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Integrating Human Rights and Biosecurity in International Law: Toward a Holistic Framework

Mengintegrasikan Hak Asasi Manusia dan Biosekuriti dalam Hukum Internasional: Menuju Kerangka yang Holistik

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ABSTRACT: Article 12 of the International Covenant on Economic, Social, and Cultural Rights (ICESCR) states the right to health as a fundamental human right. It emphasizes that healthcare should be available, accessible, acceptable, and of high quality for all individualsThe COVID-19 pandemic broadened the focus while highlighting the necessity of integrating biosecurity—including plant, animal, and human health—with a comprehensive One Health strategy within the framework of human rights.This doctrinal research examines key international agreements and organizations that govern biosecurity, biosafety, and the prohibition of biological weapons. It aims its integration with the right to health. The study finds that international public health and biosecurity regimes are fragmented, often leading to inconsistency in policy implementation. The major international agreements and institutions that control biosecurity, biosafety, and the ban on biological weapons are examined in this doctrinal study. It seeks to integrate the right to health. According to the findings, fragmented international public health and biosecurity regimes frequently result in inconsistent policy implementation.This article introduces a unifed policy model that aligns biosecurity governance with the right to health, peace, and sustainable innovation. The integrative approach protects human health and biodiversity from a range of biological threats, ofering new insights to the field.

ABSTRAK: *Pasal 12 Kovenan Internasional tentang Hak-Hak Ekonomi, Sosial, dan Budaya (ICESCR) menyatakan hak atas kesehatan sebagai hak asasi manusia yang fundamental. Pasal ini menegaskan bahwa layanan kesehatan harus tersedia, dapat diakses, diterima, serta memiliki kualitas tinggi bagi setiap individu. Pandemi COVID-19 memperluas cakupannya sekaligus menekankan perlunya mengintegrasikan biosekuriti, yang meliputi kesehatan manusia, hewan, dan tumbuhan, ke dalam kerangka hak atas kesehatan melalui pendekatan holistik One Health. Penelitian doktrinal ini mengkaji perjanjian dan organisasi internasional utama yang mengatur biosekuriti, biosafety, serta pelarangan senjata biologis. Tujuannya adalah untuk mengintegrasikannya dengan hak atas kesehatan. Studi ini menemukan bahwa rezim kesehatan masyarakat dan biosecuriti internasional masih terfragmentasi, yang menimbulkan inkonsistensi dalam implementasi kebijakan. Melalui analisis sistematis terhadap kerangka hukum, terlihat bahwa bahwa pemuatan langkah-langkah biosekuriti dalam kewajiban hak asasi manusia dapat meningkatkan koherensi kebijakan, memperkuat perlindungan kesehatan lintas negara, dan meningkatkan akuntabilitas negara baik terhadap standar nasional maupun internasional. Artikel ini memperkenalkan model kebijakan terpadu yang menyelaraskan tata kelola biosekuriti dengan hak atas kesehatan, perdamaian, dan inovasi berkelanjutan. Pendekatan integratif ini melindungi kesehatan manusia dan keanekaragaman hayati dari berbagai ancaman biologis, serta menawarkan wawasan baru bagi bidang tersebut.*

Keywords:
biosecurity; human rights; international collaboration; public health; right to health

Kata Kunci:
biosekuriti; hak asasi manusia; kolaborasi internasional; kesehatan masyarakat; hak atas kesehatan

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1. Introduction

The human rights principles, specifically the right to health in the context of biosecurity, are important principles that need to be harmoniously integrated with biosecurity principles. Existing scholarship rarely examines how biosecurity policies can effectively be incorporated into the human right to health within the framework of international law. Earlier studies have explored the legal foundations of both biosecurity and the right to health as separate issues; however, a gap remains in analyses that consider their integration within a unified legal framework.

Global threats like pandemics and bioterrorism highlight the urgent need to protect public health. However, biosecurity could limit key human rights, such as privacy, freedom of movement, and the right to information. It is necessary to have a system that respects the rights and dignity of every individual while lowering biological dangers.A study of these similarities and differences could help to create policies that can achieve robust biosecurity, protect rights, and support a fair and robust global society. First, the terms right to health, biosecurity, biosafety, and public health need to be clearly defined.

The right to health means everyone could claim a level of health suitable for a dignified life.[1] It includes fast, accessible, affordable, high-quality healthcare, as well as safe drinking water, proper sanitation, and nutritious food. Article 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR), adopted on 16 December 1966 and in effect from 3 January 1976, states: "the States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health."[2]

Biosecurity is a comprehensive and systematic strategy, encompassing policy and regulatory frameworks, to mitigate risks associated with food safety, animal health, plant health, and environmental hazards.[3] It involves the prevention, response, and recovery from biological threats, whether natural, accidental, or intentional. Biosecurity aims to protect communities from infectious diseases and bioterrorism.[4] The Biological Weapons Convention (BWC), formally named the Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and Their Destruction, is an important international treaty. It forbids the development, production, and accumulation of biological and toxin weapons. The BWC opened for signature on 10 April 1972 and entered into force on 26 March 1975.[5]

