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On Defining Global Catastrophic Biological Risks

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The Johns Hopkins Center for Health Security has formulated an encompassing working definition of global catastrophic biological risks (GCBRs) that reflects diverse sources of risk and mechanisms of damage.[1] We draw on their definition to highlight some important considerations for understanding and addressing GCBRs.

A foundational challenge in defining GCBRs as a subcategory of global catastrophic risks (GCRs) is that features and examples of GCRs are contested. Some argue that epidemics are the only historical instances of GCRs, while others argue that these do not qualify.[2,3] Disagreement and uncertainty point to the need for more specific definitions of catastrophic outcomes and associated risk metrics, including what it means to meaningfully alter the course of human existence or limit long-term human potential. These uncertainties and ambiguities are made visible when the Center's definition stops short of decisively classifying examples of past or potential future events as GCBRs and when others state that GCRs are "essentially" unprecedented (eg, Beckstead 2015). Research and policy deliberations should consider more than biological risks, but specific subcategories of risks can be useful for grounding analyses. The discussions prompted by the Center's definition should be a productive next step for refining collective thinking.

Imagining, assessing, and preparing for biological events that have not fully manifested is difficult and may sometimes be impossible. In many cases, vulnerabilities may not be evident until they are tested. We agree with Schoch-Spana et al, in line with rationale offered by Beckstead, that an encompassing focus for risk mitigation is warranted given current uncertainties over what biological risks (and their interactions) could lead to long-term disaster. Though we should expect uncertainties to persist, a refined characterization of GCBRs should help conceive of, prioritize, and manage risks. Even lacking precise thresholds, defined risk drivers can help identify strategic points of intervention.

The Center's definition considers several criteria for evaluating GCBRs, including the type of harm that may be caused by biological agents. We agree with the authors that GCBRs' "extraordinary" level of harm (which Bostrom described as ranging from "endurable" to "crushing" for GCRs) should not be defined solely by number of lives lost. Human fatality is one measure of harm, but it is not the only measure, nor is it likely the best. A biological agent that debilitates its host, especially one whose effects manifest over a prolonged period, might cause greater devastating harm. If the effects were to prevent productivity and demand expensive and limited resources, then there would be psychological, social, and economic impacts that would scale and sustain more extensively than would deaths alone.

Another criterion considered is that events are "sudden." While a sudden attack may be more likely to overwhelm controls, a global catastrophic biological event need not occur suddenly or even all at once: Multiple concordant or sequential events, each of which might have low individual impact, might together produce a catastrophe. Low or delayed degradation (including genetic) of a population, with insidious but profound detrimental effects, should be considered within the GCBR framework. Recurrent outbreaks at various locations, simultaneous use of different biological agents, or biological events in combination with nonbiological events (such as a cyber attack), as could occur in a deliberate attack using multiple phases and approaches, could have synergistic effects. No one event alone might qualify as a GCR, but more than one easily could.

A related criterion is the propensity for a biological event to cause harm that is "widespread." Features of biological agents and societal infrastructure both contribute to propagation. The transmissibility of agents and the ease with which they can be delivered affect their spread. Advances in

biotechnology that enable the engineering of such features (and others) increase risk. Global infrastructure (eg, interconnected transportation systems or centralized agricultural systems) will also have an impact on a biological agent's spread. Disruptive effects can propagate through nonbiological means. Fear and uncertainty are significant factors that might drive overblown or ill-conceived social or political responses to even a *perceived* global catastrophic biological risk. Reactive restructuring of government to devote attention to less-important risks could limit potential and sustain vulnerabilities over generations.

A summative criterion for evaluation is whether biological events are "beyond the collective capability … to control," exceeding current response capabilities. A variety of events can be contained at low levels; limited outbreaks and attacks could be contained with some structural responses (eg, quarantines) and medical countermeasures (eg, antibiotics, vaccines). But "stress tests" reveal worrying weaknesses in the existing response strategies. Even when treatments exist, there are considerable obstacles to effective responses, including the delivery of countermeasures. For example, the 2009 H1N1 influenza could not be contained because of suboptimal vaccine delivery and other weaknesses in current public health systems. The fragility of our global public health systems suggests the potential for otherwise manageable biological risks to become GCBRs. It will be critical to devise resilient systems to accommodate to a wide variety of eventualities and, wherever possible, prevent such events from occurring.

References

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