Building the Good Fire Department: Practical Preparedness and Agenda Setting for Biological Weapons Release

by

Hailey Young

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Name:	**Hailey Young**
Degree:	**Master of Arts**
Title:	***Building the Good Fire Department: Practical Preparedness and Agenda Setting for Biological Weapons Release***
Examining Committee:	**Chair:** Dr. Genevieve Fuji Johnson Associate Professor

Dr. Douglas Ross
Senior Supervisor
Professor

Dr. Tsuyoshi Kawasaki
Supervisor
Associate Professor

Dr. James Busumtwi-Sam
Internal Examiner
Associate Professor

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Abstract

The grouping of chemical, biological, radiological, nuclear and explosive (CBRNE) events is common in response planning literature, and yet from an emergency management perspective, responding to biological events is very unlike responding to the others. A sizable biological weapons response effort would be a singularly formidable emergency planning challenge. With the distinct characteristics of the biological weapons problem, and in the face of both transmissibility and the psychological trauma associated with disease, the perceived threat level matters little as long as a threat exists. Yet despite the formidable inherent threat, bio-preparedness policy has been absent from emergency preparedness planning. As such, this work will provide a critical analysis of the consistent failures of previous response policy efforts, and base analysis for renewal of the bio-preparedness discussion on agenda setting practices as established by John W. Kingdon. Finally, inter-disciplinary best-practice planning strategies will inform a comprehensive discussion on bio-specific response planning.

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List of Acronyms

BCP	Business Continuity Planning
BEP	Biological Emergency Preparedness
BSL	Bio-Safety Laboratory
BW	Biological Weapon
CBRNE	Chemical, Biological, Radiological, Nuclear, Explosive
CDC	Center for Disease Control
DHS	Department of Homeland Security
HEICS	Hospital Emergency Incident Command System
ICBM	Intercontinental Ballistic Missile
MRBM	Medium Range Ballistic Missile
PPE	Personal Protective Equipment
PTSD	Post-Traumatic Stress Disorder
SARS	Severe Acute Respiratory Disorder
TOPOFF	Top Officials
UNWTO	United Nations World Tourism Organization
W2	Worried Well

Chapter 1.

Introduction

"The tendency in our planning is to confuse the unfamiliar with the improbable. The contingency we have not considered seriously looks strange; what is strange is thought improbable; what is improbable need not be considered seriously." – Thomas Schelling, Nobel Memorial Prize Winner, 2005.[1]

The world is shrinking in size, not literally in miles but in terms of the obstacle that a mile represents. We have become more connected to people and places both close and far than we have ever been and there appears to be no lessening in the reality that is globalization. With information and people being more accessible, the planet appears to shrink. In tandem, the world's population is multiplying exponentially and people are migrating towards cities at an unprecedented rate. The reality of high-density centers and accessible travel are ideal conditions for a biological event to have maximum impact and global consequences.

International human mobility, be it tourist travel or an escape from political or religious persecution, has skyrocketed as international travel becomes more accessible, and as refugee populations grow. The United Nations World Tourism Organization (UNWTO) reported an increase from 25 million people traveling globally in 1950 to 1087 million people travelling globally in 2013.[2] In addition, the reported 51.2 million forcibly

[1] Thomas Schelling won the 2005 Nobel Memorial Prize in Economics, which he shared with Robert Aumann, an Israeli Mathematician. Schelling's most notable works include *The Strategy of Conflict (1960) and Arms and Influence (1966).* Schelling was known for his work in arms control, strategic behavior and game theory.

[2] UNWTO, "Report on Global Tourism," last modified 2014, http://dtxtq4w60xqpw.cloudfront.net/sites/all/files/pdf/unwto_highlights14_en.pdf.

displaced persons globally in 2013, is the highest level on record.[3] As human mobility increases so too does the movement of "unwanted microbial hitchhikers."[4] Given these factors disease has potential for near unlimited mobility in the 21st century.

Moreover, human density is on the rise. In 2008, 3.3 billion people, effectively half of the world's population, lived in urban centers.[5] High human density creates the perfect breeding ground for disease transmission particularly when human contact is high, sex and drug trades are prevalent and the quality of health care varies widely. There is evidence that a single infection can travel internationally, infecting other travelers and arrive in history's highest density centers where opportunity for transmission is maximized. Responding to a disease outbreak in these conditions is a herculean challenge, and becomes no easier as these trends continue and as weaponized viruses are recognized as attractive strategic alternatives.

Biological weapons (BW) have the unique ability, even in their most basic state, to spread from person to person and to multiply before they can be detected or identified. While historically bio-release events have been few, never have global conditions been so ideal for their use. Despite a general tone of readiness on the part of government, numerous misguided misallocations of time and funding for bio-preparedness efforts are ubiquitous. With evidence of barely enough preparedness to manage small-scale disease outbreaks, the ability to manage a more virulent BW event is a cause for concern.

Why, then does bio-preparedness no longer appear on the policy agenda? Surely it cannot be that there is a confident consensus that the issue has been resolved. In fact, upon reviewing the scholarship on BW it becomes clear that there is little consensus of any kind to be found. Three factors of the BW problem are widely debated; they include the assessment of threat, the likelihood of release and the appropriate post-

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[3] UNHCR, "Report on Refugees," last modified 2014, http://www.unhcr.org/5399a14f9.html.

[4] Laurie Garrett, "The Return of Infectious Disease," *Foreign Affairs*, Vol. 75, No. 1 (January 1996), p. 66.

[5] UNFPA, "State of World Population Report," last modified 2007, http://www.unfpa.org/webdav/site/global/shared/documents/publications/2007/695_filename_sowp2007_eng.pdf.

disaster response mechanism. Even so, there is a singular point of unification within the discussion - the potential for massive devastation that is inherent to this type of weapon. Regardless of the perceived threat or proposed solutions, the three streams of thought all concur on this point. With overwhelming support for this one, devastating reality, bio-preparedness planning is surprisingly absent from emergency planning policy discussions.

The central research question for this work asks: how does the BW policy community, renew the discussion on BW preparedness? If it has, as expected, been overlooked in the policy agenda despite the obvious dangers, then how can momentum be reignited to allow planners to take advantage of the best practice work that is being done in the BW field? I posit that in order to responsibly address the protean challenge of BW preparedness, and with an eye towards identifying the failings of past policy decisions, the BW debate must be reaffirmed as a priority for policy makers. In order to do so, the BW discussion must be moved away from the national defence context towards the inherent hazard of BW and its specific demands on preparedness policy.

Prior to the discussion of how to renew BW preparedness policy, a review of the inherent challenges that differentiate these weapons, and their demands on preparedness efforts, as well as the policy failings of the past, is needed. In the post 9/11 era and following the Anthrax release that took place soon after, national security and biological preparedness were central topics on the policy agenda. For years following, great effort and expense was allocated to fortifying the US and Canada against a biological release. These efforts were educational and identified major failings in the system, but were often found to be lacking and, at times, classified to prevent exploitation.

Despite that there has been no subsequent biological release, nor have we seen a simulation since 2005, there have been numerous natural outbreaks, which assist in identifying preparedness issues that would be amplified in severity in the case of an engineered bio-weapons release. In these natural outbreak examples, while there have been some resounding best-practice lessons, there have been major failings that would be markedly worse in the face of a bio-engineered release. These best practice lessons

will be utilized to inform the direction forward. Further, John Kingdon's tripartite model will be applied to the challenge of reestablishing bio-preparedness as a viable policy pursuit. Ultimately the aim of this work is to begin to draw together the necessary policy tools with the necessary preparedness tools and suggest a means forward for the critically important work of mitigating the consequences inherent to the biological weapons threat.

To accomplish this, John Kingdon's tripartite model provides a probabilistic understanding of the critical factors that inhibit or encourage policy items onto a policy agenda and into the minds of government and policy makers. Kingdon's policy model offers specific considerations that make it fitting for use in the context of BW such as consideration for fragmented policy communities, the challenges of success resulting in demise of an issue, and more broadly, due to its predication on the importance of creating policy tools ahead of a crisis.[6] Moreover, Kingdon's model balances both a realist perspective on the challenges of creating policy change with a resolution mechanism to encourage the work of agenda setting and momentum renewal.

Kingdon argues that the three categories of process must be aligned in favor of a policy category in order to secure the best chance of success. Each of the three streams – problems, policies and politics - proves equally important and yet works independently of each other in the agenda setting process. Kingdon's model allows for an understanding of their interaction.[7] Kingdon asserts that by establishing and aligning the problem in question with a well-rounded policy alternative and the right political circumstances, it is possible to assure the best chance of policy change. Interestingly, he also suggests that categorizing the problem correctly from the beginning will further encourage success.

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[6] For alternative Agenda setting models see, for example, Brian Tomlin, Fen O. Hampson and Norman Hillmer, *Canada's International Policies: Agendas, Alternatives and Politics* (Don Mills, ON: Oxford University Press, 2008), pp. 1-432.

[7] John W. Kingdon, *Agendas, Alternatives, and Public Policies* (New York: Longman, 1995), p. 20.

Literature Review

In review of the bio-weapons literature, it is clear that many scholars predicate their theories on the level of threat that they attribute to a weapons release. With threat assessments at the heart of many BW discussions, there is a distinct divide amongst scholars and thus a similar divide in regards to the necessity of planning and preparedness. Without consensus about a need for planning, given the focus on the likelihood of a release, there is no ability to move towards consensus as a policy community. Furthermore, in attempting to locate policy pertaining to the Canadian BW discussion, we find that there is almost nothing in the way of comprehensive documentation. The following section will review both scholarship and active policy specific to bio-preparedness.

The debate pertaining to the BW risk has been distinctly polarized, marked by two opposing conclusions and a small, uncertain middle ground. One pole argues that alarmist scholars and policy makers have largely exaggerated the threat posed by bioweapons, citing the low number of occurrences as proof.[8] This group argues that the resources expended on the bio-mitigation efforts have been largely wasted and reactive. Milton Leitenberg, a principal scholar of this perspective, argues "Innumerable US Government officials, academic analysts, and journalists between 1989 and 2003 nearly uniformly concluded that the proliferation of state-run BW programs was a constantly increasing trend. It now seems that that was not the case…."[9] Leitenberg concludes that this significant absence of BW development is sufficient to discredit alarmist assessments of the threat level.

The other pole is populated by the notion that bioweapons are easy enough to procure with proper motivation, have high strategic value, and pose a catastrophic

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[8] See, for Example, Milton Leitenberg, "The Self-Fulfilling Prophecy of Bioterrorism," *The Non Proliferation Review*, Vol.16, No. 1 (March 2009); Michael Moodie, "The Bioterror Threat," *Issues in Science and Technology*, Vol. 25, No.3 (Spring 2009); William Clark, *Bracing for Armageddon? The Science and Politics of Bioterrorism in America* (New York: Oxford University Press, 2008).

[9] Leitenberg, "The Self-Fulfilling Prophecy," p. 98.

threat.[10] This body of literature commonly warns against unfettered scientific research suggesting that in willingly producing these pathogens, our societies are put at great risk. This perspective argues that the international landscape of US military preponderance lends itself to a hedging behaviour as the development of bioweapons makes for a cost effective second tier of weapons to nuclear development. "Many of the reasons a state might use biological or chemical weapons against the US have to do with the asymmetrical power relations that presently exist between the US and all its potential opponents."[11] With US nuclear dominance spanning decades, non-nuclear counterforce capabilities have surely been developed by nations unable to challenge American nuclear preponderance. It is commonly thought that biological counter-strike capabilities are a viable alternative, being less expensive and equally, if not more devastating once released.

Finally, a small middle ground exists, which concludes, much in the same way this paper does, that despite the uncertain level of risk at any given time, the potential harm caused, if no mitigation strategy is in place, is unacceptable. It is critical that a base line of preparedness should exist in order to reduce loss of life and streamline efficiency for first responders and health care institutions following a biological release.[12] This argument follows that the risk assessment effort is wasted, as there is little definitive knowledge on the risk of a biological event and that the limited available resources should be focused on fortifying city-level resistance to biological and pandemic events. This scholarship argues in favour of thoughtful, responsible planning measures that neither overinflate the fear factor inherent to a bio-event, nor downplay the severity of the consequences.

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[10] See, for Example, Barry Kellman, *Bioviolence: Preventing Biological Terror and Crime* (Cambridge: Cambridge University Press, 2007); Kenneth Alibek, *Biohazard* (New York: Random House, 1999); Jez Littlewood, “Biological Weapons: Much Ado and Little Action,” *Minerva*, Vol. 45, No. 2 (June 2007); Jonathan B. Tucker, *Toxic Terror; Assessing Terrorist Use of Chemical and Biological Weapons*, (London: MIT Press, 2000).

[11] Richard A. Falkenrath, Robert D. Newman, and Bradley A. Thayer, *America's Achilles' Heel; Nuclear, Biological, and Chemical Terrorism and Covert Attack* (Cambridge: The MIT Press, 1998), p. 253.

[12] Richard A. Falkenrath, "Problems of Preparedness; US Readiness for a Domestic Terrorist Attack," *International Security,* Vol. 25, No. 4 (2001), pp. 147-186.

Transmissibility alone results in a clear need for effective and specific public policy planning in order to best mitigate casualties and contain illness. Although there are a variety of emergency response plans from a number of institutions at various levels of government, few address in a systematic and comprehensive way the unique considerations that need to be taken for a biological event. This oversight in planning policy will slow response, overwhelm mitigation efforts and allow for unfettered transmission of disease thus resulting in severe increases in devastation.

In the Canadian context, the planning literature is not varied, nor is it particularly comprehensive where biological readiness is concerned. Often there is insight to be found in documents produced by provincial and municipal governments in Canada with respect to emergency response structures and their interplay but nothing is specific to BW. The City of Vancouver, for example, possesses an excellent planning document for a variety of natural occurrences including fire, earthquake, landslide and others. Yet, the "City of Vancouver Emergency Management Plan" makes no mention of biological or even terrorist events. Emergency Management BC offers a more appropriately detailed overview of some key biological responses, but when more closely scrutinized these documents lack detail, and offer only basic information aimed at consumption by the general public.

At the national level, the Government of Canada's "Chemical, Biological, Radiological, Nuclear and Explosive Resilience Strategy for Canada" is one of very few strategies with an eye towards biological consequences. Unfortunately, it does not, as is clear from the document's title, specifically address biological events, and thus makes no consideration for transmissibility or attribution. Furthermore, this document is comprised of a very few pages which only briefly state five strategic objectives for CBRNE response. This plan, despite being geared towards a group of weapons that includes biological weapons, offers no detailed or systematic analysis of major consequences that result exclusively from biological weapons. The federal plan is severely inadequate, both in terms of detail and depth of planning. Furthermore this document at its core is flawed as it fails to mention, even briefly, the role of the provincial and municipal government responses.

There is little in the way of singular, multi-disciplinary and comprehensive planning strategies, which will serve to mitigate vis-a-vis the potential devastation specific to a biological weapons release. Many scholars agree on the matter of failed bio-event preparedness;[13] however few continue with a comprehensive analysis of what elements need to be addressed and how. This lack of available bio-event planning literature is well documented throughout scholarship on bio-readiness. "Despite Canada's important historical and contemporary role in responding to the threat of biological warfare and bioterrorism, the subject remains virtually unexplored in the scholarly literature, in part because of the tendency of Canadian military historians to ignore the subject and, in part, because of the veil of secrecy that has shrouded this aspect of the country's national defence and international relations."[14] Especially in the case of Canadian bio-response assessment, few if any resources discuss bio-security outside of the American perspective.

