Chapter

Introductory Chapter: International Health Security Expanded and Re-Defined

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1. Background

International health security (IHS) is a complex and highly heterogenous area under the broader umbrella of health sciences. Within that general context, IHS encompasses all domains that potentially influence (and more specifically - potentially endanger) the well-being of human health and wellness, from natural disasters to outbreaks and pandemics, including rapid urbanization, population growth, various environmental matters, critical supply chain vulnerabilities, misuse of antibiotics leading to unpredictable microbial resistance patterns, and even social media (SM) misinformation. The need for this expanded definition of health security came about with the realization that topics such as emerging infectious diseases (EID), food, water, and pharmaceutical supply chain safety, medical and health information cybersecurity, and bioterrorism – although clearly dominant factors within the overall realm of health security – constitute only a small proportion of forces able to actively modulate the wellness and health of human populations [1–7].

2. Why did we embark on this project?

There are ample resources for IHS experts, and many available literature sources are characterized by very high content quality. Why then, one might ask, embark on another book project on the topic? There are several important reasons. The first, and most relevant reason, is the narrow focus on the previously published scholarly literature on this increasingly complex subject. Today's IHS is a much broader and diverse discipline, with highly nuanced and rapidly evolving new areas and subdomains (**Table 1**). Some authorities on this topic even go as far as referring to Planetary Health as the next conceptual development [8, 9]. The authors and Editors of this collection of chapters believe that the broadly defined IHS inherently encompasses the plurality of concepts that include "public health," "global health security," and "planetary health" while ensuring that the overall context of its implementation maintains the compatibility with the modern understanding of the world constituting a collection of independent countries and states that operate within a well-defined set of international conventions, organizations and frameworks [10–12]. By covering new topics and providing varied solutions and

Access to health care
Biological and chemical warfare
Chronic health conditions
Emerging infectious diseases
Food/agricultural security
Globalization, including trade and travel
Health informatics/cyber health
Industrialization/robotization and related topics
Natural disasters, including volcanic/tectonic activity and natural fires
Nuclear security, both civilian and military
Pharmaceutical production and supply chains
Environmetal pollution water/air/soil
Planetary changes/global warming/invasive species
Social determinants of health
Social media platforms
Systemic racism and other forms of discrimination
Terrorism/bioterrorism and related topics

Table 1.
New areas and subdomains included within the redefined and expanded International Health Security (IHS) paradigm.

approaches on rapidly emerging infectious, social, environmental, and biopolitical dilemmas, etc., the authors hope to enlighten and energize readers to become more aware and active in matters related to health security at local, regional, national, international, as well as global scales.

3. Expanding the definition and the scope of health security

The traditional definition of what was generally known as "global health security" or GHS is somewhat limited, including primarily bioterrorism and EIDs [13]. In essence, and in a much broader sense, we are dealing with human security. The world is interdependent and we must manage our activities jointly, find common ground, and together deal with the threats with which we are confronted. As Ebola Virus, Zika Virus, and Coronavirus Disease 2019 (COVID-19) have demonstrated, a threat to one (person, region, country, continent) can easily evolve into a threat to all [14–16]. Herein we present facts, experiences and perspectives regarding important currents that affect all societies. Fundamentally, the Editors would like the readers to recognize health security vulnerabilities that they may have not previously considered and to realize opportunities that the readers themselves can create or support across their own communities, countries, and continents [17]. The current book expands on the more traditional and restricted view of IHS to incorporate new and important components of climate change, global health, cyber security, social determinants of health, technology/information management, and several other closely related areas.

4. Bridging health security and human sustainibility

Health security requires a "360-degree approach" because health problems tend to have a "360-degree impact" and therefore the solutions also have to address various associated facets and intricacies in a comprehensive and inclusive fashion. The current COVID-19 pandemic exposed vulnerabilities in various critical supply chains, including those involving things we all take for granted, such as basic medications, home oxygen availability, personal protective equipment (PPE)

and the tremendous speed of evolving science that made us all vulnerable to both misunderstanding and misinformation [18]. COVID-19 also demonstrated that that the term "health security" is inextricably tied to how we as humans can effectively respond to such a tremendous global challenge [19, 20].

Among challenges to sustainability, we must recognize the presence of "response exhaustion" or a phenomenon where the responders' ability to address the ongoing health crisis at a population level becomes ineffective due to the overwhelming nature of the task at hand, especially when dealing with long and protracted time-frames that require sustained, high-intensity effort. Excellent planning, both conceptual and logistical, is required to mitigate such "response exhaustion." Prematurely "letting our guard down" predisposes all to significant downstream effects of a long-lasting and dangerous threat – much like not adequately extinguishing a campfire only to realize that it becomes the source for a uncontrollable forrest fire. Securing health is an effort which definitely translates to sustaining health and thus human well-being, and the loss of either leads to loss of the other.

