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Common Misconceptions About Biological Weapons

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INTRODUCTION

The COVID-19 pandemic serves as a loud wake-up call to the systemic and strategic effects of biological threats. If not rapidly detected and addressed, infectious diseases can in short order infect millions, kill hundreds of thousands or more, depress economies, and heighten tensions among nations. Institutions and systems established for response and resilience to such threats can be stretched to the point of failure, leaving affected societies even more vulnerable.

This experience is driving both policy makers and the general public to pay more attention to the threats posed by the deliberate use of diseases as weapons. This discourse is bringing to light several unfortunate misconceptions about biological weapons. These include misperceptions that biological weapons programs would be irrational, that they would not serve as attractive weapons given the risks involved, and that the world has institutions and processes strong enough to effectively deter, uncover, and eliminate biological weapons programs.

If such misconceptions persist, the international community will be left ill-prepared and vulnerable to this threat, with potentially-catastrophic consequences. This paper therefore seeks to highlight and address points of confusion regarding the character of biological weapons threats.

BACKGROUND

Around the middle of the 20th century, the world's great powers began pursuing biological weapons programs with vigor. The United States, for example, formally initiated its bioweapons program during World War II in anticipation of the future use of bioweapons by its enemies who had such programs. The Japanese nearly launched a weaponized plague strike ("Operation Cherry Blossoms at Night") against the United States in 1945 in the waning days of the war, but surrendered before the attack was launched.

Bioweapons development activities reached terrible heights during the Cold War, with both the United States and Soviet Union operating large, industrial-scale programs. With technologies considered rudimentary by today's standards, government scientists developed myriad infectious agents for use as weapons against humans, animals, and crops. In the 1980s the Soviet program worked to perfect large-scale production of the Variola virus for use as a mass casualty smallpox weapon. Soviet scientists are also believed to have used early genetic engineering tools to attempt to create even more virulent versions of smallpox and plague. Prior to 1969, when President Nixon ended the United States biological weapons program, the U.S. military also developed capabilities to produce at scale, weaponize, and deliver bacillus anthracis, the causative agent of anthrax, and other deadly bacterial and viral pathogens like Venezuelan Equine Encephalitis.

While the Biological Weapons Convention officially made the development, stockpiling, and use of biological agents or toxins for offensive purposes illegal when it entered into force in 1975, bioweapons activity did not fully stop. The massive Soviet program continued for years after the entry into force of the Convention, and other nations are suspected of continuing to develop these agents.

In this context, it is important to understand where biological weapons fit in modern concepts of security and conflict. Each of the misconceptions addressed in this paper stems from a common discounting of the strategic effects of bioweapons and a misunderstanding of the calculus a would-be user of these weapons might apply in deciding to pursue them.

It is more critical than ever that we identify and dispel each of these dangerous misconceptions about bioweapons, which will otherwise hold back progress in building stronger frameworks to fully make them weapons of the past.

MISCONCEPTION #1: BIOWEAPONS ARE STRATEGICALLY IRRATIONAL

In spite of billions of dollars spent by state actors on bioweapons programs, the international community has made significant strides in preventing such weapons from being commonly used in conflict, with some countries even destroying their bioweapons stockpiles. The successes behind this history, however, have contributed to a persistent misconception that the development (and use) of biological weapons is strategically irrational, making it unlikely that nation-states would pursue or use them going forward. But is this actually the case?

Perhaps the clearest evidence of biological weapons' strategic utility is the large number of states that once had active programs. This validates legitimate concerns that several nations may value the offensive potential of biological agents, and that more may do so in the future.