On the contrary, where we are able to find some depth of thought and planning is within those specific disciplines that would be hardest hit in the event of a release. Some individual disciplines appear to recognize the importance of planning for biological response and the severity of the consequences of not doing so. There is adequate discipline-specific literature in health care planning and its projected planning needs for a biological event, as well as for psychology and social work. Other authors focus on policing and first responder planning for disaster events, although fewer specifically for bio-release.

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[13] Leitenberg, "The Self-Fulfilling Prophecy," p. 95-109; Moodie, "The Bioterror Threat," p. 92-94; Jessica Stern, "Dreaded Risks and the Control of Biological Weapons," *International Security*, Vol. 27, No. 3 (Winter 2002), p. 89-123; Kellman, *Bioviolence; Preventing Biological Terror and Crime* (New York: Cambridge University Press, 2007); Tucker, *Toxic Terror*; Alibek, *Biohazard;* Zygmunt F. Dembek, "Modeling for Bioterrorism Incidents," *Infectious Diseases: Biological Weapons Defence: Infectious Diseases and Counter Terrorism* (Humana Press, 2005), pp. 23-24.

[14] Donald Avery, *Pathogens for War; Biological Weapons; Canadian Life Sciences and North American Biodefence* (Toronto: University of Toronto Press, 2013), p. 3.

In sum, although some scholars deal specifically with health policy improvements[15] and others with first responder,[16] or hospital preparedness,[17] there is little in the way of comprehensive, inter-disciplinary or systematic planning for bio-specific events. While this inter-disciplinary framework is the ultimate goal, the fact that these pockets of preparedness exist at all may be the key to rectifying the BW policy failure. The existence of the BW policy communities indicates that there is recognition of a need, and that recognition may be the most effective way forward. If national level policy is failing to correctly acknowledge the failure in BW planning, but that acknowledgement is already taking place at disciplinary levels, then it follows that health, and public safety policy routes should be the conduits for policy change.

Given that there is little consensus amongst academics, aside from the potential for harm, the lack of policy surrounding the issue of biological event preparedness is no surprise. The mistake, it seems, is to simply accept the “head-in-the-sand” mentality that has been adopted by national levels of government and policy writers. It is critical that responsible attention be paid to the risks associated with bioweapons, that a balance be struck to ensure that city-level responders are thoughtfully fortified and that no undue panic or spending is encouraged. Because certain disciplines have begun this work, the logical progression is to work within that frame of engagement rather than continuing to seek action from policy bodies that have perpetuated inaction in bio-preparedness. Conceivably, an integrated, inter-disciplinary approach to preparedness policy that incorporates the groups that have successfully engaged in BW response planning, and encourages those that have not, to begin, would be ideal for renewed policy momentum.

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[15] Donald P. Moynihan, "The Network Governance of Crisis Resposne: Case Studies of Incident Command Systems," *Journal of Public Administration Research and Theory*, Vol. 19, No. 4 (January 2009).

[16] A. Tegnell, et al., "Development of a Matrix to Evaluate the Threat of Biological Agents Used for Bioterrorism," *Cellular and Molecular Life Sciences*, (October 2006).

[17] Russel L. Bennett, "Chemical or Biological Terrorist Attacks: An Analysis of the Preparedness of Hospitals for Managing Victims Affected by Chemical or Biological Weapons of Mass Destruction," *International Journal of Environmental Research and Public Health*, Vol. 3, No. 1 (March 2006), pp. 67-75.

Chapter 2.

The Biological Weapons Problem

Biological weapons are very often grouped together with a variety of other conventional and nuclear varieties. There are however a number of inherent characteristics that fundamentally separate the preparedness requirements of bio-weapons from any other weapons category. The realities of these characteristics are both severe and challenging for planners. They also necessitate that the biological weapons problem be identified as such, regardless of the likelihood of a release. Jez Littlewood of the WMD Commission posits that academia and the government are effectively chasing their tails in attempting to assess the threat of biological weapons and that ultimately it is a misplaced focus. Littlewood asserts that "the issue is not biological weapons and states: the issue is the biological weapons problem itself…."[18] He urges scholars to approach the BW discussion from the perspective that there is no solution that will certainly lead to eradication of all biological weapons development. Instead, management of the problem inherent to the weapon itself is possible if all parties from local to international are engaged. The following section will establish the qualities that differentiate biological weapons from any other weapon category, and will assert that they can, and are, being procured and produced.

The Spread Factor

The most important distinction between biological weapons and their weapons of mass destruction (WMD) counterparts, as well as the most difficult challenge for planners is the spread factor. This term references the living, replicating nature of a

[18] Jez Littlewood, "Managing the Biological Weapons Problem: From the Individual to the International," *The Weapons of Mass Destruction Commission Report,* (Stockholm, 2006) http://www.blixassociates.com/wp-content/uploads/2011/03/no14.pdf.

biological weapon which allows for infection of a host, multiplication within it, and spread to another. Transmissibility is characteristic of a pathogen; a disease-causing microorganism such as bacteria, virus or fungi. Pathogens require a living host in order to replicate and initiate an infection[19] which is essentially the hostile take-over of the immune system by the pathogen itself. As a result of this unique feature, a very small, localized release of a pathogen can easily bloom into a national if not international event. "Any other type of attack, regardless of its horror is confined to time and space; the harm is inflicted at the point of attack. It is awful for the victims, but if you aren't there, its effects are emotional…. [I]t does not harm you physically. But contagious bio-attack somewhere puts everyone at risk."[20]

Often this spread is referred to in terms of pandemic. While most pandemics are not a result of biological weapons, the term generally refers to "disease outbreaks that occur over a wide geographic area, such as a region, continent, or the entire world, and infect an unusually high proportion of the population."[21] While a biological weapon may be the instigating event, the result may be a pandemic spread of whichever pathogen is released. Biological weapons are a class alone as a result of the spread factor and the potential for subsequent pandemic.

The transmissibility challenge becomes intensified still further when the issue of bioengineering is considered. Bioengineering in the context of weapons refers to the practice of combining and purifying existing pathogens with the aim of creating unrecognizable, unstoppable disease. If a bioengineered weapon is used, it is then not simply a matter of disease but instead disease engineered for maximum impact. Supposing H5N1 was to be engineered to spread from person to person, the Centre for Disease Control (CDC) estimates that it would result in between 89,000 and 207,000

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[19] Gregory D. Koblentz, *Living Weapons; Biological Warfare and International Security* (New York: Cornell University Press, 2009), p. 9.

[20] Kellman, *Bioviolence*, p. 17.

[21] Gregory D. Koblentz, "Biosecurity Reconsidered," *International Security,* Vol. 11, No. 4 (Spring 2010), p. 119.

fatalities as well as an economic impact of approximately $71.3-$166.5 billion dollars.[22] "In principle, biological weapons efficiently delivered under the right conditions against unprotected populations would, pound for pound of weapon, exceed the killing power of nuclear weapons."[23] Unlike nuclear weapons however, damage is not necessarily localized to a blast radius, but threatens to be much wider in scope.

This potential is at the heart of the planning dilemma that flows from the bioweapons problem. In the event of even a small-scale release, the run on health care and prophylaxis and the likelihood that hospitals would become consumed with triage and treatment is high. "For example, no medical system could accommodate 500 patients suddenly presenting with severe…. acute paralysis and all requiring mechanical ventilation. No facility or even multi-facility hospital system would have that many ventilators on hand."[24] The spread factor is easily the biological weapon's most chilling advantage, as well as the response planner's most formidable obstacle.

The Fear Factor

The fear factor, or the “contagious panic” as Barry Kellman refers to it, may prove to be nearly as formidable an adversary as the spread factor. If the spread factor is the medical consequence of a biological event, the fear factor is its psychological equivalent. In the case of biological weapons, it is argued that “[They] are perhaps the most insidious and feared of all weapons because deliberately released contagious diseases are the equivalent of a self-sustaining attack that could cause unlimited harm among human…. populations."[25] Smithson argues, "The psychological fallout from the traumatic

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[22] Richard A. Matthew and Bryan McDonald, "Cities Under Siege: Urban Planning and the Threat of Infectious Disease," *Journal of the American Planning Association*, Vol. 72, No. 17 (Winter 2006), pp. 109-117.

[23] Joseph R. Masci and Elizabeth Bass, *Bioterrorism; a Guide for Hospital Preparedness* (Washington, DC: CRC Press, 2005), p. 9; David Malet and Herman Rogers, "Biological Weapons and Security Dilemmas," *The Whitehead Journal of Diplomacy and International Relations,* Vol. 11, No. 2 (Summer/Fall 2010), pp. 105-113.

[24] Raymond S. Weinstein and Kenneth Alibek, *Biological and Chemical Terrorism; A Guide for Healthcare Providers and First Responders* (New York: Thieme, 2003), p. 8.

[25] Amy E. Smithson, *Germ Gambits; the Bioweapons Dilemma, Iraq and Beyond* (Stanford: Stanford University Press, 2011), p. 1.

event typically exceeds the medical consequences, in some instances by an order of magnitude."[26] In the event of a release, the incidence of civil disobedience, reclusiveness, fear, panic and subsequent influx in demand for medical service and pharmaceuticals would quickly become unmanageable. In essence, while mitigation of the physiological illness caused by a biological event is easily the most pressing concern for planners, the sheer number of worried-well (W2) patients will likely rival that of infected patients.

Fear factor was exemplified, “during the 2003 SARS epidemic in Toronto, nearly 200 individuals sought medical evaluation for every diagnosed case of SARS."[27] With the fear of unknown illness either for oneself or one's family, the psychological cases of illness prove to be in some ways more taxing than their medical counterpart. Grey and Spaeth break down the psychological effects of a potential biological event into two distinct categories: fear of illness and fear of trauma following a catastrophe. In essence, there is fear for one's own health in addition to the more general feeling of fear after a major traumatic event. Alibek describes the fear of illness in terms of “a panicked dash for the nearest doctor's office or emergency room, as well as a run on antibiotics" spurred on by fear that anyone could be or become infected.[28] It is pertinent to assume that there will also be a high demand for information on prevention and protection, which additionally taxes health care infrastructure preparedness and impedes successful mitigation measures.[29]

In addition to fear of illness, the lasting trauma of enduring senseless death, and potentially the collapse of basic services, can cause a rise in Post-Traumatic Stress Disorder (PTSD) patients, a phenomenon seen following the Anthrax attacks in 2001.[30] This is of course not exclusive to biological events but does however deepen concern for W2 and requires consideration for planning and preparedness experts. In a healthcare

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[26] Michael R. Grey and Kenneth R. Spaeth, *The Bioterrorism Source Book* (New York: McGraw Hill Publishing, 2006), p. 100.

[27] ibid.,100.

[28] Weinstein and Alibek, *Biological and Chemical Terrorism*, p. 9.

[29] Grey and Spaeth, *The Bioterrorism Source Book*, p. 103.

[30] Ibid.,102.

system overwhelmed by the medical demand, the addition of an exponentially higher number of psychological patients could to be devastating. It is the fear of spread and stress in combination that create the undeniable need for effective preparedness and planning for a biological event.

“It’s All Natural”

The bioweapons problem is additionally complex due to the simple and undeniable fact that disease is natural. "Bioweapons are inherently advantageous being that they are naturally occurring. With Smallpox as an exception[31], most of the Category A pathogens are naturally occurring…"[32] While this may seem like a matter of concern for attribution and policing, as it aids in determining if intent to cause harm existed, it is also a concern for health care response planners. "Many pathogens generate flu like symptoms, and it might appear at first that victims are suffering from an acute flu outbreak. Although some diseases, notably smallpox, have unmistakably distinctive symptoms that could be readily observed, this is more the exception than the rule."[33] Likely, by the time the biological release can be established as such, any perpetrator would have fled, and containment of the spread would be priority. Attributing pandemic to natural or bioweapon roots is important in treating the subsequent illness; knowing what is causing illness is also a key factor in managing health, civil and policing responses.

The natural characteristic of bio-weapons work to the advantage of an attacker as it can become extremely difficult to distinguish naturally resultant illnesses from the malicious variety. “One of the biggest problems is that we don’t know whether or not we have had such attacks. […] We cannot distinguish between naturally occurring

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[31] Smallpox was considered eradicated in nature as of 1979 following the World Heath Organization (WHO) worldwide eradication program. It however remains unseen if there is a risk emanating from the former Soviet Union, or other national programs, in the form of a stockpiled and weaponized cache of Smallpox virus. (www.bt.cdc.gov/agent/agentlist-category.as).

[32] Kellman, *Bioviolence*, p. 11.

[33] Ibid.,12

epidemics and ones we create."[34] The difficulty of attribution allows for a longer period of unfettered incubation as well as a 'get-away' period in which any evidence of usage can be destroyed. Furthermore, some scholars posit that the interim incubation period could allow for a further series of attacks on a number of other cities, all long before the initial attack can be identified. Indeed the natural quality of a bio-release divides planners by priority; one division needed for identification of the illness and its subsequent treatment as well as one division for the attribution and limiting of further possible events. Delayed detection poses an impossible challenge; identification further lengthens the time line for recovery. "But even if cities were well equipped for a bioterrorism attack, they would still have a difficult time recognizing that such an attack had occurred. Local authorities probably aren't going to be able to recognize that it has happened until the incubation period is over."[35] At this point the job of disease identification, tracking and mitigation has intensified exponentially.

Even after it has been established that some type of pattern exists, the identification of the causative agent is a slow process. If the agent is a common strain like botulinum, identification may be fairly easy; however in the case of a rare pathogen or worse a genetically engineered pathogen, a local lab would be nearly incapable of diagnosis. The sample would need to be moved to, and assessed by a larger lab, which would delay the identification and response. "In the case of a bioterrorist attack, valuable time -and lives- might be lost during such an arduous process."[36] Despite the catastrophic effects of a delay, correct identification of a bio-release and specification of the strain of the disease are pivotal in disease management and treatment.

The Dual Use Dilemma

In his book *"Bioviolence"*, Barry Kellman posits that the progression of the life sciences is both vertical and horizontal. It is vertical in the sense that the life sciences "offer the potential to uncover elemental principles of pathogenicity that could enable the

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[34] Kenneth Alibek, "Prepare for the Worst," *New Scientist* (July 14, 2001), p. 43.

[35] Laurie Garrett, "The Nightmare of Bioterrorism," *Foreign Affairs,* Vol. 80, No. 2 (January 2001), p. 77.

[36] Ibid., 79.

cultivation of disease", and of course, vaccines and immunities. It is also horizontal in the sense that the life science sectors (academia, pharmaceutical industry, and government) "are proliferating rapidly across the planet, with a concomitant multiplying of the diversity of persons trained and engaged in that sector."[37] Arguably this increase in life science research is further perpetuated by a deeply entrenched corporate drive for profit and the lucrative nature of the pharmaceutical industry. In the context of the bio-weapons dilemma, the "horizontal" progression of the life sciences is at the core of the problem. In discussion, this problem is most often referred to as the "dual use dilemma".

The dual use dilemma refers to the ongoing "…research that, based on current understanding, can be reasonably anticipated to provide knowledge, products or technologies that could be directly misapplied by others to pose a threat to public health, agriculture, plants, animals, the environment, or material."[38] With the resulting increase in flow of goods between countries and the dual use nature of many of the necessary facilities for bio-development, it is possible to observe many instances where globalization and capitalism have facilitated development of the necessary industrial facilities for BW research and development.