The current collection of chapters takes on a comprehensive and integrative approach toward a truly global problem, highlighting the interconnectedness of the various components of the proposed IHS framework (**Table 1**). For example, a natural disaster, despite best preparatory efforts, may cause significant disruptions across multiple IHS domains, resulting not only in the destruction of essential infrastructure, but also directly and indirectly affecting human health within the affected region [21], as well as various potential downstream effects on other areas such as food security (e.g., if the disaster-stricken country is a major agricultural exporter). Humans have learned to design plans and take proactive steps to mitigate damage and save lives. However, such plans and steps must also be kept in the context of the reality of the constantly evolving geopolitical and socio-economic global landscape. In the highly interconnected world, events have the potential to evolve as rapidly as a click of a computer mouse button, or perhaps one's ability to enter a commercial airliner on one continent and arrive on another within half-a-day [22, 23]. Be it "health security" or "cyber security," sustainability depends on our expanded definition and understanding of "comprehensive health security".

5. Integrative synthesis and synergy creation

As we embark on the journey across the much more diverse and heterogeneous landscape of IHS, both reimagined and redesigned, each chapter introduces a new and unique perspective on interrelated topics that blend into a comprehensive repository of synergistic experiences, knowledge, and approaches. The ultimate goal is to create an authoritative, open access source of the most important insights available to-date within the expanded IHS domain. The current collection is therefore intended to include discussions on some of the most pressing topics within the broader context of public health and health security. Starting with a summative assessment by the IHS Working Group of the American College of Academic International Medicine, the discussion then moves on to incorporate a variety of contemporary topics such as refugee crises, cyber security, social media, big data analytics, scientist training, and point-of-care diagnostics. Also important to the overall IHS discussion, the authors touch upon the importance and impact of organized systems of care on health security, focusing on the tremendous value of such systems to human wellness and the continuous focus on care quality and improving clinical outcomes [24–28].

More recently, a new set of insidious threats to health security emerged with the advent of Internet and social media (SM). This general theme includes the now all-too-common phenomenon of ransomware that increasingly plagues our healthcare systems and various critical supply chain components. In addition, it is important to emphasize the benefits, while also highlighting the dangers of modern SM technology, including some of the approaches to mitigate the negative aspects. Of special concern is the emerging evidence regarding the very design of SM platforms, with key element of the business model being the ability to fractionate individuals and groups into self-reinforcing, opinion-based camps [1, 29–32].

We would be remiss not to discuss herein the critically important and emerging topics of refugee crisis and refugee healthcare. Relevant to this context, careful considerations must be given to human, economic, and healthcare aspects of the ongoing global refugee crisis, including dillemmas created for governments and refugees regarding manipulation, displacement, rights, sexual exploitation, and the need for legal options. Serious global efforts must be made on behalf of the refugees by the host governments to provide the necessary resources to ensure the well-being of the 15 million+ refugees around the world [33], along with the 214 million international migrants and 740 million internal migrants [34]. Comprehensive examinations of the problem must also consider refugees in relation to the political, social and moral perspectives of the topic.

Especially relevant in the context of the current novel coronavirus (SARS-CoV-2) crisis, pandemics and plagues must be addressed as mankind's socio-political constructs that – at some point in the history – either require or outright force a major paradigm shift. Historically, the known plagues have decimated the young children and the elderly; but emerging pathogens (inclusive of SARS-CoV-2) have changed the paradigm sparing the young and primarily preying on those over 50 years of age [18, 35, 36]. And it is precisely such low-frequency, high-impact, largely unexpected events that produce generational fear, collective memory, and subsequent durable change among populations [18, 37]. In addition, as has been seen during the COVID-19 pandemic, such changes can occur very quickly regardless of whether communities, industry, governments, or society are prepared or able to efficiently or peacefully adapt. Currently, the world is reacting to the reality of an ongoing crisis of multi-generational proportions, with limited means to remedy or mitigate the impact. The evidence and lessons learned to-date from the COVID-19 pandemic indicate that the "Pasteurian paradigm" – which establishes that health security is primarily determined by a singular factor: the pathogen – has to be abandoned. Instead, the evidence seems to show that the health-disease continuum is considerably more likely to be affected by a plethora of political, social, economic, environmental and individual factors [18]. Therefore, when forming a more mature understanding of the construction of a more complex causal framework, the world will need to respond with a more holistic approach addressing social inequities, environmental pollution, protecting biodiversity, strengthening local health systems, prioritizing public and preventive health interventions, reducing non-communicable co-morbidities and promoting healthy behaviors [38]. Within the expanded IHS framework, the repose to the current pandemic has been a kind of one-size-fits-all public health policy without a strategic assessment of the local and regional situation. The undercapacity of our existing surveillance and control systems has forced local governments to "copy and paste" control strategies from abroad [18, 38]. Also, in the last few decades, there has been a dramatic disinvestment in the area of public health. Moreover, the concept that investment in the workforce's health positively impacts productivity seems to have been abandoned. Nevertheless, the immense costs for the global economy of the COVID-19 pandemic have changed this paradigm and forced stakeholders to re-emphasize the need for robust public health funding. As a matter of fact, no other pandemic has affected the U.S. and the global economy with such historical precedent [39, 40], at least in absolute terms.