Biological weapons meet several strategic goals that may render them attractive to a potential user. Despite being finicky, as a weapons class they provide relatively inexpensive access to weapons of mass

destruction and the corresponding intimidation factor. Compared to nuclear and chemical weapons, biological weapons are perceived to be easier to manufacture, especially clandestinely due to the dual-use nature of the materials, equipment, and techniques required for their development. Attacks with biological weapons may also be harder to attribute, since the effects of biological weapon attacks could appear to be a natural outbreak until causes are well-investigated. As such, actors considering these weapons might be attracted to the potential for deniability when used. For the offender who wishes to sow chaos without attribution, biological agents could be highly appealing.

A more attainable weapon of mass destruction may be increasingly enticing as the broader military arsenals of the United States and other superpowers become increasingly harder to compete with. As the United States and its near-peer adversaries continue to compete and develop capabilities designed to undermine one other, many other nations increasingly seek asymmetric capabilities to advance their political interests. In this security environment, some nations may see advantage in probing the most powerful actors' other vulnerabilities -- such as via biological warfare -- to drive a more level playing field.

Historically, states have seen a stockpile of bioweapons as an in-kind deterrent against the use of bioweapons or other weapons of mass destruction against them. Though the United States may be able to forgo the deterrent advantage of bioweapons, one could imagine smaller states, perhaps especially non-nuclear ones, making the opposite calculation. Indeed, while the power of biological weapons as a deterrent has been debated among experts, precedent sets deterrence as a likely strategic motivation for state leaders.

Table: Possible Strategic Advantages of Bioweapons	
Less expensive than other weapons of mass destruction	Rally domestic pride and nationalistic support
Easier to manufacture, and to do so clandestinely	Assert regional hegemony
Challenges to accurate attribution	Use as a force multiplier
Intimidation of enemy states	Tunable harm and diversity of agents
Use as an in-kind deterrent	Ability to sow chaos
Asymmetrical economic impacts	Utility in covert operations

Past decision-making may prove relevant to current motivations, but it would be remiss to omit how present circumstances shift the perceived strategic advantage of bioweapons. COVID-19, although almost certainly not a bioweapon, illustrates how a single transmission event of a natural biological agent can result in death and devastation worldwide and reshape global power dynamics, as some countries like the United States are taking significantly longer to recover than others. The intentional use of an equally or even more devastating biological agent with similarly asymmetrical effects could prove advantageous to certain countries, making the potential harms of risky bioweapon deployment on the citizenry's welfare secondary to the jingoistic goal of promoting the state's status in the world.

From the outside, it may appear that a political leader's actions are against their strategic self-interest. Yet this often reflects misunderstanding across nations and cultures---not irrational decision-making. Ideologies and national myths can be powerful motivators, especially when they complement rational strategic goals. For example, while much of the Cold War was waged to protect their material interests,

the US and USSR also fought to achieve the separate but related goal of promoting their ideologies internationally. Similarly, China's strategic ambitions in seeking reunification with Taiwan are supercharged by an adamant belief in the One China principle.

The use of chemical and biological weapons by Rhodesia (now Zimbabwe) in the 1970s in its struggle against a nationalistic African insurgency showcases the perils of regional conflict combined with bioweaponry. These forces are poised to become only more powerful in a world growing increasingly nationalistic. Regional animosity is the frequent cause of substantial violence within and between states. Ideological motives like these have inspired and will likely continue to inspire political leaders the world over to consider the option of pursuing biological weapons as a means to assert the appearance of regional hegemony or global dominance.

MISCONCEPTION #2: BIOLOGICAL WEAPONS AREN'T TACTICALLY USEFUL

At least part of the misconception around the strategic use of bioweapons is related to another: that biological weapons are *tactically* flawed and therefore have no real place in conflict, including due to the threat of infecting a nation's own forces. This misconception has been particularly persistent, and has led to the underestimation of the biological weapons threat both historically and today.

Biological weapons are very different from conventional weapons, which all ultimately exert lethal force through some sort of kinetic effect. These weapons are highly targetable and produce generally consistent destructivity. Biological weapons are not only a heterogenous group of agents, but are equally as variable in mechanism, destructive behavior, and their potential specific uses.