With a large number of medical and pharmaceutical industries, as well as research laboratories and even breweries possessing some, if not all of the necessary equipment and/or agents to produce bio-weapons, monitoring dual use equipment can prove to be futile. Additionally, with the increased privatization of medical and pharmaceutical institutions there is a sustained problem of security monitoring standards. "As much of the research and development of biotechnology involves dual use samples and equipment, numerous private sector firms and contractors that do not receive adequate security checks will have access to sensitive biomaterials…. continuing research into bioweapons creates opportunities for the technologies to leak from secure government facilities."[39] In an industry of over 15,000 employees the lack of

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[37] Kellman, *Bioviolence*, p. 19.

[38] Geoffrey L. Smith and Neil Davison, "Assessing the Spectrum of Biological Risks," *Bulletin of the Atomic Scientists,* Vol. 66, No. 1 (January 2010), p. 2.

[39] David Malet and Herman Rogers, "Biological Weapons and Security Dilemmas," *The Whitehead Journal of Diplomacy and International Relations* (Summer/Fall 2010), p. 106.

standardized security screening processes certainly a risk to release.[40] As was the case in the Amerithrax release, where Bruce Ivins, an employee working at a level three biosafety lab (BSL-3), obtained and released a highly virulent strain of Anthrax using the postal system, it is not so farfetched to assume that if one motivated perpetrator can remove pathogens from a highly secured facility, so too can others.

The issue of knowledge remains the pin in the proverbial grenade that is the bioweapons problem. So long as the necessary knowledge stays in the appropriate hands, the problem is minimized. Without some knowledge of pathogenicity or virology, the likelihood of affecting a successful event is low. Arguably, this has been the sticking point, the proverbial pin, for groups who have attempted proliferation of these weapons.

The Life Sciences Debate

The inextricable link between the life sciences and BW development perpetually plagues the effort to manage the BW problem and, over the last decade, a boom has occurred in the life sciences discipline as is evident in the near doubling of the number of US BSL-4 laboratories in 2009.[41] This only serves to intensify the previously discussed dual use dilemma. "Gene sequencing and synthesizing technologies, which are good benchmarks for measuring the ability of scientists to manipulate genomes, are advancing at a rate comparable to that experienced by the computer industry."[42] The result of this boom is exponential growth within the life sciences and more specifically in virology and synthetic or recombinant DNA research.

While this research can result in the development and testing of decidedly more dangerous pathogens, it can also result in vaccinations and immunities that may function to reduce casualties in the event of an outbreak. This is the dichotomy that besets the

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[40] Ibid.

[41] Laboratories in the US are categorized from Bio Safety Level 1 through 4, with 4 being those handling the "…most dangerous agents for which there are no effective vaccines or treatments available, such as Ebola, Marburg, and Smallpox". Currently the US has 13 BSL-4 laboratories (according to the Federation of American Scientists), Canada has 1, The National Microbiology Laboratory in Winnipeg,(according to the Public Health Agency of Canada), and 24 other BSL-4 laboratories exist outside of North America (Gregory Koblentz, 118).

[42] Koblentz "Biosecurity Reconsidered," p. 118.

BW problem. In a recent example, the Whitehead Institute for Biomedical Research bio-engineered a new function for red blood cells, which has sparked interest from numerous military organizations as a temporary therapy against disease outbreak. "Because the modified human red blood cells can circulate in the body for up to four months, one could envision a scenario in which the cells are used to introduce antibodies that neutralize a toxin,…. [T]he result would be long-lasting reserves of antitoxin antibodies."[43] In an ironic twist of the dilemma, despite the perpetuation of the life sciences risk phenomenon, this advancement might eventually be used to combat biological release agents for first responders and military personnel. While many argue that the risks of bio-engineering exceed acceptable limits, most maintain the undeniable value that can be gained through relatively unconstrained life sciences research.[44]

Despite the undeniable importance of advancing our ability and facility to perform bio-medical research, the life sciences manifest all of the requirements for facilitating a powerful biological weapons release. Suffice it to say that the life sciences bring together advanced skill sets, dangerous pathogens and the required equipment for bio-development. This in addition to the potential for knowledge proliferation from past or current biological weapons programs, which have the necessary motivation and resources, bio-development sophistication, is undoubtedly possible. Dual use materials can further disguise nefarious intent in innocent pursuit and motive for BW development apparent.

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[43] Matt Fearer, "Engineered Red Blood Cells Could Carry Precious Therapeutic Cargo," *Whitehead Institute for Biomedical Research*, June 2014, http://wi.mit.edu/news/archive/2014/engineered-red-blood-cells-could-carry-precious-therapeutic-cargo.

[44] In another example, researchers at the University of New York State were successful in synthetically mapping the genetic path for the eradicated poliovirus, effectively creating a synthetic means for its renewal. While the poliovirus is virtually unheard of in contemporary medicine, vaccination development against it remains a viable pursuit and the academic advancement in synthesising a virus in-vitro is no small accomplishment. That established, the potential harm that the published results of this study could cause if found in the wrong hands is obvious.

Ghosts of Bio-Programs Past and Emergent Threats

The following section will provide a brief review of the national and international threat sources, which are not thoroughly dissected herein, but instead offered as confirmation of some inherent risk posed by biological weapons. The purpose of this section is to suggest that there are existing programs, not to speculate on the likelihood of their deployment. In the late 1990's "a report [was] submitted by the US Office of technological Assessment [which] identified seventeen countries believed to possess biological weapons – Libya, North Korea, South Korea, Iraq, Taiwan, Syria, Israel, Iran, China, Egypt, Vietnam, Laos, Cuba, Bulgaria, India, South Africa, and Russia."[45] In addition to the state-sanctioned programs, the risk of non-state or terrorist activity represents a second threat source for bio-weapons development.

For those non-state affiliated actors, be they "terrorist" or otherwise, the knowledge requirements stand firmly in the path of bio-development. There is however, some speculation as to knowledge emanating from foreign programs, for sale to a motivated party[46]as well as the availability of rudimentary instruction online. Furthermore there is concern over the emergence of a phenomenon referred to as "do-it-yourself biology" in which there may be an "amateur biologist who engaged in molecular biology and synthetic biology research outside of an institutional laboratory setting."[47] Still, it appears that without an advanced knowledge source, or the means to acquire one, the ability for non-state groups to develop anything more than basic, rudimentary weapons is limited. This is not to say that that exact effort is not being made, but simply to suggest that the necessary resources may be harder to procure for smaller groups. Endless speculation surrounds the market for this specialized skill, much of which points in the direction of the men and women formerly engaged in the highly advanced former Soviet Union bio-weapons program.

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[45] Alibek, *Biohazard,* p. 277.
[46] ibid.
[47] Koblentz, "Biosecurity Reconsidered," p. 118.

Russian Biological Weapons

With what was, in its day, the most advanced and covert bioweapons program, and an integral part of Russia's war making capability, Leitenberg and Zilinskas write, that is reasonable to assume the Soviets left some remnants of their biological development successes after their fall.[48] The Soviet biological weapons program ran a staggering sixty-five years from 1928 to 1992, almost three times the length of its closest competitor. It maintained up to 65,000 scientists, engineers and military experts at a time, another major advantage over their closest competitor, the US who maintained no more than 8000 at a time.[49]

Competing with, and having an upper hand on the US and having the capacity to decimate entire populations of civilians and/or military personnel, encouraged the Soviet government BW program of the day. At the time it was thought "that there would be several nuclear exchanges between the Soviet Union and the United States, the last of which would consist of Soviet missiles armed with biological warheads…."[50] Late into the 1980's it is known that the Soviet Union had gone as far as to begin development on intercontinental ballistic missiles (ICBMs) and mid-range ballistic missiles (MRBMs) with BW warhead capability in the event that a long range attack was needed.[51] The Soviet BW program was intended as a "war termination" solution as well as for use against enemy populations too large for Russian invasion and dominance. It is important to stress that the Soviets had total annihilation in mind when developing this capability.

The resulting program made an art of advancing biological weapon development, succeeding in developing strains of antibiotic resistant Anthrax,[52] for which the Western world still has no treatment. As well, the Russians are known to have created an unrecognizable strain of the Plague that used a protein sheath to disguise itself to all

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[48] Milton Leitenberg and Raymond A. Zilinskas, *The Soviet Biological Weapons Program; A History* (Cambridge: Harvard University Press, 2012), p. 699.

[49] Ibid., 700.

[50] Ibid., 708.

[51] Ibid., 704.

[52] It is understood that in the late 1980's, the Soviet program had built facilities capable of yielding weaponized Smallpox at a rate of 2000kg annually. Ibid., 703.

conventional diagnostic tools. The Soviet program effectively succeeded in manifesting pathogen characteristics not existing in the natural world.[53] It broke ground in bioengineering with the creation of Chimera viruses, those that combine two pathogens together creating unmanageable combinations of symptoms that are virtually impossible to treat.

The secrecy surrounding this Soviet biological weapons program serves to increase suspicion surrounding its sophistication. To this day, the official Russian position on this program is that it never existed, and yet a number of the Ministry of Defence facilities remain closed to both public and international observers. Leitenberg and Zilinskas suggest that it is probable, with arguably the most advanced offensive bioweapons research ever carried out, that many of the more advanced weapons remain in storage in one of Russia's secured locations to this day. [54]

In tandem with a fear that there is residual, modern day Russian BW development, or at least maintenance, the other risk that emanates from the ostensibly non-existent Soviet program are the numerous highly trained scientists who worked in the program, and the expertise they possess. Without a trained technician with substantial knowledge of handling and weaponization, the development of bioweapons is nearly unfeasible. In his book '*Biohazard,'* Ken Alibek, a former Soviet bio-scientist, recounts multiple incidents in which government representatives approached him soliciting his help with their own biological programs. He further details the desperation felt by many of the scientists in the wake of the fall of the Soviet Union and the subsequent flood of offers for employment. In Alibek's own words "The services of an ex-Biopreparat scientist would be a bargain at any price. The information he could provide would save months, perhaps years, of costly scientific research for any nation interested in developing, or improving, a biological warfare program…. I've heard that several went to Iraq and North Korea. A former colleague, now the director of a Biopreparat institute, told me that five of our scientists are in Iran."[55] There remains

[53] Ibid., 701.
[54] Ibid., 698-712.
[55] Ibid., 271.

speculation as to the likelihood that intellectual proliferation took place[56], but it nonetheless creates uncertainty as to the alleged difficulty of obtaining expertise in BW development.

Syrian Biological Weapons

The threat posed by Syria is one that is well established and yet poorly understood. "Syria has begun to acquire the status of the country with the most advanced offensive chemical capacity (quantitative and qualitative) among the Arab states, and also in comparison with Iran."[57] Further as an ally to both Iran and North Korea, as well as an affiliate of many terrorist organizations such as Hezbollah, Syria poses a grave threat in terms of both expertise from developed programs, as well as resources for development. In an interview, Jill Dekker, a consultant to the NATO Defence Establishment in Bio-warfare and Counterterrorism, was quoted as saying "Contrary to how the US State Department and other agencies tend to downplay the sophistication of the Syrian biological and nuclear programs, they are very advanced." Dr. Dekker further asserts that the Syrian chemical weapons program is amongst the most advanced in the Middle East,[58] which serves to indicate that the necessary expertise and facilities are already in place were the Syrian government to decide that biological development was more strategic.

"In February 2006, the director of the US Defence Intelligence Agency testified, 'we believe the Syrian government maintains an offensive biological weapons research and development program.'"[59] With the knowledge that Russian scientists have also been engaged with the Syrian program,[60] there can be no doubt that there is ample expertise for a flourishing program. The equipment and the agents, as discussed above,

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[56] Ibid., 712.

[57] Jerry Gordon, "Syria's Bio-Warfare Threat: an Interview with Jill Dekker," *New English Review,* December 2007, ASA:http://www.newenglishreview.org/Jerry_Gordon/Syria's_Bio-Warfare_Threat%3A_an_interview_with_Dr._Jill_Dekker/.

[58] Ibid.

[59] Barry Kellman, *Bioviolence; Preventing Biological Terror and Crime* (Cambridge, MA: Cambridge University Press, 2007), 71.

[60] Gordon, "Syria's Bio-Warfare Threat, p. 1.

are plentiful and available, and by virtue of the existing chemical weapons program are already thought to be in use.

Iranian Biological Weapons

With Iran's track record of offering resources to terrorist groups, such as Hezbollah, Islamic Jihad and Hamas, there is grave concern that production of a well-developed biological weapons program might follow. Kellman encapsulates the threat level when he suggests that, "Iran certainly has the capability to segregate and cultivate lethal pathogens as well as the capability to weaponize them for dispersal by artillery and aerial bombs. Moreover, Iran has recently conducted chemical and biological defence military exercises with helicopter sprayers and has worked with ballistic, cruise and scud missiles."[61] In addition to dispersal technologies, in 1998 the Iranian government reportedly dispatched a "scientific advisor" to Moscow with the intention of recruiting former Soviet scientists.[62] Iran has obtained the necessary conditions for a weapons program and, due to their comparative nuclear inferiority, has sufficient motivation to seek an asymmetrical deterrent.

North Korean Biological Weapons

North Korea has reportedly established a substantial bioweapons program capable of mass-producing an agent for military purposes, which can be activated in a matter of weeks. It is speculated that North Korea has also developed a strain of Anthrax, equivalent to that developed by the Soviet Union during the Cold War, a strain that may rival for the most devastating and virulent strains known to man.[63] Furthermore, "the North Korean Academy of National Defence organized biological laboratories, recruited foreign scientists and microbiologists (mainly from the Soviet Union), and imported bacterial cultures for producing Anthrax, cholera and plague from Japan."[64] According to Barry Kellman's conclusions, half of North Korea's long-range missiles and

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[61] Ibid., 1.
[62] Alibek, *Biohazard*, pp. 271-272.
[63] Ibid., 272.
[64] Ibid.

a third of their artillery shells are bio-capable. [65] The robustness of the North Korean program is in little contention; it is easily one of the most prominent bioweapons developers.

While some scholarship argues that knowledge proliferation is the cause for the low number of instances of bio-release, and the even lower success had by non-state actors, Maci and Bass make the rather unique assertion that the events of 9/11 should act as proof that a motivated party, regardless of the perception of their ability, "…could carry out a technically sophisticated, well-coordinated long range plan…." They argue that "it showed that they could devise a novel and unexpected technique. And perhaps most ominous, this seemed to confirm that they were eager to cause mass civilian casualties, without limit, rather than targeting their attacks more narrowly."[66] By this logic, the value of biological weapons to at least some terrorist organizations is evident.

With anti-Western sentiment on the rise in light of the post 9/11 war in Iraq and Afghanistan and the propagation of jihadist activities within many Middle Eastern and African states, the threat of non-state action is real. "The terrorist problem changes the dynamics of the biological weapons threat. Unilateral, secretive state responses to the perceived bioterrorism threat may corrode inter-state relations and increase opportunities terrorists have to secure access to biological weapons."[67] Especially in the case of states with anti-American sentiment, the temptation to covertly support non-state actors and terrorist groups deepens the risk of biological program development capabilities by groups that may otherwise not possess the resources.

The intent of this discussion is not however, to divert into an in-depth actor-based threat assessment. Suffice it to say that states are often more than equipped with the knowledge required and have access to the top scientific minds. To date the international and moral norms appear to have held the levies against state-sanctioned BW use. When we have seen action by states it has most commonly been against an

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[65] Kellman, *Bioviolence,* p. 67.

[66] Masci and Bass, *Bioterrorism,* p. 4.

