities as needed. But are the economic burdens associated with these responses simply part of the so-called cost of doing business for health departments, to be borne by them and, accordingly, by the taxpayers from whom their funding derives? Or do those whose voluntary decisions to delay or decline recommended vaccines, thereby aiding the emergence and spread of vaccine-preventable disease outbreaks, bear particular responsibility for the consequences of their choices?

A high vaccination rate in a community is a public good, benefitting all regardless of one’s personal decision to vaccinate. To be sure, the benefits through herd immunity are less than the direct protection conferred through vaccination, but rather that high vaccination rates reduce the likelihood that any individual, vaccinated or not, will encounter a vaccine-preventable disease.
Those who voluntarily choose to forego vaccination are thus free-riders, benefiting from this public good without contributing to it. One potential response to this long-standing inequity in US vaccination policy would be to require families who obtain nonmedical exemptions to pay a fee. These fees would directly support vaccination activities such as educational efforts, information systems, and outbreak response. Such a fee would reflect the shared benefits among a community that result from a well-functioning vaccination system and the corresponding shared responsibility for contributing to and sustaining those benefits. An exemptor fee in lieu of receiving required vaccines could be viewed as analogous to the alternative service typically required of those with conscientious objections to compulsory service in the armed forces: a means by which all contribute to a collective, mutually beneficial effort in a manner consistent with their personal values.

Adding a fee-based component to US vaccination policy (or a version of the functionally similar tax-based approach used in Australia) would raise many complexities, concerns that such fees or taxes would be regressive, and questions on ethical and political feasibility.\(^{15}\) Whether the current focus of vaccination advocates on reforming nonmedical exemption policies, optimizing physician-parent communication regarding vaccination, or alternative strategies are superior policy priorities is a topic deserving further deliberation and study.

As that work continues, Rosen et al\(^{3}\) provide additional evidence that decisions to delay or decline vaccination result in potentially serious health risks to those individuals and their communities as well as significant burdens and costs to health departments and the health care system. Amid increasing reports of measles and other vaccine-preventable disease outbreaks around the world, a renewed focus on identifying and implementing evidence-based approaches to sustaining high vaccination coverage in the United States is both timely and essential.
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