Biological weapons could be used in advance of a conflict in order to weaken or incapacitate opposing forces, or to destabilize targeted nations by overwhelming their health systems and causing public confusion. The pathogens used could be selected to variously create fast and widespread effects on their targets, to create slow-onset health effects that appear like a natural outbreak, and anything in between. Especially-lethal biological weapons may be staged around other strategic sites to prevent access by invading forces during a conflict.

These specific biological weapons-use scenarios are of high concern regarding conflict on the Korean Peninsula today, and they contributed to U.S. and South Korean defense and civilian agencies holding the Able Response series of biological attack response exercises over several years to improve preparedness.[1] Open, unclassified sources regarding operational plans for a conflict with North Korea also posit that, in particular during early weeks of a conflict, North Korea may use chemical or biological weapons to deter Japan from entering the conflict, or to demonstrate a willingness to escalate to the use of weapons of mass destruction without crossing the nuclear threshold.[2]

While these scenarios generally apply to conflict between countries with neighboring territory, the perceived utility of biological weapons may be even higher for distant conflicts.

[1] Sangwoo Tak, et al. "Enhancing 'Whole-of-Government' Response to Biological Events in Korea: Able Response 2014." *Osong public health and research perspectives* vol. 9,1 (2018): 32-35. doi:10.24171/j.phrp.2018.9.1.06

[2] See, for example, Federation of American Scientists web page on North Korean doctrine, updated 2000, https://fas.org/nuke/guide/dprk/doctrine/.

A related misconception is that a country would not launch a biological attack due to the risk of negatively affecting its own forces. This defies the brutal history of conflict in general, such as centuries of ground force operations that were designed to take or protect territory, push back invading forces, and other objectives; it is common across countless wars that such operations include positioning and using some forces in ways that will almost certainly mean their deaths. The use of biological weapons in ways that affect a nation's own forces could also entail such cost-benefit calculations depending on the agent used, and it is consistent with the history of warfare that some leaders would decide in favor of their use. Beyond frontline forces, countries have historically put their defense assets on the line in countless ways, whether by flying aircraft over enemy lines or placing nuclear intercontinental ballistic missile silos in the middle of the United States to absorb attacks as a "sponge" during an all-out nuclear conflict.

More broadly, planning for warfare inherently includes thinking through scenarios of near-total loss. When regime survival is at risk, calculations of next steps change. Leaders of nations facing defeat may see their choices starkly as full surrender (and possible death) or fighting to the end with all remaining assets. If that nation has biological weapons, its leaders would then ask whether a significant, strategic attack could sway things in their favor -- even if only temporarily -- in order to maximize their leverage in the process of surrendering. In the early years of the current Syrian civil war, when Bashar al Assad was losing significant territory and appeared at serious risk of defeat, a leading concern was that he would use his chemical weapons arsenal in a potentially-suicidal attack on Israel in this fashion. This threat contributed to Israel working to supply masks for all its citizens, and shows the very real threat of countries with weapons of mass destruction using them.

A related subset of misconceptions focuses specifically on the downsides of using transmissible diseases as biological weapons. First, perpetrators may be attracted to noncommunicable diseases if considering producing biological weapons, as evidenced by the various historical anthrax weaponization and larger-scale production by the United States, United Kingdom, Japan, Germany, and Soviet Union.[3]

Second, countries have in the past experimented with and subsequently developed biological weapons to deliver transmissible diseases. As described above, the USSR worked to create even-more transmissible smallpox, research ballistic delivery systems, and develop more persistent formulations. Accounts from former USSR bioweapons scientists also allege that the state worked tirelessly to weaponize other transmissible diseases such as tularemia, Ebola, Q fever, Marburg virus, plague, tularemia, glanders, and antibiotic resistant microbial diseases with little to no consideration as to whether treatments for these diseases existed.[4] Development of weaponized diseases was not limited to these two Cold War era superpowers. The United Kingdom, Canada, Rhodesia, and Japan were all known to experiment with and develop weaponized diseases with many other countries facing accusations of alleged programs. Notably, Japan not only worked to develop transmissible biological warfare agents such as cholera and plague, but also experimented on thousands of human prisoners to develop them further. Japan reasoned that epidemics made effective weapons and in fact used them multiple times in warfare against the Chinese people, often utilizing fleas as a delivery mechanism for diseases such as the plague. Japan's World War-