[67] David P. Fidler and Lawrence O. Gostin, *Biosecurity in the Global Age; Biological Weapons, Public Health and the Rule of Law* (Stanford: Stanford Law and Politics Press, 2008), p. 33.

insurgency within their home country or as a tool for assassination. On the other hand, independent actors seem to be restrained by the advanced skills required to fulfill development.[68]

For perpetrators, the feasibility of building a usable biological weapon is mired in countless challenges that span from funding to expertise, from dispersal to assured transmissibility. Despite the challenges, bio-weapons of varying sophistication continue to be developed, very likely due to the fact that there would be near unmitigated consequences in the event of their release. Thus the weapon itself retains high strategic value. With expertise having emerged from the former Soviet Union program and evidence of numerous countries undertaking development both historically and in present day, it appears that there is a motive as well as an opportunity for the further development of bio-weapons. To quibble over threat level and likelihood seems short-sighted; it is a possibility and as such is a threat that should not be ignored.

[68] Koblentz, "Biosecurity Reconsidered," p. 118.

Chapter 3.

Policy Failures

There are a number of ways to assess the failing of current policy on bio-preparedness. Whether it is classification, jurisdiction or underestimation of the challenges, it is evident that the current planning is insufficient. Furthermore, in reviewing bio-simulations and natural pandemics it is possible to observe the core preparedness issues in need of review.

Chemical, Biological, Radiological, Nuclear & Explosive Weapons

Complicating the response challenge is the mistaken idea that combining planning for CBRNE or WMD events together is an efficient and effective strategy for mitigation. It has become common in emergency response strategy building, and yet one of these weapons is unlike the others. The 'B' in CBRNE, and its unique features are being ignored by virtue of being buried in this cluster of other mass destruction weapons. "The widespread use of these labels has obscured the important differences between these weapons and the strategic consequences of their proliferation."[69] In the case of biological weapons, planners face some of the most unique and inherently challenging characteristics and thus need an equally specific planning framework by which to establish response and mitigation. "Despite the growing awareness of the threat posed by biological weapons, ...the unique security challenges posed by biological weapons remain unfamiliar to much of the public, academia and government. Biological weapons are the least well understood of the WMD [category]."[70]

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[69] Koblentz, "*Living Weapons*," p. 5.
[70] Ibid., 4.

Municipal Level Planning

There are undeniable benefits to international counter-proliferation measures as a means to manage the biological weapons threat abroad. While these the present paper, and thus finds little need for discussion of this perspective, aside from saying that the domestic preparedness and international counter-proliferation efforts are best served when both are robust and working in tandem. Arguably the major role of the national government in the bio-preparedness effort should be to ensure that both the defence policy community and the response policy community have the necessary network of resources available to facilitate the best possible outcome in each sphere. That being said, there is a clear argument for the separation of response and defence policy, one to national bodies and the other to provincial and municipal bodies, as each plays a critical and distinct role.

It is well understood that "when it comes to emergencies, the essential remedy to an emergency situation is almost invariably applied at the local level."[71] Yet, a singular, comprehensive academic planning document for a biological event does not exist for city-level response and recovery. With the national security lens placed on the biological weapons discussion, most planning for response is at a national level, despite the fact that the key actions will be required at the city level. This misplaced policy direction is a serious obstacle in getting BW preparedness on the public policy agenda.

While there are a number of resources pertaining to a variety of subjects, few of them prove to be interdisciplinary in nature, failing to draw together health, policing and governance tools. As such they do not succeed in establishing the breadth of essential considerations for the development of planning for bio-specific events. The consequence is a sizable gap in policy literature on municipal BW planning. Littlewood suggests that if little to no government money or attention is being paid to the biological weapons threat from abroad, then the little notice bioweapons do get, should be firmly focused in the

[71]Arjen Boin and Paul 't Hart, "Organizing for Effective Emergency Management: Lessons from Research," *The Australian Journal of Public Administration,* Vol. 69, No. 4 (December 2010), p. 360.

mitigation of consequences.[72] Across a wide variety of preparedness disciplines the common practice is to build preparedness from the ground up, and yet as a result of the 'national security' lens that is placed on biological events, there are repeated examples of failing public policies and practices.

Top Officials Simulations

Since there are few real world bio-event responses to study, the US government led by the Department of Homeland Security (DHS) simulated four major biological events with the intention of identifying vulnerabilities in response networks. The vulnerabilities were substantial. Beginning in 2000, the first two simulations were run in coordination with a number of federal organizations including the Federal Bureau of Investigation (FBI) and the Center for Disease Control (CDC): Top Officials (TOPOFF) and Dark Winter. Following these two simulations, results were discussed and published for learning and development purposes. In 2003, following the creation of DHS, the simulations continued but simulation results were subsequently classified. In their place, superficial documents were published announcing excellent learning opportunities and little else. The following section will review in detail the results that were made available following each simulation.

In May 2000 in Denver, Colorado, prior to the 9/11-era surge of funding, a bioweapon simulation was performed using Yersinia Pestis, the causative agent for the plague. At a cost of $3 million and with local, state and federal health and policing agencies in attendance, the first (TOPOFF) exercise identified enormous gaps in preparedness and response. In particular it was clear that the resources for quarantines, were not in place. The findings were as follows:

Modeling indicated that within 2 days after the release, victims would begin to be seen at local hospitals. By the fourth day after the release, 500 (including 25 fatal) cases had occurred and only then was the point of release clearly based on epidemiological

[72] Jez Littlewood, "Managing the Biological Weapons Problem: From the Individual to the International," *The Weapons of Mass Destruction Commission Report*, No. 14 (2006), p. 1.

investigation. During the first week after the attack began, antibiotic shortages were reported and hospitals were overwhelmed with cases and concerned individuals seeking reassurance. At this point, over 80% of individuals entering hospital emergency rooms were the W2. Because of delays in the imposition of travel restrictions and the concern of 2nd generation transmission[73] of pneumonic plague, this single release ultimately would have resulted in 4000 cases of pneumonic plague and 2000 deaths worldwide.[74]

At the close of the simulation, three major failures were identified. The first was the lack of surge capacity: too few rooms, insufficient containment and treatment resources and too few trained healthcare workers to triage and treat W2 and the infected. This also overlapped with the public health investigative abilities, as the management of personal information and contacts was limited.[75] Additionally, each agency ran largely separate command centres, resulting in confusion around chain of authority and inefficient decision-making. Finally, "by day three, it became clear that, unless controlling the spread of the disease and triage and treatment of ill persons in hospitals received equal effort, the demand for health care services [would] not diminish."[76] This conclusion was drawn after extensive indecision on border closures, in-home quarantines and distribution of prophylaxis. With major breakdown in communications and decision-making, as well as a huge shortage of health care professionals with the appropriate skills and far too few resources, the exercise was terminated and the specific details were largely withheld from the press.[77]

Dark Winter

In the summer of 2001 the Dark Winter simulation was held. With all manner of national health and safety infrastructure taking part in a bio-terror simulation, the goal

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[73] Generations in the context of pathogenicity refer to the life cycle of each phase of infection. The first generation is the initial release that infects those directly in contact. The second generation refers to those illnesses that are caused by coming into contact with the first set of infections.

[74] Grey and Spaeth, *The Bioterrorism Source Book* (New York: McGraw Hill Publishing, 2006), p. 9.

[75] Masci and Bass, *Bioterrorism; a Guide for Hospital Preparedness*, p. 336.

[76] Ibid., 337.

[77] Grey and Spaeth, *The Bioterrorism Source*, p. 7.

was effective containment for three simultaneous smallpox outbreaks. It was found that, despite best efforts to maintain quarantine, the worldwide effects would eventually exceed 3 million infections and 1 million deaths. This is a conservative number as it represented the number of casualties at the time of the halting of the simulation. The actual number had the simulation run its full course would have been much greater. The exercise began with the two-dozen CDC confirmed cases of Smallpox in Oklahoma with unconfirmed cases in Georgia and Pennsylvania. Initially, the response was to implement ring vaccination[78] and accelerate vaccination production given availability of only 12 million smallpox vaccinations.

By day six "15 states had reported a total of 2000 smallpox cases; isolated cases had also been seen in Canada and Mexico and the UK…. Little vaccine was left; there were food shortages, public unrest, and violence." Schools and state borders were closed and a 4 million vaccine dose agreement was made with Russian officials, in an attempt to bridge the 5 week production gap in US vaccine laboratories."[79] Finally two weeks into the simulated Smallpox pandemic, "25 states had reported 16,000 cases with 1000 deaths. Ten other countries reported cases…. Demands for vaccine had sparked riots and looting."[80] This represented the 2nd generation of the disease and by the fourth generation, and without a major vaccination campaign, they expected that the total infected would reach 3 million with one million deaths and no end to the spread in sight.[81]

Senator Sam Nunn pin-pointed the failings of Dark Winter in saying "You know that your vaccine's going to give out and you know the only other strategy is isolation but you don't know who to isolate and that is the horror of the situation."[82] With two consecutive exercises finding fault in the ability to hold quarantine and manage communication networks, planners returned again to the drawing board affecting a

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[78] Ring vaccine practice refers to the practice of providing vaccination only to those in contact with infected patients, including health care professionals, families and public safety personnel.

[79] Masci and Bass, *Bioterrorism; a Guide for Hospital Preparedness,* p. 338.

[80] Ibid.

[81] Ibid.

[82] Ibid., 339.

number of Smallpox-related improvements including the procurement of 155 million additional doses of vaccine.[83] While this appears to be progress, Smallpox has numerous strains and variations, only one of which can be treated with the vaccine here noted. "According to participants and post exercise analyses, a major bioterrorist attack in the United States has the potential to cause enormous loss of life, the disruption of essential institutions, civil unrest and loss of public confidence in government, public health and health care institutions."[84]

TOPOFF 2

In May of 2003, TOPOFF 2 was run in three phases, meant to simulate a multi-release event. Following the previous failures, the bio-defence portfolio had been entirely transferred to the newly created Department of Homeland Security. "The main goal of the exercise [was] namely to strengthen the ability of all government departments to deal with WMD terrorism and coordinate domestic counterterrorism strategies with international response systems."[85] During this open exercise, all participating organizations, including a number of Canadian planning and response organizations, were notified and given months to prepare for the simulation. Time was spent in consultation between departments, along with training for health care professionals and first responders.

The first simulated event was a May 10th pneumonic plague[86] attack in Chicago at a Blackhawks hockey game against the Vancouver Canucks. The foundational assumption for the hockey arena release was that there would be no advance warning to the target population and a high number of attendees would become infection carriers. This resulted in the first cross-border contamination response effort ever to be simulated.

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[83] Grey and Spaeth, *The Bioterrorism Source Book,* p. 9.

[84] Ibid.

[85] Avery, *Pathogens for War*, p. 221.

[86] Pneumonic plague has an abnormally long gestation period and thus may have been a poor choice for the purposes of a finite simulation. This is suspected to have contributed to the failure of responders to manage the effects, as no one was made aware that there was a pandemic spread until many days after the simulation had begun. While this may have not been a successful choice for the simulation, the reality of the matter is that it is just as likely to be chosen for release as any of the other Category A pathogens.

In tandem, on May 12th a radiological device detonation was simulated in Seattle and Vancouver was hit with two chemical events, one of which was to be launched from a trawler off the coast of Vancouver Island.[87] At the completion of the 5-day simulation 5,000 people had been infected with plague, 1,100 were casualties of the three events and the plague had spread internationally.[88]

Immediately following the completion of the simulation, the 200-page report summarizing the final findings was classified, and a 14-page public document, with a slight air of manufactured positivity, was issued.[89] What is understood is that, for a third time, the response to the simulation proved to be disappointing, reflecting a number of similar short-comings as the first TOPOFF simulation. Again, these included issues of inadequate surge capacity, poor communication networks and slow pathogen identification procedures. The hospital system quickly became overwhelmed, and a break down in the health infrastructure communication system saw no recognition of the pandemic until long after the inundation had begun. While the simulation was considered to have unacceptable results, the major benefit proved to be the engagement of cross-border resources and the advanced training. This led to the production of a third TOPOFF exercise to again test and strengthen this relationship. TOPOFF 2 demonstrated the importance of international relationships in the case of a biological events. Irrespective of borders and nations, biological events must be met with an international response, especially for neighbouring countries with porous borders.

TOPOFF 3

TOPOFF 3, undertaken in April 2005, included the last bio-specific simulation to take place in North America. With the largest number of tandem events and participants, the findings were extensive; however "Homeland Security Officials declined to say what problems and vulnerabilities were discovered during TOPOFF3."[90] While its results went

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[87] Avery, *Pathogens for* War, pp. 221-222.

[88] Masci and Bass, *Bioterrorism; a Guide for Hospital Preparedness,* p. 340.

[89] Ibid.

[90] Donna Young, "States, Hospitals Learn from Emergency-Preparedness Lessons in TOPOFF3," *American Journal of Health-System Pharmacy,* Vol. 62, No. 10 (May 2005), p. 1000.

largely unpublished, it was touted as "an important learning curve for Canadian counterterrorist specialists."[91] With little in terms of analytical data from this simulation made public, there are unfortunately few lessons to take away.

Amerithrax

While there are a number of simulation exercises to learn from, rarely have emergency responders been tasked with an intentional biological release. The 2001 Anthrax release, despite offering some lessons in response planning, in fact proves to be limited as an example due to its distinct lack of transmissible characteristics. The anthrax release, often referred to as “Amerithrax”, was the only true bio-weapons response challenge faced by the US, complete with live agents and real consequences. While the effort to respond is thought to have been only moderately successful, there are a number of lessons that may prove to be valuable.

October 3rd, 2001 saw the first diagnosed case of anthrax presented in the US. Initially the case was misdiagnosed by the CDC who attributed it to contaminated soil exposure. That error went unseen until the time trace amounts of the pathogen were found in the victim’s office. This discovery initiated the biological weapons response. Up until that point, Anthrax had not been thought to pose a grave threat to American society and was largely off the radar of both the CDC and FBI. "Unaware of the capacity of Anthrax spores to disperse and infect in low doses, the CDC officials reckoned that the probability of infection was low."[92] Upon its identification, the CDC and the FBI, with conflicting response priorities, largely failed in cross communication, effectively cutting containment and attribution efforts off from one another. This led to serious challenges including misinformation being passed on to medical practitioners. It resulted in two deaths, and a failure to convey to the public the urgency and importance of seeking immediate care.

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[91] Avery, *Pathogens for War,* p. 222.

[92] Jeanne Guillemin, *Biological Weapons; From the Invention of State-Sponsored Programs to Contemporary Bioterrorism* (New York: Columbia University Press, 2005), p. 175.

Poor communication during the Amerithrax event, both between agencies and within them, further reduced the effectiveness of the response. "The failure to communicate the risks of inhalational anthrax to the postal workers and describe its symptoms cost lives, as did the lack of a clear communication with local physicians to be on the watch for any patients from postal facilities."[93] The result of this was a lack of urgency in identifying and treating exposed victims and a failure to communicate symptoms to directly exposed postal workers. By virtue of postal workers being the most vulnerable population, their health and safety should have immediately been the focus of the response.

It quickly became clear that primary health care providers and family doctors lacked the essential knowledge to effectively diagnose/reassure their patients on the matter of anthrax exposure. "Community physicians may have [had] no recourse but to refer their concerned patients to already overcrowded hospital emergency rooms."[94] In all major health related events, a critical point of failure is the inability to manage the influx of sick and W2 who seek care and/or reassurance. Referred to as “surge capacity,” the major concern is the ability of medical centres to manage overwhelming numbers of patients with enough beds, supplies and medical professionals to provide care. This too is a repeating pattern and a formidable challenge in the face of a bio-weapons release.

