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Abstract. This article provides commentary on Chyba's comparative analysis of biological and nuclear warfare.

Christopher Chyba, co-director of Stanford's Center for International Security and Cooperation, recently has provided an analysis differentiating strategic aspects of biological and nuclear warfare. Clear and intriguing, this analysis merits further elaboration.

Nonproliferation. Chyba asserts that nonproliferation is a much more problematic enterprise with biological than nuclear warfare. To support this assertion, he rightly points out that biological warfare (BW) are microscopic, can be grown via equipment that is easily attainable, can be obtained during natural outbreaks of disease, and can be expected to be even easier to obtain through future advances in biotechnology. However, one must note that global dissemination of knowledge, technology, dual-usage and single-usage equipment, counterintelligence and security assets, and precursors and end products of controlled materiel and substances pertaining to nuclear weapons renders the problematic gap in nonproliferation between BW and nuclear warfare less than Chyba intimates. (Or so would assert supporters of United States Government initiatives on ballistic missile defense.)

Deterrence. Chyba implies that the deterrence of BW is more problematic than of nuclear warfare. However, one must note that the dependence of deterrence on rational and logical adversaries--with rationality and logic ultimately defined as mirror imaging of perceptions and cognitive attributions, as consensual styles of perceptions and cognitive attributions, or as the time honored eclecticism of whatever works to generate a desired response or lack thereof--is a vulnerability for both BW and nuclear warfare.

Both types of warfare also face a "deterrence fails" scenario with terrorism. Sophisticated targets of nuclear warfare may well detect the political source of ballistic or cruise missiles, while unsophisticated targets probably will not. Neither would probably detect political sources of nuclear attack via nuclear explosive devices smuggled onto their own territory. A similar case can be made for sophisticated and unsophisticated BW targets. As well, these targets--in confronting attacks initiated within their own territory--must face the challenges of variable incubation periods of disease and of differentiation of BW attack versus natural occurrence. With the attacker believing that the political source of an attack cannot be identified so that mutually assured destruction, massive retaliation, parity, and sufficiency are moot, one must admit that deterrence may well fail for BW and nuclear warfare.

Defense. Chyba asserts that managing the BW threat must rely on defense much more than nuclear warfare. This premise is based on a process of elimination--i.e., the assumed inadequacies of nonproliferation and deterrence. However, Chyba's advocacy for a vital defense BW capability seems to ignore unique aspects of BW psychology. Of special note here are the difficulties in tracking the incidence and prevalence of specific diseases and practically significant differences in incidence and prevalence due to nonspecific factors in self-report, hypochondriasis, social contagion, and other reporting biases once the public became informed that a BW attack might have occurred. Then, of

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course, one must be aware that numerous turf battles and political animosities within, between, and among components of city, state, national, and even international reporting systems would significantly contaminate disease estimates--the contamination being heightened through the context of crisis response management. Finally, the ever-increasing global mobility of populations ensures ever-greater difficulty in screening would-be perpetrators and managing the natural medical threat.

In contrast, nuclear warfare defense may founder on the technical, financial, and political aspects of developing a ballistic missile defense system; virtual lack of defense (save for inadequate and stressed intelligence systems) against within territory attacks with nuclear explosives; and similar medical reporting biases and population mobility challenges to those of BW. In summary, both BW and nuclear warfare confront huge defense problems including one other: the confusion over whether the development of defense or the lack thereof is more likely to elicit an attack.

Chyba cogently describes BW challenges. However, more analysis is needed by all concerned world citizens in comparing BW with nuclear war and in developing appropriate tactics and strategies of primary prevention. As more and more basic assumptions are surfaced and questioned, it may turn out that weapons of mass destruction will not only remain as a threat to human life but also to how we think. Yet, this very last destructive consequence may even possess the seeds of our salvation. (See Chyba, C.F. (August 10, 2001). *Microbe warfare hides the enemy*. *The New York Times*, <http://www.nytimes.com>; Fullerton, C.S., & Ursano, R.J. (1994). Health care delivery in the high-stress environment of chemical and biological warfare. *Military Medicine*, 159, 524-528; Lederberg, J., & Cohen, W.S. (1999). *Biological weapons: Limiting the threat*. MIT Press; Nevin, J. A. (1992). B.F. Skinner: On behalf of the future. *Behavior and Social Issues*, 2, 83-88; Simon, J.D. (1999). Nuclear, biological and chemical terrorism: Understanding the threat and designing responses. *International Journal of Emergency Mental Health*, 1, 81-89; Stokes, J.W., & Banderet, L. E. (1997). Psychological aspects of chemical defense and warfare. *Military Psychology*, 9, 395-415; White, J.R. (2001). *Political eschatology: A theology of antigovernment extremism*. *American Behavioral Scientist*, 44, 937-956.) (Keywords: Biological Warfare, Chyba, Nuclear Warfare.)