[3] U.S. Centers for Disease Control and Prevention, "A History of Anthrax," webpage viewed on November 25, 2020, https://www.cdc.gov/anthrax/resources/history/index.html.

[4] Ken Alibek, *Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World*, (Random House, 1999)

era bioweapons history suggests little regard to the blowback effects such transmissible diseases may have had on their own people.[5]

These cases show the various motives and rationales for countries seeking to weaponize infectious diseases. If such weapons are created for use in specific conflict scenarios, including those described above, the leaders deciding to pursue such biological weapons may calculate that the benefits outweigh the risks of uncontrolled infections afflicting their forces or populations. The tactic of attacking adversaries to spread disease preceding conflict or in its early stages could be seen as more effective with transmissible diseases---many of which may also be difficult to attribute to non-natural causes at the outset, given today's technology.

Additionally, nations that decide to develop biological weapons may still make specific decisions designed to somewhat reduce their own risks. This could include selecting pathogens that are more difficult to transmit, or focusing on those that have known vaccines (such as smallpox, for which a global vaccination effort halted the disease's natural spread by 1980), as they could be given to a nation's military forces or broader population.

Using biological weapons requires calculations of tactical and strategic benefit that extend beyond decisions to experiment with or fully develop them. The dramatic differences in responses to COVID-19 that are still playing out will factor into calculations about biological weapons, including whether to actually use them if pursued. COVID-19 is unfortunately showing that weaponizing infectious diseases can have asymmetric advantages to a perpetrating nation that itself has strong preparedness and response capacities. The COVID-19 pandemic response by many countries may also perversely indicate benefits of early use of such weapons rather than late in a conflict (for example, moving infected individuals or agents into a nation before it closes its borders).

MISCONCEPTION #3: WORKING ON BIOWEAPONS IS INHERENTLY TOO RISKY

As described above, national leaders envision what threats could hit their territory and people in the normal course of security strategy development and war planning---including how their own decisions and actions could come back to strike them. Biological weapons programs are similar: governments that pursue them normally calculate that the strategic benefits justify the risks that developing them, possessing them, or using them pose to their own nation.

Bioweapons threats are indeed great. They present clear risks to public health and the agricultural system and are believed by some to present an existential risk as a weapons class to human life broadly. Biological agents can be difficult to control, and their tactical use is likely to inflict some degree of blowback on the offender. This blowback is greater with transmissible agents. COVID-19 has swept to nearly every corner of the globe, infecting millions, including several world leaders. These risks to health and safety are present, even if biological weapons are never deployed. Laboratory accidents have also resulted in the exposure of civilians and laboratory personnel to bioweapons agents in the past, and that risk remains for anyone working on bioweapons.

[5] Seth Carus, "The History of Biological Weapons Use: What We Know and What We Don't," *Health Security*, vol 13, no 4 (2015): 233.

Beyond their risk to human health, biological weapons present geopolitical risks: the world has norms and laws against offensive bioweapons, and the use or discovery of these weapons could result in retaliation. Nonetheless, the idea that these risks are so strong that they would necessarily dissuade a potential offender is misguided.