At the hospital level, lack of education further inhibited responders as "the appropriate use of nasal swab surveillance among postal workers to identify areas where anthrax exposure had occurred … led many clinicians to mistakenly believe that this technique was an essential tool in diagnosing individual cases. In many instances the surge in prescriptions for such agents reflected health care workers seeking to obtain supplies for themselves and their families…,"[95] which indicates a recognition of the lack planning for medical staff, their health and safety.

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[93] Ibid., 177.
[94] Masci and Bass, *Bioterrorism; a Guide for Hospital* Preparedness, p. 50.
[95] Ibid., 64.

The panic that surrounded the Amerithrax event was exacerbated by the fact it closely followed the 9/11 terrorist attacks; the importance of providing clear instructions and accessible information to reduce already elevated panic, was never greater. Demonstrating the high demand for direction and information, the CDC website crashed just days into the event as a result of being one of only a few platforms for publicly accessible information.[96]

Severe Acute Respiratory Syndrome

In March of 2003, Canada faced its own major response effort, which, although not a biological weapons release, was Canada's closest modern brush with a pandemic. From March through July 2003, two separate outbreaks of Severe Acute Respiratory Syndrome (SARS) resulted in 438 infections with a 10% mortality rate. "In particular, SARS highlighted serious deficiencies in public health infrastructure and preparedness."[97] SARS revealed issues of disease identification, issues of protection of response staff and the realities of economic losses to the city and province.

The challenge in the case of SARS, much like with Amerithrax, emanated from the identification phase. The rarity of the illness, one not often seen nor considered in diagnosis, resulted in SARS being low on the list of considerations. "We did not know that the cause was coronavirus…. We did not know the duration of the incubation period. We did not know whether it was spread by droplets or by air. We had no reliable diagnostic test, no vaccine and no treatment."[98] In addition to the role that delayed identification played in this particular response, failure to reduce spread and lack of resources to educate the general public on SARS-specific personal health practices also contributed to slow response.

Additionally, nearly 40% of those affected were hospital and health care staff, an unacceptable failure to protect staff on the part of hospitals and response leaders. "A

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[96] Grey and Spaeth, *The Bioterrorism Source*, p. x.

[97] Nola M. Ries, "Public Health Law and Ethics: Lessons from SARS and Quarantine," *Health Law Review,* Vol. 13, No. 1 (2004), p. 3.

[98] Avery, *Pathogens for* War, p. 235.

sense of vulnerability and powerlessness was a common complaint of Toronto area hospital workers infected during the SARS crisis. In 2009, they launched a class action suit against the Ontario Ministry of Health and several Toronto area hospitals on the grounds that they were not given adequate protection against this lethal virus."[99] With reduced numbers of health care staff willing to participate in major infectious events response as a result of there being improper protection for themselves and their families. The tragic reality is that health care workers were overrepresented in the mortality rate and yet "SARS was contained only by the heroic efforts of dedicated front line health care and public health workers, with little help from the central provincial public health system that should have been there to help them."[100]

Tens of thousands of people in Ontario alone were placed in quarantine at the mere hint that they had come in contact with the disease.[101] "Anyone who had visited certain hospitals during specific time periods was asked to observe quarantine. 1,700 high school students were quarantined after one student at the school became ill. Many health care workers had to abide by 'work quarantine', which required them to travel directly from home to work without using public transit and without stopping at any other destination."[102] These exemplify only a handful of the “creative” quarantine measures adapted to the SARS response. In the case of Torontonians, very few court-ordered quarantines were ultimately required, as most citizens observed isolation requests and heeded public health warnings. In contrast, the simultaneous SARS outbreak in China, Hong Kong and Singapore found that surveillance, electronic monitoring, imprisonment and threats of execution werer necessary in order to enforce their quarantine parameters, and even still breaches occurred.[103]

Psychologically, the impacts became apparent as the SARS crisis lessened and the response could be examined. With the benefit of hindsight, many argued that quarantine had been overused and without consideration for the cost and benefit of

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[99] Ibid., 257.
[100] Ibid., 236.
[101] Ries, "Public Health Law and Ethics,” p. 3.
[102] Ibid.
[103] Ibid.

doing so. The question of overuse arose in light of Beijing and Toronto quarantining the same number of people (approx. 30,000), despite that the number of outbreaks in Beijing exceeded that of Toronto's by ten times.[104] "The unsurprising conclusion […] is that quarantine seriously disrupts lives, isolates individuals from the outside world, and jeopardizes workers' livelihood…."[105] In the case of SARS, while quarantine was unpopular, over-used and relied upon tenuous public compliance, it proved, at the very least, not to hinder the response effort.

Ebola

In the case of the Ebola outbreak in March 2014, the challenges were abundant and obvious. While there has been little discussion of this outbreak as a bioterror event[106], the challenges and chain of events that have unfolded in the subsequent 9 months mimic many of those expected in the event of a bio-release. Further, Ebola is a Category A pathogen as identified by the CDC and so provides appropriate circumstances for bio-response planners to study. It is important to note that, in this example, the standard of social and medical services varied quite widely amongst African nations, and that despite that challenge, there were numerous successful policy lessons that were quickly observed and reapplied, ending in some "spectacular success stor[ies]"[107] in some cases. While the challenges responders encountered were similar to

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[104] Ibid., 5.

[105] Ibid., 4.

[106] In the case of a large pandemic or BW event, there will likely be prolific conspiracy theory generation amongst populations which may serve to increase the fear factor consequences. In the Ebola case, for example, Dr. Cyril Broderick, a Liberian scientist and former professor of Plant Pathology at the University of Liberia, College of Agriculture and Forestry, asserted that "The US Department of Defense (DoD) [was] funding Ebola trials on humans, trials which started just weeks before the Ebola outbreak in Guinea and Sierra Leone." Timothy Guzman, "US is responsible for the Ebola Outbreak in West Africa: Liberian Scientist," *Global Research,* October 2014, ASA: http://www.globalresearch.ca/a-liberian-scientist-claims-the-u-s-is-responsible-for-the-ebola-outbreak-in-west-africa/5408459.

[107] World Health Organization, "Successful Ebola Responses in Nigeria, Senegal and Mali," January 2015, ASA: http://www.who.int/csr/disease/ebola/one-year-report/nigeria/en/

those described above, the WHO and first responders on the ground implemented many of the best practice policies detailed in Chapter Five.[108]

The first Ebola patient was identified in December of 2013 in Guinea, West Africa, followed by a cluster of other cases identified in March 2014. Almost immediately several countries became riddled with new cases and experienced an overwhelmed medical system with significant lack of resources, training and capable and willing medical staff. Furthermore, police and military personnel were in high demand, tasked with enforcing quarantine throughout West Africa in an effort to quell the spread of the disease.[109]

In the initial stages, the response to Ebola included the sealing off of borders and closing of West African airports to incoming and outgoing travellers. The result of this was not only to refuse exit to those unaffected, but more importantly it limited the ability to bring in medical and security personnel to treat those who were affected. Furthermore, the closing of airports and borders shut out supplies and fuel to these countries, creating a shortage that would prove to intensify the spread in the early stages. By early September of 2014, the cumulative death toll in Liberia, Guinea, Sierra Leone and Nigeria was conservatively 1,427 people.[110]

In the span of a week, the death toll jumped to 1,900 surpassing the total number of Ebola deaths in all previous outbreaks. The fear factor associated with this period of the outbreak was reflected in the desperate conditions within the country. "The fear factor has grown way out of proportion…. We're not able to deploy [health experts] because there are no airlines going in…', said Margaret Chan, the Director General of

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[108] For example, when the realization occurred that misinformation was causing great detriment to the response effort, door-to-door information campaigns in numerous local languages were undertaken, allowing for the easement of fears and the reduction of W2 patients.

[109] The term quarantine, at least at this stage, was rarely used in the rhetoric around West Africa; instead it was often referred to as “sealing boarders” or “prevention of movement”. The understanding seems however to reflect that an isolation effort was being undertaken, especially in major cities like the capital of Monrovia.

[110] Geoffrey York, "Isolation Hampers Ebola Effort," *Globe and Mail*, August 26, 2014.

the World Health Organization about the fear induced shutdown of travel both internationally and within Africa."[111]

It also became apparent at this point in the crisis that the number of health care workers available was dismally low, and those willing were falling ill themselves. The reality of fearful, sick and dying health care workers is formidable, and it is a complex aspect of both pandemic and biological weapons response efforts that is very hard to manage. In early September, this reality was blatant as both American and WHO medical personnel had fallen ill, and as many as seventy-nine West African doctors had died. Specialized hospitals set to care for medical personnel began to pop up in an effort to quell the illness and death of those most valuable and most vulnerable populations. In addition to the above noted fear factor and staff illnesses, responders were also plagued with a dramatic lack of public education, to the point where some believed that doctors were causing the illness.[112]

Turning to the Canadian Ebola response effort, while there were no confirmed Ebola cases in Canada, preparations were made for response, in case any presented. Toronto planners, following their preparedness engagement with SARS, had already begun communicable disease outbreak planning. In light of the Ebola outbreak, the Ontario government and the City of Toronto increased training and education for staff and worked on a number of key preparedness strategies specific to Ebola. Improvements were implemented according to a framework of organizing medical facilities into three categories and then focusing attention on the special needs of each stage of response. The first category of hospital was dedicated exclusively to the treatment of identified Ebola cases. A second category of hospitals carried out diagnostic hospitals for suspected cases. The third category of hospitals was assigned to the task of triaging health patients away from confirmed cases.[113] By employing this

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[111] Geoffrey York, "WHO Fights Fear Factor as Death Toll Rises," *Globe and Mail*, September 4, 2014.

[112] Jonathan Paye-Layleh and Sarah Dilorenzo, "Ebola Outbreak: The Worst is Yet to Come," *Globe and Mail*, September 8, 2014.

[113] "A Three Tiered Approach to Ebola Virus Disease Management in Ontario," Government of Ontario, Ministry of Health and Long Term Care, October 2014, http://www.health.gov.on.ca/en/public/programs/emu/ebola/.

strategy resources for treatment and palliative care can be concentrated in a group of facilities, as can the most well-equipped and knowledgeable medical personnel. Similarly, resources for large groups of W2 can be concentrated at other facilities, as can police and social services.

Additionally, Ontario sought to equip ambulances for transportation of confirmed cases, stockpiles of personal protective equipment (PPE) were purchased, and staff working with confirmed cases were required to work in buddy systems in order to reduce the potential for accidents.[114] As a result of no cases emerging in Ontario, the effectiveness of these measures cannot be ascertained; however amongst Canadian cities, Toronto is thought to have relatively advanced response capability.

Conclusions about BW Preparedness Policy

The reality of North American preparedness on the whole is summed up succinctly in the report issued by the WMD Center, a non-governmental and independent reviewer, in 2011. This American institution reviewing American preparedness finds staggeringly that current policy is resulting in failed preparedness. In all but one category (categories included: detection and diagnosis, attribution, communication, medical counter measure availability, medical counter measure development, medical countermeasure dispensing, environmental clean-up and medical management), preparedness was found to “fail to meet expectations.” The exceptional category, which received “meets minimal expectations”, was communication which was awarded a “C” grade. The report expanded on its conclusions, summarizing key findings:

> The United States does not yet have a nation-wide multi-source disease surveillance system…. Despite extensive research, a scientifically and legally validated attribution capability does not yet exist for anthrax or virtually any other pathogen or toxin…. Despite significant progress, risk communication does not always reach diverse/special needs populations. No suitable risk assessment for bioterrorism is available for engaging and

[114] Paola Loriggio "Health Minister Outlines Ontario's Ebola Procedure", *CTV News Toronto*, October 17th, 2014 http://toronto.ctvnews.ca/health-minister-outlines-ontario-s-ebola-procedure-1.2058260

> educating the public…. Current stockpiles of medical counter-measures … may not be adequate for large-scale attacks. Medical counter-measures are not currently available for resistant or novel pathogens…. The inability to dispense potentially life-saving medical countermeasures in the event of a large-scale bio-attack presents a serious risk of needless deaths, social disorder, and loss of confident in government. It is highly unlikely that antibiotics could dispense to a large population within 48 hours…. A catastrophic biological event in the United States would quickly overwhelm the capacity of an already stressed health care system…. [T]here is not yet a comprehensive approach to emergency medical response…. Although Evidence suggests that a better-prepared citizenry can reduce demand on hospital-based services during a crisis, currently there is minimal public investment in demand-reduction strategies.[115]

While the failings are many and formidable, the outlook is not entirely bleak. In assessing the preparedness planning for only small-scale events, communication, medical countermeasures and countermeasure dispensing were found to "meet many expectations." Needless to say, the mounting task of developing preparedness for BW-event is far from in order, which in turn makes the emerging best-practice scholarship exceedingly valuable in policy development.

[115] Tara Kirk Sell, "The Bio-Response Report Card: Some Progress, But More Work Needed," *Clinician's BioSecurity News* (November 2011), pp. 3-4.

Chapter 4.

Putting Bio-Preparedness Back on the Agenda

Kingdon's Probabilistic Model

John Kingdon suggests a model for understanding policy decisions and how items are identified for policy action. Since the policy discussion regarding bio-weapons has stalled, Kingdon's model of agenda setting serves to shed some light on the conditions necessary for the revival of bio-preparedness as an agenda item. This chapter will discuss the factors that got it the agenda in the first place and what subsequent factors caused its removal and the necessary steps for its return.

Kingdon's model proposes three necessary conditions that together, when leveraged in service of a policy agenda, create a window for policy change to occur: problems, policies and politics. Each stream works independently from the other, and each according to its own constraints.[116] This model functions to create a probabilistic understanding of the factors that either make, or break, a policy endeavour.[117] It is the coupling of problems, policies and politics that create Kingdon's critical policy change juncture, which he calls a "window of opportunity."[118] It is in this opening that policy initiatives are successfully addressed.

The first condition is the identification of a problem. Problems in this case refer to those conditions which policy makers and experts have determined are in need of attention on the policy stage.[119] The policy stream is where the process of policy

[116] Kingdon, *Agendas, Alternatives, and Public Policies*, p. 20.
[117] Ibid., 8.
[118] Ibid., 94
[119] Ibid., 115.

alternative development takes place by vested parties such as experts and policy specialists. It is through this process that a policy alternative is developed. It is then refined through discussion and debate, eventually making it into a viable course of action. Finally Kingdon presents the political stream, which differs greatly from its counterparts as it is motivated by outside forces such as national mood and political advancements, making the policy agenda a political strategy document rather than a solution-based one.

It is through these process streams that Kingdon perceives a "window of opportunity", resulting from a favourable alignment of conditions servicing a single policy agenda. Prior to the opening of this window and prior to its debate amongst experts, a condition must be transitioned into a problem that is seen as needing to be addressed. The policy item has to be framed as a problem, not as an accepted condition of another phenomenon. In turn, this allows experts, politicians, policy makers and the public to take notice and decide to take action. We must be convinced that something must be changed in order for the root problem to be recognized.

Kingdon suggests that this transition from condition to problem is neither easy nor obvious. While statistics and studies may act as indicators of a problem and identify gaps or issues in current policy options, they are not always enough to provoke action. Rather it is often noticeable changes in these indicators that cause them to be noticed and that encourages the shift towards "problem" rhetoric and away from being a condition of something greater. "Policy makers consider a change in an indicator to be a change in the state of a system; this they define as a problem."[120] Changes in indicators can in fact draw such attention as to overstate an otherwise unaddressed problem, and cause more dramatic action than may be necessary. Alternatively the identification of a problem may happen as a result of a value-based judgement or through comparison to another country or government. In either case, the condition must first gain recognition within the policy community.