No discussion of International Health Security would be complete without touching upon unique and diverse roles of civil society organizations in national health systems during the 2014–2016 Ebola outbreak; the importance of big data and health registries within the overall IHS framework; an insight into nurturing responsible future generations of scientist; an exploration of a relationship between adverse childhood experiences and adult chronic disease; a compendium on biopolitics in occupational health; and finally a mention of lab-on-a-chip, point-of-care approaches within the international public health security context [41–45].

6. Future trends

It is important to recognize that the field of IHS continues to evolve dynamically, and that its subdomains are in constant flux (**Figure 1**). For example, it is now recognized that systemic racism – as well as other forms of systemic discrimination – constitutes a prominent threat to health security [21, 46–48], and that socioeconomic inequity plays an important role in the overall existing global health imbalance [47–49]. These critically important issues have only recently been recognized as essential elements of health security, with implications felt across a variety of settings and dimensions.

The IHS community must stand in solidarity, and act swiftly, when tragic events – such as large industrial explosions or toxic chemical releases – recur at an unacceptably high frequency. For example, the recent explosions in Beirut resulted in great loss of life, many wounded, and massive destruction of property and critical infrastructure [50]. Yet the pattern is eerily similar to previous incidents, both characterized by massive scale explosions, preventable loss of life, and tremendous property damage. In this context, what should be major global health security lessons were minimized to "local problems," leading to lost opportunities to save lives. For example, rewinding back to 2015, a series of industrial chemical explosions killed 173 people, wounded 798, and created billions of dollars in lost property [51]. In many cases, significant proportion of those who lost their lives were first

Figure 1.
Composite word cloud depicting some of the keywords and dominant concepts in International Health Security.

responders [50, 51]. The world needs to learn from these catastrophic industrial events and strive to ensure that dangerous chemicals are not allowed near large population centers in quantities sufficient to cause mass destruction and loss of life.

Likewise, there is growing recognition of the profound effects brought about by the early manifestations of climate change, such as the realization that sea-level rise is here to stay, and that phenomena including invasive species, zoonotic-to-human disease transmission, and regional hunger due to disruption in food supplies, are not only real but also likely to worsen in the foreseeable future [21]. The increasingly apparent frequency of both natural forest fires and wind disasters are among additional, more obvious manifestations of the ongoing planetary change [21, 52]. The immediate and evolving risks are only now slowly coming into focus with an impact and magnitude that will only be understood over time. What is becoming more obvious is the potential global implications of what might have been previously minor events in remote places of the world. While it is well-established that certain local events may have geo-political implications on local, regional, and often global economies (i.e., a local act of terrorism in an oil-rich country potentially impacting the complex economics of oil), it is quickly becoming clear that such events also create significant impact on global health [53, 54].

In another example, supply chain factors are beginning to endanger the availability of entire classes of life-saving pharmaceuticals [55]. Within this subdomain, relatively recent concerns of potentially carcinogenic impurities in commonly prescribed antihypertensive medications made international headlines [56], but unfortunately were pushed to the back pages with an evolving – and at the time, highly controversial, politically charged, and poorly understood novel viral pandemic [36, 57]. Nevertheless, the concept of the "butterfly effect" – especially as applied to international health security – becomes, tragically, easier to understand [58]. Smaller events, in themselves, potential perceived as trivial at the time, have the potential to slowly evolve into events with global catastrophic implications [18]. Such events, superimposed with fluctuations in political agendas, economic disparities, budgetary constraints, and a perceived abandonment of the mistakes of the past and government safety nets unfortunately might become more common. The growing role of SM in giving credence to conspiracy theories, radicalism, and so called "fake news" only compounds the problems especially with regards to leaders being able to establish creditable action plans to manage such threats [29, 31]. As the population of the world grows to potentially unstainable sizes [59], combined with concerns of climate change, simmering socio-economic and political conflicts will all play a role in the growing concerns for the "safety" and sustainability of humanity. Such events, must be taken seriously at all levels – but there are no easy solutions to the problems that frequently start on a small and often difficult-to-notice scale.

7. Summary and conclusion

The expanded and redefined scope of International Health Security provides a unique opportunity for the public health community to embrace a more holistic approach to an area that was traditionally much more narrow in scope. As we tackle one of the greatest challenges to IHS in recent decades – the novel coronavirus 2019 (COVID-19) pandemic – it becomes increasingly important to shift our focus to a more global, yet significantly more granular, perspective on IHS threats and emergencies. We hope that the foundation created by this Editorial team will provide a solid springboard for an insightful and captivating discussion in this rapidly developing and important area of academic medicine and public health.

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