History has shown us that governments are willing to overlook, and even embrace, risky weapons programs, including those related to bioweapons development---and do so with zeal. At the time of its discontinuation in 1969, the United States was spending $300 million annually (nearly $1.8 billion in today's dollars) on its offensive bioweapons program---which had involved at various times testing of biological agents on unaware U.S. citizens. The Soviet program, which expanded after the Soviet Union ratified the BWC, aggressively pursued agents with the goal of wiping out large swaths of civilians. In recent years, the regimes of countries such as Syria and North Korea surviving despite their use of chemical weapons also shows that countries may still possess and use weapons of mass destruction despite geopolitical risks, and that the threat of international retaliation for them may be far weaker than it should be.

For some governments, a degree of blowback may be acceptable if the strategic ends justify the costs. Even existential risk is not necessarily a deterrent: the prospect of mutually assured destruction during global nuclear war has not motivated the nuclear powers to rid themselves of these arms, in spite of the potential calamity to humankind. It is unlikely that catastrophic biological risks will be any more a deterrent to the determined aggressor.

Although no governments currently admit to active bioweapons programs, there is increasingly sophisticated scientific research being performed on and related to potential biological agents. Many nations have funded the creation of biosafety level-4 laboratories to contain and support the study of biological agents representing the highest level of threat. Although this research is important scientifically, it has resulted in the release and exposure of biological agents on numerous occasions.[6]

In some cases, a central enabling condition for state leaders to develop bioweapons is the misguided thinking that these particularly unruly agents can be controlled or contained. This thought process represents both a failure of foresight and an outsized estimate of one's own control over biological forces. History has shown the folly of not fully understanding the biological risks that offensive bioweapons programs pose to both national and global well-being, through either accidental or intentional harms.

Lab accidents in which hazardous agents are accidentally released via a breach in biosafety infrastructure are frighteningly common and can occur via both offensive bioweapons programs and peaceful dual-use research programs. A well-known example of such a breach in biosafety occurred April 29, 1979 in Sverdlovsk (now Ekaterinburg) with the accidental release of anthrax spores from a Soviet bioweapons facility. This release caused a local outbreak that resulted in at least one hundred deaths[7]. Accidents like this one are often covered up due to their violation of the BWC's international ban on bioweapons. This, combined with the specter a lab accident can bring to a dual-use research institution, means the number of lab accidents is likely under-reported and the effects of accidental releases underestimated. Further, the health effects of weapons programs on population health are in some cases indirect and difficult to

[6] Alison Young and Nick Penzenstadler, "10 incidents discovered at the nation's biolabs," USA Today, May 28, 2015; "Russian Scientist Dies After Ebola Lab Accident," Science 28 May 2004: Vol. 304, Issue 5675, pp. 1225, DOI: 10.1126/science.304.5675.1225b

[7] Ken Alibek, *Biohazard: The Chilling True Story of the Largest Covert Biological Weapons Program in the World*, (Random House, 1999)

measure. For example, estimates of American deaths from Cold War nuclear weapon testing range in the hundreds of thousands of people, which poses the question of whether similar effects may be tolerated in countries with bioweapons programs--- something difficult-to-impossible to estimate due to the underground nature of this research.

More scientists around the world working on dangerous pathogens adds to our collective risk due to the dangers of human error[8] (accidental releases, worker infections) and the potential of deliberate malpractice from inside actors. Just by the nature of researching these pathogens within their own borders, state leaders are putting their populations at risk regardless of whether or not they plan to deploy them as weapons.

While accidental harms are highly concerning, nefarious intent from inside actors poses additional risks. The 2001 anthrax attacks in the United States were allegedly carried out by Bruce Edward Ivins, a U.S. scientist working at the federal government's biodefense laboratories. This example highlights the danger of mal-intent, even in cases where research is defensive. Further, state leaders have no way of ensuring that their bioweapons or biodefense program will remain in their control in perpetuity. The risk of misappropriation of dangerous agents becomes even greater in regions of instability with insurgents and political opponents, especially when such forces are bent on causing violence against the state's own people. Examples of ethnic and racial violence within state borders unfortunately abound, such as South Africa's Project Coast intended for use against the Black population in apartheid-era government, and more recent chemical warfare usage in Syria. These examples pose a cautionary tale when state leaders consider the development of state bioweapons programs, since these unpredictable or non-targetable bioweapons could fall into the hands of someone who would seek to use them for malicious purposes.