[120] Ibid., 97.

In many cases, Kingdon suggests that indicators, value-based assessments and comparative issues may not be sufficient to succeed in placing a problem on a policy agenda. Instead, a focusing event will be the catalyst for change. Kingdon compares this type of policy response to the jolt of falling out of bed: "you have to fall out … before you can get any help".[121] The whole legislative process, says Kingdon, is "putting out brush fires, not building a good fire department".[122] Problem recognition, at times, requires the total descent into chaos in order to draw the necessary weight to put behind policy development; it may take "A powerful symbol that catches on"[123] and creates momentum both within the government and amongst the population. Even in these cases, viable, pre-existing policy alternatives are needed in order to be able to take advantage of a catalyzing event.[124]

The question remains. What factors cause a policy alternative to fall from the agenda? Kingdon suggests a number of factors that can contribute to an attention shift away from a specific issue. For one, governments may feel that they have adequately addressed the issues. Even if there has in fact been sufficient policy action to merit this assessment, the perception that due diligence has been done may be the kiss of death for policy advancement in any given area. Alternatively, the government may find, after attempting to address an issue, that it is unsustainable or simply unrealistic, thus dropping it from the agenda. "It takes time, effort, mobilization of many actors and expenditure of political resources to keep an item prominent on the agenda. If it appears, even after a short time, that the subject will not result in legislation or another form of authoritative decision, participants quickly cease to invest in it."[125] Kingdon suggests that losing momentum on a policy option can be simplified by hinting that agenda items can be as fickle as to be fads or novelties, and just as easily a new fad or novelty policy item can emerge and divert focus.[126]

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[121] Ibid.,100.
[122] Ibid.
[123] Ibid., 99-100.
[124] Ibid., 103.
[125] Ibid., 109.
[126] Ibid., 110.

Once a problem has been identified, in order for it to advance onto the policy agenda, a policy proposal, or policy alternative, must be prepared and thoroughly vetted by the policy community before any further achievements can be made. Policy alternatives are shaped and re-shaped by Kingdon's policy community. This is a group made up of vested parties such as subject matter experts, policy specialists and both government and non-government actors who take an interest in a specific issue. "This community of specialists hums along on its own, independent of such political events as changes of administration and pressure from legislator's constituencies".[127] In the process of sharing and discussing ideas, disparate expert opinions may be blended thus leading to more common thought patterns. Ideally expert discussion will lead to a refined policy solution that is smooth, nuanced and appropriate for insertion into the policy agenda.[128] Kingdon refers to this reforming effort as the softening process.

When consensus cannot be had, or fragmentation exists within the policy community, there is not enough weight behind the policy alternative to push it through the political stream and affect change. If there are too many differing stakes in the conversation, and too many different actions and different goals, too little momentum can be built in each camp to push forward. "Fragmentation begets instability," says Kingdon, instability both in terms of the viability of the policy alternative but also instability of the agenda itself.[129] The policy stream is in fact a "primeval soup" that plays by the rules of evolution and natural selection. It is not always a rational, decision-based system but instead one that relies on the evolution, mutation and recombination of policy actions that lead to strong, viable policy alternatives; anything else will simply not survive the competition for an agenda position.[130]

Finally, the political climate must also work in favour of policy change in order for Kingdon's "window of opportunity" to be open. If the national mood and the political priorities of the governing party do not line up with the proposed policy change, that change will neither be part of the conversation nor placed on the agenda. "The political

[127] Ibid., 124.
[128] Ibid.
[129] Ibid., 125, 128.
[130] Ibid., 130.

stream … is composed of such factors as swings in national mood, administration or legislative turnover, and interest group pressure campaigns. Potential agenda items are congruent with the current national mood."[131] It is important to note that the political stream affects the agenda setting process in an entirely new manner than the two preceding streams, in that it is motivated not by identification or advancement of a cause but instead by political motivations such as "skewering of members of the opposite political party and … efforts to obtain the support of important interest group leaders".[132]

The national mood is a critical factor in the political stream. It refers to the fact that there are a vast number of citizens who uphold similar values and support similar policies at any given time, and when a shift does happen in the national mood, it has the populist power to shift the priorities of the government.[133] This shift in national mood however is a tenuous matter, as the perception that a governing body has of the national mood, and the reality of that mood may differ. It may instead be a case of the government putting weight behind a policy based on its misconception of the national mood, and subsequently watching the policy fail to gain support from the constituents.[134]

Kingdon further differentiates organized political forces from the alternative and then focuses on how these forces can build the most advantageous conditions for political support of an agenda item. Consensus is prominent throughout this discussion, as it leads politicians into a sense of ease around supporting a policy alternative. "If important people look around and find that all of the interest groups and other organized interests point them in the same direction, the general consensus provides them with a powerful impetus to move in that direction. But if there is some conflict among the organized forces, then political leaders implicitly arrive at an image of their environment that strikes some balance between those for and those against a proposal, or for and against the emergence of an item to agenda prominence."[135] Strong united policy communities being present in the political arena are critical to the alignment of the three

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[131] Ibid., 21.
[132] Ibid., 152.
[133] Ibid.,153.
[134] Ibid., 154.
[135] Ibid., 157.

streams as their existence signifies a problem and a solution, leaving only the implementation to be undertaken. Implementation is further facilitated by their presence and unity on this stage.

Kingdon & Bio-Preparedness Policy

Returning to the question of bio-weapons preparedness policy, Kingdon's model illuminates some key challenges facing BW preparedness. Primary amongst these challenges is the identification of a problem from an otherwise accepted condition. In many ways the risks posed by bioengineering and similar scientific pursuits are conditions that are, for the most part, accepted by government and the general population. Additionally, most experts participating in the discussion of the dual use dilemma and the life sciences agree to the primacy of scientific freedom over fear of misuse. The risks inherent to these pursuits are accepted conditions and thus are not a lightning rod for change, as they are not seen as problems to be addressed.

On a larger scale, biological weapons are similarly viewed as conditions of ongoing international unrest, and even as a consequence of American nuclear hegemony on the international stage. What should be avoided at all costs is problem identification through Kingdon's "fortuitous catalyst."[136] In the context of biological weapons preparedness policy, waiting for a catalyzing event is a dangerous game, with high stake consequences including a considerable loss of human lives. It is a disconcerting notion that it will require a large scale event to bring forward policies for mitigation, especially so when presumably the resources available at that time would be taxed and diminished. Historically however, it has been the unfortunate moments following instigating events that have seen bio-weapons put on the agenda, namely in 2001 following the 9/11 attacks in New York and the subsequent Amerithax incident. While 9/11 was arguably the "jolt of falling out of bed" moment that Kingdon speaks of, the Amerithrax release following in direct succession allowed bio-weapons to ride the national mood of fear onto the policy radar.

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[136] Ibid., 103.

In 2005, the fourth and final bio-weapons release simulation was run, involving 10,000 first responders and costing over 16 million dollars. In many ways this final attempt to prove that the established policy was sufficient to respond to a biological release, marked the removal of the biological weapons category on the American national policy agenda. While some discussion continues amongst the policy community, the government attention span waned following TOPOFF3 in 2005. Speculatively, the shift elsewhere may prove to fall in line with much of John Kingdon's logic. In Kingdon's own words "problems often fade from public view because a short period of awareness and optimism gives way to a realization of the financial and social costs of action."[137] The failure, after four very expensive and time-intensive simulations, in addition to the obvious desire to hide the failings of TOPOFF 3, likely contributed to the removal of the biological weapons preparedness effort from the agenda. The creation of the Department of Homeland Security in the US, and its choice to absorb any remaining discussion on the issue, effectively pulled bio-weapons policy alternatives from the agenda and retired them back behind the closed doors of the policy community. To all appearances, national preparedness efforts died off. Likely, the shift in national mood away from the fear-heavy era that followed 9/11 further sealed the fate of bio-weapons policy.

Canada has never experienced the scale and swell of national support for BW preparedness policy as was seen in the US, likely because we have not experienced biological release on our soil. We have however seen infectious pandemic preparedness during the SARS outbreak in Toronto and in preparing for the potential of Ebola in Canada. Tomlin suggests that lesser events may instead function as a warning shot, a drawing of attention to an unidentified or under recognized problem.[138] In the case of SARS, rather than catalyzing national change, we saw policy change take place at the local level in the Greater Toronto Area. In many ways, this was a policy change for the better and a call to attention for local first responders and medical personnel. Unfortunately, the SARS outbreak failed to inform other provinces in any meaningful way

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[137] Ibid., 109.

[138] Brian W. Tomlin, "On a Fast Track to a Ban: The Canadian Policy Process," *Canadian Foreign Policy,* Vol. 5, No. 3 (November 1995), p. 5.

and, as with bio-weapons preparedness in the states, eventually faded from view. It was arguably a case of, what Kingdon refers to as, success resulting in the demise of an issue.[139] The city and provincial policy and government bodies felt that they had successfully managed the outbreak and put in place stopgaps for future events. This overconfidence may be slightly more appropriate in the face of a natural outbreak, but if the event were to be of a nefarious or engineered nature, the small, localized mitigation efforts would likely be found insufficient. In fairness, the effort made in the case of SARS was not meant to be a bio-weapons response plan; it does however function as an example of insufficient health policy which would surely fall apart in the face of something larger.

To this end, how then is bio-weapons preparedness policy to be renewed in order to have it placed, once again, on the policy agenda? By Kingdon's logic, a window of opportunity will need to be opened by aligning the problem with a policy alternative and the correct political conditions. This is no simple undertaking, and it may unfortunately take a catalytic event in order to sufficiently address the policy failures surrounding this issue. Short of that chilling notion, Kingdon's theory proves insightful and may aid in developing alternative routes for policy betterment and reform.

At the very least the policy community must unite to begin to discuss softening of the fragmentation that exists. With very few government bodies dedicating time and resources to the task of bio-preparedness, the academic community and interested members of the public have to begin to find consensus on the appropriate course of action. What will the policy proposal be, if ever there is an audience for it? When the perception of the condition shifts into a realization of the problem, the policy community must have a nuanced, cohesive view of what effective preparedness will look like in order to take advantage of the chance to speak up in its favour. In this case, it is not a threat assessment discussion; it is a discussion of response if a threat were to become manifest, regardless of the perceived likelihood. The academic community and knowledgeable members of the public need to take steps towards socially and financially responsible action on policy issues related to BW.

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[139] Kingdon, *Agendas, Alternatives, and Public Policies*, p. 109.

To this end, Kingdon posits that the category in which policy change may prove to be as important as the proposal itself. “You may not be able to judge a problem by its category, but its category structures people’s perceptions of the problem in many important respects.”[140] This is an encouraging opportunity to reframe the biological preparedness conversation into a policy category with a pre-existing support base. The consequence of the current perception of the BW problem may be to require a devastating catalyzing event to get biological weapons policy on the agenda. In that case, perhaps reframing the policy category will serve to refresh the discussion in a critically important way. Currently bio-weapons fall into the National Defence policy discussion which means that any response will be managed in a top-down fashion by the national government. In this forum we are seeing obvious signs of failure to address policy needs for BW response and there is no indication that policy change is occurring or is even on the horizon. Instead, perhaps biological weapons response policy efforts need to be shifted into a health care policy context in order to best address the key policy challenges.

Can health care workers and institutions not be the starting point from which to build a real preparedness policy? It is critical that first response organizations be deeply integrated into the policy reform, the ability to identify, to vaccinate and to quarantine all depend on the effectiveness of the health care response capability. Kingdon suggests that despite the ever-changing circumstances and needs “the government’s first instinct is to preserve the old categories as long as possible.”[141] With defence policy encompassing all issues related to weapons, national security and international conflict, the notion that a bio-weapons attack should fall into that policy category has historical precedent in its favour. That said, when the better part of the response must be health related, and when almost all long-term response capabilities also fall into that category, empowering that policy category is arguably far more conducive to progress. In the event of BW-release, while attribution is important, it is by no means the most critical function. Furthermore, the attribution effort, despite our best efforts may prove futile.

[140] Ibid., 117.
[141] Ibid., 118.

There will be no retaliation capability on a national scale for quite some time, if ever, and little in the way of defence may functions once the attack has been perpetrated.

Kingdon pushes one step further in saying that, even better than switching policy categories, building new ones allows for fresh parameters on a concept and creates the perception that a problem does exist. “The new category also creates the sense that there is a much more massive problem than if people were seeing each of the pieces separately. That in turn argues for the devotion of more resources to rebuilding.”[142] In this “Cadillac” scenario, the policy community and its policy entrepreneurs could affect sweeping change in bio-weapons, or even health emergency preparedness. In the case of bio-preparedness the drawing together of health, psychological, first response, essential service and governing experts could take place, to thoroughly examine and address the unique needs for this type of event. Such a multi-sectoral approach could strengthen the push for policy change. However, without first establishing something as basic as a general consensus that an adequate bio-response is lacking, this option seems far-fetched. A less dramatic shift of categories offers benefits such as a renewed look at bio-preparedness, a more resilient health care system, and a prospective long term and responsible funding stream.

[142] Ibid., 119.

Chapter 5.

Building Blocks for the Good Fire Department

The “Good Fire Department” is Kingdon’s expression of the notion of building defences long before they are needed. The “Good Fire Department” is one that exists prior to anything catching fire. It is undeniable that the challenge of having bio-weapons preparedness policy reintroduced to the policy agenda is formidable. If however, it could be achieved, there would be a strong best-practice discussion taking place internationally, which offers responsible and viable policy alternatives for BW event preparedness. Perhaps the creation of Kingdon’s “Good Fire Department” has already begun. The establishment of a national benchmark for necessary response capabilities would be an encouraging step towards an effective outbreak mitigation policy. The following section will outline some of the key challenges and considerations for bio-preparedness planning and policy development as categorized by Boin and t’Hart in their best practice emergency preparedness document.[143]

Identification & Natural Nature

Deciding that a BW attack has occurred and identifying the pathogen are the most important factors in terms of casualty mitigation. During the Amerithrax cases in 2001 "one of the earliest cases was identified by an emergency physician who had recently been to a seminar on bioterrorism, demonstrating the importance of educational activities and highlighting the potential for emergency departments and public health authorities to serve as a front line of defence for the community."[144] At the very minimum,

[143] Boin and 't Hart, "Organizing for Effective Emergency Management," (2010).

[144] G. Bobby Kapur and Jeffrey P. Smith, *Emergency Public Health; Preparedness and Response* (Sudbury: Jones and Bartlett Learning, 2011), p. 311.

for police, all manner of front line health care practitioners, and psychologists, should have basic access to education about biological agents, their manifestation, spread and management as this education will be critically important in the initial detection phase.

McIssac suggests four requirements for developing bio-education among responders. The first is that the education campaign has support from executives both at the responder level and at the municipal level. The second is that specialized training be contracted from experts in the field who can offer subsequent “refresher” courses as policy and bio-technology developments occur. Thirdly, he argues that clinicians need to be left to their responsibilities and a select number of physicians should be given the in-depth training to be followed by briefings to staff at lower levels. This “train-the-trainer” system is common practice amongst emergency planners as it reduces the scale of the education campaign and yet effectively transfers basic information. It is this type of cost-saving consideration that will allow for planning efforts to be responsible in nature. Finally, McIssac suggests entrenching a bio-response component in the medical school curriculum; some nursing programs offer it, and yet few medical school programs do.[145] Despite the perceived size of an undertaking of this manner, even a single individual within each larger unit who can disseminate knowledge further would have substantial influence over the level of understanding among health care professionals.

