Outbreaks of infectious diseases regularly shock human societies. Outbreaks may be unpredictable, but future events are inevitable. During an outbreak, the exigencies of current circumstances tend to be overwhelming, and all we can do is respond. Collectively, the international community fails to coordinate and plan interventions preemptively between crises. Why can’t we predict outbreaks or mount faster and more effective responses?

What should we be doing in anticipation of a future infectious disease outbreak? This special section points to tools that could be incorporated into anticipatory programs, whatever the pathogen involved.

International surveillance is essential for early discovery of potentially dangerous infectious diseases, but this also requires local community involvement and redressing inequalities in health systems. If a pathogen eludes surveillance, mathematicians can be among the first to help by modeling the patterns of transmission among the chaos. Mathematical models can indicate the trajectory of an outbreak and show how to optimally target data collection. As outbreaks develop, vaccines and drugs may become available. However, it is not ethical to deploy such interventions in an affected population without any test of effectiveness. Therefore, we must design rigorous and controlled trials so that interventions are ready for use. Anticipation must also stretch into the post-outbreak phase. As incidence drops and fear declines, emergency responses are redeployed elsewhere. If a pathogen is not eliminated, it can become endemic—as has happened for HIV. The disease becomes normalized, governments lose interest, and elimination become impossible. Then, individuals—often those least able to afford it—are expected to pay the price of treatment and control.
Outbreak
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