Lastly, though leaders who establish bioweapons programs may believe their motives align with state safety, this nationalistic belief blinds them to potential miscalibrations. For example, state leaders may think they are developing less risky agents or focusing their efforts on purely defensive efforts, but this assumption can be quickly thwarted as experiments progress due to the dual-use nature of biological research. Examples of this miscalibration of intention abound, including the creation of a more virulent strain of mousepox through the introduction of a gene coding for an immune modulator and the rendering of H7N1 influenza more contagious through passage in ferrets. Both experiments, the latter funded by the U.S. National Institutes of Health, proceeded with the goal of combatting the viruses but instead led to strains with uniquely dangerous properties that may make weaponizing them more attractive.

While lack of foresight may pose a threat to society if these bioweapons programs are enabled, there is no way to adequately predict all of the consequences of a decision to develop bioweapons. In total, this means that nation-state leaders may not discount risks in deciding whether they should create these weapons, even if they can.

Finally, biological weapons programs and work that hedges toward potential bioweapons programs may not be directed in a top-down, or centralized manner at all. This poses unique risks covered below.

[8] Lynn Klotz, *Human error in high-biocontainment labs: a likely pandemic threat* (Feb 2019) https://thebulletin.org/2019/02/human-error-in-high-biocontainment-labs-a-likely-pandemic-threat/

MISCONCEPTION #4: DECISIONS REGARDING POTENTIAL BIOWEAPONS WORK ARE TOP-DOWN AND WELL-KNOWN TO NATIONAL LEADERS

In many cases, biological weapons programs have been driven by top-down decisions from national leaders. In some cases national leaders understand well the specific details of those programs. Yet these generalizations don't always hold and may not in the future. Not all bioweapons programs have been or necessarily will in the future be known to national leaders and directed in an orderly, top-down fashion. Bureaucratic politics, work by scientists and technicians to secure their roles and resources, and actions by individuals or small groups, can play strong roles in shaping whether and how biological weapons programs advance within nations.

Even in military and national security matters, the directions a country takes are not always orchestrated or even sanctioned from the highest leadership levels. This extends to weapons of mass destruction programs. In her landmark 1989 book *Guardians of the Arsenal*, Dr. Janne Nolan detailed how bureaucratic inertia, gaps in legislators' knowledge, insufficiently specific presidential directions, and basic resistance of some military organizations to change, all thwarted attempts to reshape U.S. nuclear weapons strategies and plans consistently from the Truman through the Reagan administrations.[9]

For biological weapons, divergence between senior leadership direction and actual government activities and plans can take many forms. In some manifestations, a nation's most senior leaders may not even know or fully understand the bioweapons-relevant work occurring in their own countries.

Governments are not monoliths. They comprise thousands to millions of human beings, each with distinct motives, abilities, and shortcomings. Therefore, it should come as no surprise that when a country decides to embark on a biological weapons program, it may come from a few product champions within or outside the government, and not from senior leadership. During and in the years leading up to World War II, Ishii Shiro, a Japanese military physician, was his country's main advocate for developing and using biological weapons. In the USSR, shortly before signing the BWC treaty in 1972, scientist Yury A. Ovchinnikov and his colleagues at the USSR Academy of Sciences persuaded Soviet leadership to expand their biological weapons programs under the guise of the civilian pharmaceutical industry. In Canada, Nobel laureate Sir Frederick Banting was so important a driver of its biological weapons program that his untimely death in a 1941 plane crash delayed the program's development for months. While buy-in from higher-ups was necessary for the programs these men advocated to gain traction, their outsized influence over the programs' shape and scope highlights a gap between some idealized version of unified, top-down strategic decision-making and how governments practically set their policies.