The ability to identify the pathogen used to sicken victims in a timely manner is an effort inextricably linked, on one end to education, and on the other to communication. The CDC utilizes a system of international monitoring to track and identify recurring disease outbreak. While this is an effective oversight mechanism, it relies heavily on the input from health care practitioners who must be able to first identify the agent in a timely and accurate way. Moreover, it is very likely that illness will not be attributed to a BW release until such time when there are clusters of cases.[146] The cross-reporting of cases must happen in order for the CDC disease tracking system to function efficiently. "Thus it is important that urban and health planners work with first responders to assess the early warning needs of urban areas and design appropriate information

[145] Joseph H. McIsaac, *Hospital Preparedness for Bioterror; a Medical and Biomedical Systems Approach* (San Diego: Academic Press, 2006), pp. 10-11.
[146] Kapur and Smith, *Emergency Public Health*, p. 328.

systems that can support local decision making and harmonize with state and federal systems."[147] In agreement with the prescription offered by Matthew and McDonald, these types of communication pathways need to be established and reinforced early on in planning development and entrenched in all planning documents. Any flaw or delay in the communication between hospitals and the oversight agency could warp the perspective on the spread of the disease, potentially misidentifying the quarantine zone, or misdiagnosing the spread pattern and its origin.

Mobilization and Organization

Mobilizing and organising refers to the efficient drawing together of necessary response resources as well as their subsequent deployment into the field. "In many cases the most debilitating communication barriers are culture: lack of pre-existing communications channels and routines, lack of trust between organizations, predominance of narrow, mono-disciplinary or localized definitions of what's going on and what's important to know and divulge to others."[148] Arguably, the relationships that are most gravely affected by this communication breakdown are those between policing organizations and public health organizations. The need for pre-established communications chains will, in the event of a release, "mutually reinforce their detection capabilities so as to minimize delays from inefficient information exchange." [149] This will in turn enhance source detection and means and location of release, allowing for appropriate medical response features (quarantine/evacuation, protective equipment, decontamination etc) to be mobilized.

Flexibility in decision-making is touted as the key to effective front line response. Especially in the context of the city, immediate action will be required, long before provincial or federal actors are in play. City-level responders must be empowered to take action and must be given the resources to do so. "In crises and disasters, there needs to

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[147] Richard A. Matthew and Bryan McDonald, "Cities Under Siege; Urban Planning and the Threat of Infectious Disease," *Journal of the American Planning Association,* Vol. 72, No. 1 (Winter 2006), p. 113.

[148] Ibid., 362.

[149] Kellman, *Bioviolence*, p. 171.

be the capacity to improvise and make intuitive judgements on the basis of incomplete information. Refusing to make urgent decisions in the absence of complete and accurate information is an avoidable failure."[150] In order to make important judgements calls, lower level officials require the authority and flexibility in actionable options to suit the requirements of the specific situation.

In the context of biological response, major decision-making will be required early on in order to halt the spread and preclude unnecessary, socially destabilizing panic. Once an attack has been confirmed, which will happen likely at the hospital or primary care physician level, there should be no delays in putting in place the necessary measures, be it quarantine or other, to prepare for infection control and limit the movement of high transmissibility agents. It will thus be very important that hospital administrators, police command and municipal leaders have emergency contact channels ready to facilitate communication and relationships long before an event occurs, and to allow them the decision-making flexibility to act based on real-time, situational circumstances.

When building communication and organization planning, adapting a system like the Hospital Emergency Incident Command System (HEICS) may be ideal. While there are a number of variations on systems of this nature, the key importance is the advanced development of a communication structure that serves the characteristic, resources and purposes of the area. HEICS includes a "predictable chain of management, a flexible organization chart, prioritized response checklists, accountability of position function, improved documentation, common language to promote communication within hospital and with outside agencies [and] cost effectiveness."[151] The key to this system is a needs-based flexibility of authority and service personnel. If they are needed or if a strategy change is needed, the system can accommodate the recalling of staff or the reorganisation or personnel. [152] Thus this system facilitates clear

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[150] Boin and 't Hart, "Organizing for Effective Emergency Management," p. 362.
[151] Ibid.
[152] Masci and Bass, *Bioterrorism; a Guide for Hospital Preparedness*, p. 55.

communication and additionally offers the necessary flexibility to allow for adaptation to an ever-changing situation.[153]

While the city level response is the building block to a number of other levels of response, any "plan must be specific about the extent and limitations of its jurisdiction."[154] It is common that in the planning hierarchy, the municipal level response is the triage phase and, once the post-event triage stage is complete, the provincial and federal coordination effort steps in.[155] As such, the “front line” mobilization and organisation on the part of the municipality will require efficiency and empowerment of authority of the police and health care authorities for the initial period. Once that aspect has been stabilized, handing over coordination to provincial and federal level responders will be more easily negotiated. That is not to say that the municipal response slows, but simply that organization and collaboration between agencies, can at this point, be shifted upwards.

Containing and Mitigating

Containment and mitigation are the true challenges of a bio-weapons response. This is not a natural outbreak, but a targeted attack with enhanced qualities and so should be thought to present different, perhaps more severe repercussions. Boin and 't Hart qualify the containment effort as the "using [of] available resources effectively and

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[153] Regardless of the network formation that is preferred, there are some clear best practices for communication structures. "Networks fall apart when: information does not travel smoothly back and forth within the system, creating blind spots, gaps and biases in sense-making/diagnosis." As such networks must embody the following: A. "The articulation of a set of common purposes, based on a deep-rooted awareness of interdependency among the parties involved…” B. A decision making structure that is supported by all parties, C. an agreement to eliminate in-fighting with an eye towards upholding the common purpose, D. A scope of included organizations that is not too limited, as they often are. This includes any potentially valuable resources; in the case of bio-response, this would likely include resources like psychological services. E. And "…interpersonal trust between key representatives of different units…" which will require development and continuous cultivation irrespective of bio-event. Paul t’Hart, “Organizing for Effective Emergency Management,” *Royal Commission on the Victorian Brush Fires,* (April 2010), p. 11.

[154] David Alexander, "Towards the Development of a Standard in Emergency Planning," *Disaster Prevention and Management,* Vol. 14, No. 2 (2005), p. 162.

[155] Ibid.

efficiently to contain the agent of threat and destruction so as to minimise damage to lives and property."[156] Despite the apt word choice, their best-practices document does not refer to a biological event, and yet this category directive makes up the heart of a bio-response plan.

Surge capacity refers to the ability for hospitals to deal with a steep increase of patients in a short period of time and manage illness in extreme quantities. The first step in this process is triaging the sick, the infected and the W2 into appropriate groups for care. Under usual circumstances, this process involves patient paperwork and tracking. "Under attack conditions, the need for express triage would rapidly become apparent. Hospitals should include, in their pre-event planning, processes by which triage can be streamlined. For example, preassigned medical record numbers and abbreviated assessment forms may be created for implementation under such circumstances."[157] In all possible scenarios, this efficiency should be implemented for paperwork and tracking needs. The realities of managing sick and worried patients in unusually high numbers should be seriously considered in planning policy.

The other major concern in preparedness literature is the ability to isolate patients. “In an average hospital the number of isolation rooms that could be considered viable for bio-event is dangerously few. Temporary isolation chambers may need to be explored in facilities where the isolation capacity is less than a few dozen."[158] Quarantines are the unfortunate next step and yet are a vitally important consideration in the face of a major outbreak. As was evident in the analysis following all three of the TOPOFF simulations, it was concluded the failure to hold quarantine was the single largest factor that contributed to the failure of the simulations and the resulting high number of casualties. With its substantial challenges and the probability of uncertain authority, the question really ought to be “Should an attempt to impose quarantine even be made, not to mention relied on?” The importance of holding quarantine is evident in the case of a major pandemic, and yet the logistical realities of quarantine are

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[156] Boin and 't Hart, "Organizing for Effective Emergency Management," p. 360.
[157] Masci and Bass, *Bioterrorism; a Guide for Hospital Preparedness*, p. 64.
[158] Ibid., 68.

substantial. Barry Kellman equates it to a siege, in reverse.[159] In its most advanced form, it requires that groups of both sick and healthy victims be held together very likely against their will, until the time when then disease is being managed successfully, and there is confidence that the spread will not continue. "In a democratic society, coercive public health powers should be carefully justified. We have to balance the public health interests of society against the freedom of the individual."[160]

Rather than moving directly into an enforced quarantine, less resistance may be met if self-isolation practices can be adopted within a region. If the public can become educated in the basic medical facts necessary to detect and monitor disease outbreak, and additionally can voluntarily isolate themselves, the number of cases who require quarantine can be lessened and the spread can be quelled. In the SARS case, it appeared that Canadians were willing to accept the limitation of their freedom in service of general public health. The concern remains however, that in a more severe instance, quarantine enforcement would prove difficult.

The argument continues that "the legal and logistical difficulties in applying and enforcing quarantine are daunting" and it "may unjustifiably expose uninfected individuals to the contagious disease if it does appear in the quarantined population…. Further, long incubation periods may mean infected individuals not showing signs of disease have left the infected area before becoming ill. …Quarantine … may not be medically justifiable or logistically feasible in most circumstances."[161] The other challenge raised by reliance on quarantine is the requirement of policing and monitoring staff to be diverted to its maintenance. With limited policing resources, in the face of a major health crisis, there are potentially too few extra personnel to enforce and monitor large quarantined populations. The challenges to effective and successful quarantine are

[159] Kellman, *Bioviolence*, p. 186.
[160] Ries, "Public Health Law and Ethics," p. 4.
[161] Masci and Bass, *Bioterrorism; a Guide for Hospital Preparedness*, p. 43.

formidable and must be carefully considered before being used in preparedness strategies.[162]

Vaccination Programs

Vaccination programs are laborious undertakings and hinge on the assumption that the disease can be treated with a pre-established vaccine. Assuming it was possible to obtain large numbers or viable vaccines in a short period of time, which in cases like Ebola is simply not yet possible, their value would be limited due to two factors. The first goes back to the issue of the spread factor. By the time symptoms are presenting in victims, and the agent itself has been identified, potentially hundreds, even thousands may have been exposed, either directly or part of the second generation of the spread. Further, it takes days or weeks for the body to develop necessary antibodies in order to be able to fight off the illness, thus delaying containment.[163] "The cost of a delayed response to an anthrax attack would be staggering…. In a model city of 100,000 people, the number of deaths is 5,000 if you start a vaccination program on day one after the attack, versus 35,000 on day six."[164]

Delayed response aside, and even if the disease can be identified early, fully developed and tested vaccines do not exists for a large number of the potential release agents. Vaccines require a substantial amount of time and care in the development

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[162] If, as in the case of the SARS outbreak in Asia, the population will not submit to self-isolation and quarantine is required, numerous features should be considered, and challenges faced. Barry Kellman argues for a number of “must-haves” to increase the likelihood of successful quarantine. The first is early detection; as with so many of the response strategies, promptness in detection and identification is critical. If the disease has an opportunity to spread beyond quarantine limits, the integrity of the effort is severely compromised. Along the same lines, Kellman mandates that quarantines should be intended for short term use as the longer they persist, the more the numbers of will grow along with fear and resistance to the restriction. Finally strong leaders must be embedded within quarantines; leaders who are trained to manage the specific challenges of this type of environment and public support for leadership actions. In a fearful environment, strong leadership and credible public authority will decelerate the panic and resistance to response measures. Finally, Kellman insists on maximizing the restrictions on public transit options as they represent perfect conditions for the transmission and mobility of disease. - Barry Kellman, *Bioviolence; Preventing Biological Terror and Crime,* (Cambridge: Cambridge University Press, 2007), p. 186.

[163] Garrett, "The Nightmare of Bioterrorism," p. 77.

[164] Ibid., 79.

process and without knowing which pathogen will be used, vaccines cannot be relied upon as sufficient for mitigation. In the Ebola case, by fortunate coincidence, a partially developed vaccine was available for initiating a human testing phase in early October 2014 even though it was not expected to be available for distribution until December or January.[165] In the meantime, over 27,609 total cases presented, 11,261 of which died.[166] With no guarantee that a viable vaccine will be in place, it is imprudent to then base a response plan on the assumption that vaccination will halt the spread of a disease.

Complicating reliance on vaccines further is the fact that they are often specific to a single variation of a disease. More unsettling is the development of vaccine-resistant variations, as seen during the Soviet development program may render immunization programs useless. Additionally, vaccination requires enough administrators to effectively immunize large numbers of patients to allow for mitigation to succeed. Simulations showed substantial reduction in the number of health care providers simultaneously with a substantial increase in the number of patients seeking immunization or vaccination. In a health emergency the expectation should be that health care practitioners will quickly become overwhelmed and may fall ill themselves, given their proximity to high numbers of infected patients. Finally, for vaccine stockpiles currently in place, the challenge is the integrity of stockpiles as they are delicate, high maintenance resources with finite shelf lives. Their integrity is commonly called into question. In 1999, the stockpile of smallpox vaccine was found to be unsafe for human use as the samples were compromised by the degradation of the rubber stopper used to maintain vacuum pressure. "Although the rest of the world's vaccines reserves have not undergone similar scrutiny, experts do not have much confidence in those either."[167] In the case of vaccination programs, there may be a fine line between preparedness and misplaced over-confidence.

Maintaining first responder safety is paramount in the event of a bio-release as they will be the most important personnel in systemic operational response. "Reports have indicated that a substantial portion of hospital workers would be unwilling to report

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[165] Will Campbell, "Testing Begins on Canadian Vaccine," *Edmonton Journal*, October 14, 2014.

[166] The Data Team, "The Toll of a Tragedy," *Economist*, July 8th, 2015, http://www.economist.com/blogs/graphicdetail/2015/07/ebola-graphics.

[167] Garrett, "The Nightmare of Bioterrorism," p. 77.

for duty in the event of such an attack. …[T]he protection of staff in the event of an actual or expected attack goes far beyond the simple stocking of personal protective equipment (PPE) to be used by first-line responders."[168] Complicating the issue of health care worker protection is the possibility that these groups will refuse vaccination all together. In a US example, some health care workers refused to receive preventative vaccines without indemnification from the government in the case that they have negative subsequent reactions (permanent health impairment or death).

While the stockpiling of PPE and vaccines ear-marked for staff is an essential precaution and will be certainly be required in the face of any outbreak, it is important to remember that the “fear factor” is also felt by first responders and is not limited to fear for oneself, but extends to fear for families and children. With few first responders, be they health practitioners or otherwise, who are capable of managing a biological event, it is essential that they be secured first and considered the most vulnerable population. Bio-response planning will need to take into account staff safety and health, staffing shortages, and a near certain-need for psychological services.

In the case of the Ebola outbreak, four of the five confirmed cases outside of Africa were health care practitioners who had treated infected patients. Still more devastating, the UN has reported that of 240 infected health care workers in Guinea, Liberia, Sierra Leone and Nigeria, 120 of them have died in the service of treating Ebola patients.[169] In the face of staff shortages, relationships and agreements with clinics, part-time health care workers, medical students, nursing temp agencies and other hospitals must be engaged to provide knowledge and skills[170] as "communication with medical providers working outside the hospital setting remains a particularly difficult challenge."[171]

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[168] Masci and Bass, *Bioterrorism; A Guide for Hospital* Preparedness, p. 56.

[169] Jonathan Paye-Layleh, and Sarah Dilorenzo, "Ebola Outbreak: The Worst is Yet to Come," *Globe and Mail*, September 8, 2014.

[170] Masci and Bass, *Bioterrorism; A Guide for Hospital* Preparedness, p. 68.

[171] Ibid., 45.

Similarly, safety and security of hospital infrastructure is a key consideration. With fear and panic heightened, there is often a 'run' on antibiotics and medical services, similar to that which was seen in the TOPOFF simulations. McIssac suggests a three-pronged planning solution to ensure hospital security. As hospitals are singularly important institutions in the face of bio-event, policing services will need to, at least to some degree, make hospital safety a priority. This requires the development of dedicated communication systems that circumvent those established for the public. Further, McIssac suggest that hospitals encourage partnerships with private security companies, to be activated in the event of a release. The simple fact of having clear and authoritative direction as a patient enters the hospital may prove to be the difference between panicked populations and manageable surge. Finally, in a last resort scenario, McIssac recommends the consideration of lock-down protocol. This may include the limiting of access to a single point of entrance that can be more easily managed.[172]

Communication within and between hospitals for the tracking of vaccines, available beds, staffing shortages and bio-expertise is another important consideration for containment and mitigation. With a high demand for vaccines, antibiotics, isolation space and staff, the interrelationship between hospitals and other care facilities must be porous. While the communication and decision making structure will likely provide the formal reporting mechanism, informal communications and information sharing will be necessary. Information pathways will also need to be developed and tested well ahead of time. The use of handheld radios, intercom systems, status boards, runners between facilities and training in the use of the aforementioned, in addition to basic land lines, will play an important role to open up as many possible communication and monitoring pathways as possible.[173]

Coordinating and Collaborating

Coordinating and collaborating are a call for the incorporation of non-traditional resources that can bolster the response effort. Often these take the form of community-

[172] Joseph H. McIsaac, *Hospital Preparedness for Bioterror; a Medical and Biomedical Systems Approach* (San Diego: Academic Press, 2006), pp. 10-11.
[173] Ibid., 8-9.

based, grass-roots efforts, public-private partnerships or government organizations that, in collaboration with responders, can offer some relief.[174] In reviewing lessons learned in the 2003 SARS outbreak in Toronto, absenteeism across the board was a major issue. In an effort to combat the reality of breakdowns in business and government agencies not involved in the bio-response effort, the creation of Business Continuity Planning (BCP) has emerged as a form of mitigation planning. "In a survey conducted by the Ontario Chamber of Commerce, the majority of employers indicated that preparedness plans were essential to successfully weathering the H1N1 pandemic. However, less than half of the respondents said they have a pandemic plan in place to protect their operation from business disruption."[175] These BCP's could potentially be the forum for much of the learning and preparedness for the public, and in the case of a bio-event could allow for as many people to maintain day-to-day responsibilities in the face of uncertainty.

The drawing in of psychological services to manage some of the non-medical effects of an event may again prove to reduce pressure on medical and policing resources. If planners can engage private practices in response strategies, the mental health response capacity will increase. Enabling the healthy population to continue to support regular civil and economic functions may in turn allow those functions to persist or at least rebound more effectively. Linking psychological resources into the response network could further function as a tool of education for both medical staff and psychological staff, thus widening, even marginally, the network of functional respondents following a release.

From examining past simulations and events it is possible to observe three major failings. The first is the issue of surge capacity, or the ability to triage and treat both those infected and the walking well. It has been the case throughout all bio-responses that the initial and continued surge far surpasses the capability of health care infrastructure. In fact, the surge of the ill can result in the absenteeism of health care staff, for fear of becoming ill themselves, thus perpetuating the shortage. The second

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[174] Boin and 't Hart, "Organizing for Effective Emergency Management," p. 360.

[175] Susan Novo, "Pandemic Planning: Lessons We've Learned," *Benefits Canada,* Vol. 34, No. 5 (May 2010), p. 34.

issue encountered in many of the major simulations was the inability to encourage the flow of decision-making and communication through all levels of response. This issue appears in many facets of emergency management, not just biological response, and proves to be a substantial obstacle for planners. In the context of biological response, the importance of efficient and educated decision making is two-fold, as containment of a pandemic is the single most important mitigation factor.

Informing and Empowering

Informing and empowering refers to the movement of clear information outward to the public. This is a vital step in managing fear, panic and uncertainty, which will in turn reduce the surge of W2 and potentially the breach of quarantine or spread of disease. Similar to the need for general education for health care practitioners, the public will also need to have resources at their disposal for self-education. As was evident during the 2001 Anthrax release, there is a need and a desire for this type of information. The public wants to have the correct information and instruction, and yet, "few concrete steps have been taken to plan prepare, and educate the population about what to do in the event of a major crisis. Yet such actions could significantly reduce the hordes of W2 likely to demand medical care although they do not display any symptoms of exposure."[176] This type of communication needs to come in the form of clear, actionable steps for individuals and families.

Susan Novo suggests, "providing clear information regarding policies and procedures is essential for building trust and containing a virus. In conjunction with a pandemic plan, the impact of clear communication should not be underestimated. Guidelines and direction regarding basic principles such as hygiene and hand washing techniques will help to reduce the spread of the virus."[177] In addition, it is imperative that a single message be provided to the general public and that that message be translated into numerous languages and available in numerous mediums. In the face of a bio-event, the limiting of fear and panic may be equally as important as the management of

[176] Matthew and McDonald, "Cities Under Siege," p.113.
[177] Novo, "Pandemic Planning," p. 34.

disease. The two become inextricably linked, if there are rushes on hospitals or attempts at mass exodus. The goal in empowering and informing the public is to help people to manage fear, uncertainty, and concern for their families and develop trust in the management system.

Chapter 6.

Conclusions

One of many consequences of the existent biological weapons (BW) is that their strategic value is so inherently great. Given the sheer devastation that BW can inflict, and because the devastation is neither as localized as the conventional alternative nor as complex and symmetrical as a nuclear exchange, a BW attack will always appear inherently valuable to both terrorist groups and insecure state leaders. Russia exemplifies this fact by continuing to possess its non-declared BW program, while at the same time possessing thousands of nuclear weapons.

In addition, the easily transmissible nature of the BW, accompanied by the human dread of disease, makes BW uniquely damaging. Unlike other threats in the CBRNE category, BW are singular in that they are typically transmissible from host to host. The actual disease is sufficient to make BW gravely concerning. The intense fear that rises from the potential of becoming sick effectively infects the remainder of the population regardless of their contact with the disease. This threatens total psychological and social destabilization of the entire population. The fear and spread factor, coupled with the masking value of naturally occurring diseases, make bioweapons attractive alternatives to other WMD options, especially for actors covertly attempting to counter-balance American military hegemony.

Despite the obvious advantages to BW-procurement, the barriers to BW-development likely will inhibit all but the most determined from building BW. With risks inherent to life sciences, and the dual-use nature of much of the necessary equipment, BW development is however, still feasible. There will always remain those who have both the resources and the motivation to seek out perceived BW advantages. The conclusion is thus: a biological weapons threat does exist because many state actors

and a few non-state actors have both motive and opportunity. Furthermore, if a bio-release were to take place, the resulting fear and illness would hold the potential to be both widespread, beyond national borders, and deeply damaging to societies.

With the consequences of a BW event being so high, the debate that surrounds the likelihood of an attack being perpetrated seems secondary if not completely inadequate, to the scale of policy challenge. Suffice it to suggest that a state-sponsored event would likely be a more well-resourced effort, would have the power and intelligence of top scientific minds, and would be set on maximum destruction with the minimum opportunity for attribution and retaliation. While there is some debate about the amount of proliferation of Soviet scientists that took place after the fall of the Soviet Union,[178] "one must assume that whatever genetically engineered bacterial and viral forms were created […] they remain stored in the culture collections"[179] at the very least. Further, accepting the threat that continues to emanate from Russia, Syria, Iran and North Korea, BW programs make the preparedness conversation undeniably important. With the well-established existence of designer smallpox strains, more virulent anthrax bacteria and unknown viral-bacterial combinations, created and masked by advanced bio-engineering, there can be no better case for the need to plan, especially in light of the interconnected vulnerabilities inherent to the globalized world.

If a terror organization were to be the perpetrator, the likely result would be a smaller more rudimentary BW-event although the effort of scaling up casualties by repeated releases could allow for substantial effect.[180] Terror organizations, becoming bolder and more resourced, should not be dismissed from threat discussions. Despite the notable challenges pursuant to BW development, if the goal is to inspire terror and draw attention, bio-weapons are an attractive next frontier.

In either case, if an event is successfully executed, preparations made in advance are essential. While this is not a case for panicked, fiscally and socially

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[178] Leitenberg and Zilinskas, *The Soviet Biological Weapons Program,* p. 712.

[179] Ibid., 701.

[180] Gerald L. Epstein, "Biosecurity 2011: Not a Year to Change Minds," *Bulletin of the Atomic Scientist,* Vol. 68, No. 1 (May 2013), p. 31.

irresponsible preparedness measures, it is an argument in considering the risks and basic preparedness standards. “Because of difficulties inherent in biological weapons detection, […] the bulk of preparedness involves post attack scenarios, which require clear and coordinated response plans to ensure that an attack affects the smallest number of people possible.”[181] In review of both simulation and naturally occurring outbreaks, analysis shows a clear picture of broken-down communication, failure to diagnose and contain illness, and inability to manage surging worried and ill.

Epstein aptly argues that the poor response capability is the “result [of] extraordinarily daunting technical challenges such as expense, time, and scientific uncertainties involved as well as the logistical difficulties that come with distributing millions of doses of medicine quickly enough to forestall disease.”[182] In fact this has been the experience following numerous TOPOFF simulations; the realities of entrenching preparedness into each critical institution, developing vaccination programs, managing surge, attribution and containment, are both expensive and highly complex. Regardless, if a BW attack is carried out, underdeveloped policies and plans will surely be pushed past their breaking point, the consequences of which are significant.

With policy failures being evident in all areas of previously discussed pandemic and biological events, there can be no doubt that the measures currently in place will do little when tested by an unforeseen, unknown real-world transmission event. As such, it is imperative that preparedness policy be placed back in the conversation and on the agenda in order to encourage more careful safe guarding specific to BW events. The added advantage to this effort is that all first response and medical entities that receive measures of preparedness will benefit from being more resilient even if bio-release never occurs. There is no loss factor if all size and manner of pandemic events can be withstood, rather than only those that we deem most likely.

There is also a measure of optimism to be taken from the Ebola crisis and the response effort undertaken in Africa and abroad. Despite numerous formidable social

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[181] Rebecca Katz, “Public Health Preparedness: The Best Defense against Biological Weapons,” *Washington Quarterly,* Vol. 25, No. 3 (Summer 2002), p. 71.

[182] Epstein, “Biosecurity 2011,” p. 32.

and cultural challenges, the spread of Ebola was controlled and international infection was successfully contained. It is critical, however, to note that the Ebola outbreak, as with the SARS outbreak, was a naturally occurring event. If management of natural disease poses a grave challenge, it should not be assumed that the response to a weaponized pathogen would also be manageable. Without some key policy inclusions that cater singularly to the BW capabilities, no mitigation policy will succeed. It is important that an effort be made to have those policy inclusions added to the agenda.

John Kingdon's model for agenda setting, while pessimistic in nature, proves to be exceptionally valuable in understanding how the discussion on bio-weapons preparedness has failed to garner the attention of policy makers and government actors. Most formidably, bio-preparedness is simply not a condition for which action will be taken as it is not perceived to be an imminent problem. Even in the case that the BW threat is identified as a problem in need of addressing, the fragmentation of the policy alternatives and expert opinions instil little faith that any action being proposed could gather traction. The issue of budgetary concerns and national support for BW-preparedness spending further inhibits progress. Analysis of Kingdon's agenda setting model quickly indicates that policy action in this field is both laborious and stalled, and will require reinvestment on the part of government and policy experts in order to be jump-started.

The unfortunate conclusion is that policy change is not yet on the horizon for BW preparedness. If Kingdon's pessimistic model for policy change is in fact accurate, BW policy advocates will need a catalyzing event. One that is not too catastrophic, and yet catastrophic enough to draw serious attention to the failures in the preparedness model. The obvious down side to this scenario is the unavoidable resulting casualties that will occur, thus making this "solution" an abhorred catalyst for change. Kingdon calls upon policy communities to put aside differences and focus instead on a singular policy direction.[183] This imperative is critical if BW preparedness is to be taken seriously on the policy stage and in the preparedness conversation. Due to the unavoidable devastation

[183] Kingdon, *Agendas, Alternatives, and Public Policies*, p.157.

pursuant to a catalyzing bio-event, the current opportunity to establish advanced preparedness must take place at the earliest moment.

Kingdon is the bearer of bad news but he also indicates the potential first steps to renew momentum for policy reform. Kingdon makes a strong case for ensuring that policies are being promoted into the correct agenda category, that the issues are being defined by the most advantageous circumstances. If BW preparedness can be reframed and reprioritized into a prominent policy category perhaps it is possible to avoid a catalyzing event as the only stimulant for policy change. With the issue of bio-preparedness touching numerous policy categories such as defence, health, public safety, the Kingdon model offers two re-categorization options to encourage new perspective on the issue. First, to select the category that is most well-resourced and to reframe the problem to allow it to fall within the parameters of that category. In the case of bio-preparedness, that category would surely be health policy, as a majority of the response challenges fall to the health care sector. Extending the discussion to include bio-preparedness would be a logical and strategic move.

Second, Kingdon argues that the best option for kick starting policy action, if it has the potential to gain traction as a policy option, is the creation of a new category all together. The benefits to this method include institutionalizing bio-preparedness as a problem to be managed, not simply a condition to be accepted. For this second method to work, the swell of consensus, policy entrepreneurship and sheer force of the community would need to be overwhelming. While the conditions for the second option are clearly not currently being met, the notion of shifting policy categories in order to bring new perspective to a policy challenge is opportune for bringing necessary parties to the table and turning them in a similar policy direction. Perhaps Kingdon's suggestion to reframe is just the opportunity needed to begin to address BW preparedness.

Challenges to the policy prominence of bio-preparedness are formidable under current conditions. But there remains a strong number of best-practice experts who are discussing the preparedness challenges inherent to bio-weapons, and they and their work should not be discounted. The work being done on quarantine strategies, on vaccination and inoculation practices, on public education and critical communication

procedures, is representative of a policy community working, albeit at times in diverging directions, towards “softened” policy alternatives. The existence of these actors in a constant dialogue signals a persistent discussion of possible reform measures and more hopeful still, the substantive evidence that new thinking is being brought to bear on a grave and persistent threat.

In conclusion, the challenge of BW is neither new nor simple and improved preparedness for the eventuality of a bio-release is only one piece of the solution to the BW problem. Internationally there must be true disarmament and those state actors who are well known to have undeclared programs must be taken to task and their programs must be eradicated. Even international treaties have not proven sufficient to deter BW procurement in the cases of insecure nations and nefarious non-state actors. Perhaps in the case of countries like Russia, a good first step would be as simple as beginning to change the adversarial tone of the relationship and open lines of communication in a way that can foster a new era of BW disarmament. While the above analysis has not been one of international non-proliferation, there is no doubt that that is a key step if we are to eliminate the BW threat all together. With the hope that a BW-free world will one day become reality, a respect for the potential consequences in the interim is important. The reality is such that were a major BW event to occur, no amount of preparedness could ever completely protect a population. Instead we should seek to put in place socially and fiscally responsible measures so as to mitigate and respond to the best of our ability. The first step will need to be the formidable task of once again re-establishing the enhancement of BW preparedness on the policy agendas of Western Governments.

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