This potential misalignment at the outset of these programs extends to their entire lifecycle. The history of the United States biological weapons program presents an instructive example. The US program was begun in earnest during World War II, with the intention of developing an in-kind retaliatory capability. But as the Cold War era progressed, the country's biological weapons strategy vacillated between in-kind retaliation, deterrence, and practical use in both limited and all-out war scenarios, with different groups within the government pushing for different policies. All the while, the program, which jockeyed for priority within the Army's Chemical Corps, pursued a wide array of lethal, incapacitating, and anti-crop agents, likely with an eye to meeting the diverse use cases envisioned by various government agencies. Ultimately, inspired by the Joint Chiefs of Staff's 1969 call for "a coherent policy," the Nixon

[9] Janne Nolan, *Guardians of the Arsenal: The Politics of Nuclear Strategy*, Basic Books, Inc, January 1, 1989.

administration conducted a review of the program that resulted in its termination.[10] Yet even after the ratification of the BWC in 1975, it was discovered that the Central Intelligence Agency had retained a significant stockpile of deadly toxins. (This mirrors the more egregious apparent continuation of the Soviet biological weapons program by the Russian Federation after President Boris Yeltsin's 1992 decree that all such work was illegal.[11]) Taken together, the US example demonstrates that when it comes to weapons development, a spectrum of forces within the government ecosystem can come together to weaken and even sever the link between leaders' objectives and actual on-the-ground actions.

In fact, specific work that could contribute to a biological weapons program may not stem from or align with that country's grander security strategy. In all countries, government and nongovernmental scientists commonly pursue ideas that are interesting and exciting, even if they do not align with current policies or national strategies. Those overseeing such work may not even know if scientific or more developmental-stage efforts edge too close to offensive bioweapons work or even cross that line. (Indeed, some scientists and technologists may themselves not realize it, given the dearth of universal cultures, norms, and awareness about biological weapons in the scientific community.) This may be especially true in cases where oversight is conducted by those who don't fully understand the work of teams under them.

It is also common for bureaucracies in all countries to conduct work in anticipation of policy changes, especially if they perceive such changes to be important or imminent. At times this is well known up to high levels of leadership, for example when the U.S. national laboratories developed robust plans to implement and verify a ban on intermediate range nuclear and conventional missiles with the USSR in anticipation of President Reagan making a political decision to pursue such a treaty. Similarly, there is a risk that if personnel at any levels in a government believe their leaders wish to hedge toward offensive bioweapons capabilities, such hedging may occur---in particular if such individuals or groups themselves believe this to be best for their nation.

MISCONCEPTION #5: WE HAVE STRONG-ENOUGH INTERNATIONAL NORMS & INSTITUTIONS TO DETER, DISCOVER, AND STOP BIOWEAPONS PROGRAMS

Another general misunderstanding of nation-state behavior is that even if countries considered developing biological weapons, they would not breach international laws and norms against these weapons, most notably the Biological Weapons Convention, which has banned the development, production, and stockpiling of this entire class of weapons. While the BWC has indeed served to strengthen norms and taboos against bioweapons with nearly 150 nations participating, its power is limited due to its lack of enforcement and verification mechanisms. Notably, violation of the BWC has occurred in the past with the secret Soviet bioweapons program continuing and expanding in earnest after the USSR signed on to the treaty. While this is the only confirmed violation of the BWC, there is concern that the forces and norms against bioweapon programs are weakening during the 21st century. As described above, modern warfare is different and bioweapons may prove advantageous to the shifting nature of the theater battlefield. Further, there is concern that the COVID-19 pandemic (and its ensuing chaos and national

[10] Brian Balmer & John Ellis van Courtland Moon, "Chapter 3: The British, United States and Canadian Biological Warfare Programs," in Biological Threats in the 21st Century, ed. Filippa Lentzos, pp 57-87, Imperial College Press, London, UK (2016).
[11] David E. Hoffman, *The Dead Hand.* Anchor Books (2009).

shutdowns) may serve as a motivator for nefarious actors to initiate or re-start bioweapon research and development.[12]

Offensive biological weapons work is, by its nature, difficult to differentiate from defensive research and development. This combined with the BWC's lack of a verification regime makes the norms and institutions to deter, discover, and stop bioweapons programs quite weak. Unfortunately, efforts to implement verification constructs have so far been met with failure. There remains a lack of a global regime through the BWC to monitor and control bioweapons threats as a result.

Furthermore, biological weapons threats may also stem from sub-national or independent actors. Terrorist groups such as Al Qaeda and Aum Shinrikyo notoriously sought biological weapons, and anthrax was the weapon of choice for causing terror in the United States in the Amerithrax attacks.[13] Experts have long wondered why the world has not yet seen mass-scale biological weapon attacks by non-state actors, with mixed views on the answer. However, there is growing concern that advances in the tools and technologies that could be used for nefarious purposes are lowering that threshold.

LOOKING AHEAD

Biological weapons pose a real and growing threat. They are also one of many security risks for which common misperceptions distort public impressions and policy responses. This briefer serves as one step toward dispelling some of the most common misconceptions about biological weapons.

Looking forward, this is a threat against which the United States and international community can make strong, near-term progress. The first line of defense against bioweapons is public health and biodefense infrastructure. Our ability to rapidly detect and respond to biological threats (regardless of whether man-made or not) is the single most important factor in driving nation-state actors toward the calculus that bioweapon investments and utilization would counter their interests. However, our deterrent capabilities including global surveillance, medical countermeasures, and public health infrastructure require increased investment to fully dissuade those considering pursuing bioweapons programs.

This fact was laid bare by the COVID-19 pandemic. While certain nations have successfully contained the virus (by virtue of prior experience with similar viruses, geographic isolation, or other factors), SARS-CoV-2 continues to infect the population globally at unprecedented levels, particularly in first world countries. Although there have been some successes, such as the relatively rapid development of vaccines and rapid diagnostic tests, progress will still not be fast enough to prevent millions of deaths worldwide. Sincere investment in technological advances in surveillance and biodefense capabilities are required to truly make bioweapons a futile endeavor.

Indeed, the COVID-19 pandemic has shown us that a single viral transmission event can balloon wildly, cripple the global economy, infect the broad public and world leaders alike, and strain our health systems in ways not seen in recent history.

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[12] Christine Parthemore and Andy Weber, "COVID-19 may be teaching the world a dangerous lesson: Diseases can be ideal weapons." *LA Times*, November 12, 2020.

[13] Rolf Mowatt-Larssen, "Al Qaeda Weapons of Mass Destruction Threat: Hype or Reality?" Belfer Center for Science and International Affairs, January 2010, https://www.belfercenter.org/publication/al-qaeda-weapons-mass-destruction-threat-hype-or-reality; Richard Danzig et al., "Aum Shinrikyo: Insights Into How Terrorists Develop Biological and Chemical Weapons," Center for a New American Security, December 2012, https://www.cnas.org/publications/reports/aum-shinrikyo-second-edition-english

It also shows that the misconceptions described above are dangerous in foreshadowing the repercussions the world may see if it does not adequately deter the pursuit of bioweapons and prepare to minimize the repercussions if they are developed or used. Although the international community has spent decades building norms against them, the risks of bioweapons remain real. Multiple nation-states' activities drive concerns that they may have offensive bioweapons programs or hedge in that direction, and countless more engage in risky dual-use research. Scientific research that borders on or has implications for biological weapons development has advanced to a point unimagined when the Biological Weapons Convention was originally drafted nearly half a century ago, and it continues to speed ahead faster than improvements to our public health infrastructure. COVID-19 has revealed the holes in our defenses; we must move swiftly to plug them.

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