Biosafety involves the principles, technology, and techniques used to prevent accidental exposure to infections and poisons and their unintended spread. It includes protocols to protect laboratory staff, the ecosystem, and the public against biological hazards.[6] Biosafety is especially vital in research and clinical laboratories that handle infectious agents. The Cartagena Protocol on Biosafety to the Convention on Biological Diversity (CBD) was adopted on 29 January 2000 and took effect on 11 September 2003, 2226, UNTS 208.[7] It sets a framework for managing biosafety in the safe transfer, handling, and use of living-modified organisms (LMOs) created by modern biotechnology.[8]

Public health covers the scientific and artistic fields of disease prevention, life extension, and health enhancement through collective social action. It includes disease prevention, health promotion, and the control of infectious diseases.[9] Public Health aims to improve population health by addressing social determinants and ensuring fair access to healthcare. The International Health Regulations (IHR) adopted on 23 May 2005 and in effect from 15 June 2007, 2509, UNTS 79 (2005), offer a global system for the prevention and management of public health threats that cross borders.[10]

These frameworks illustrate that biosecurity and the right to health share a foundation in protecting life and dignity but function in separate legal areas.Biosecurity and the right to health are fundamentally rooted in the protection of life, human dignity, and society welfare. Biosecurity frameworks generally aim to prevent the misuse of biological agents and ensure national and global safety, whereas the right to health emphasises access to medical care, illness prevention, and the promotion of equal health outcomes. These frameworks mutually

1 Joseph, "Extending the Right to Life under the International Covenant on Civil and Political Rights: General Comment 36."
2 UN General Assembly, "International Covenant on Economic, Social and Cultural Rights."
3 FAO, "Strengthening biosecurity for pest and disease management."
4 Novossiolova dkk., "The
5 United Nations Office for Disarmament Affairs, "Biological Weapons Convention."
6 Saeed dan Mohammed, "International Efforts to Protect Biosafety."
7 "Cartagena Protocol on Biosafety to the Convention on Biological Diversity."
8 "Cartagena Protocol on Biosafety to the Convention on Biological Diversity."
9 Sun, *Protection of the Right to Life by International Human Rights Law: Chinese Contributions to International Discourse of Human Rights*.
10 "International Health Regulations."

enhance one another by striving to protect human life, however they function within separate legal spheres—international security law concerning biosecurity and international human rights law pertaining to the right to health.

The main international agreements on these principles are crucial for guiding global practices. It is vital, however, to understand their specific terms and implications. Article 12 of the ICESCR outlines a right that includes access to timely and suitable healthcare as well as key health determinants like safe water, sanitation, and safe work environments. States that are parties to the ICESCR must work to fully realize this right. Measures include prevention, treatment, and management of epidemic, endemic, occupational, and other diseases. The right to health is basic, connecting human rights and biosecurity by ensuring that health protection uphold and achieve human rights without discrimination.[11]

The BWC is a major international convention that seeks to eliminate biological weapons. The BWC bans the creation, production, acquisition, transfer, stockpiling, and use of biological and toxin weapons. It calls for strong biosecurity measures to prevent misuse of biological agents that could threaten public health and violate human rights.[12] The BWC also promotes worldwide cooperation and confidence-building to strengthen global security and compliance.[13] The Cartagena Protocol on Biosafety, adopted in 2000 as an addition to the CBD, applies to the safe handling, transport, and use of LMOs produced by modern biotechnology. The Protocol aims to protect biodiversity from risks caused by LMOs while considering human health.[14] It outlined a detailed, advanced, informed agreement (AIA) process to ensure countries have the needed information to make decisions before allowing LMOs to be imported.[15] This cautious strategy combines biosafety and human rights, so that biotechnology progress does not harm environmental or human health. In summary, from a human rights standpoint on health, individuals should not face unsafe living or working conditions.

The World Health Organization (WHO) established the International Health Regulations (IHR) as a legal framework for the global community to prevent, safeguard against, manage, and respond to the transnational spread of illness. The IHR strives to promote public health security at national, regional, and global levels by enhancing the capacity to identify, assess, report, and respond to public health threats. These regulations harmonize the demand for effective public health measures with the preservation of human rights, guaranteeing that activities conducted in the public interest do not violate individual liberties and privacy. The IHR is crucial for synchronized worldwide responses to health emergencies, underlining the significance of public health and human rights in ensuring global health security. Human rights and biosecurity need an integration, to contribute to the core purpose of preserving human health and rights against biological threats. This subject applies to the right to health, biosecurity, biosafety, and public health regulations.

Article 12 of the ICESCR stresses the right to the best possible quality of health, acting as a basic premise for biosecurity efforts. Effective biosecurity on the other hand, mandated by the BWC, strives to forestall the use of biological agents as weapons, thus defending public health. .Biosecurity measures must be formulated and implemented to protect and uphold the right to health. In the event of a biological threat for instance, it is important to guarantee health services' availability and ensure that security measures do not limit patients' access to essential medical care. The necessity of strict security and the obligation to promote health fairness and accessibility highlights the link between these two objectives.

The Cartagena Protocol on Biosafety aims to protect biodiversity and human health from the risks posed by living modified organisms (LMOs). This Protocol defends the right to health by guaranteeing that biotechnological innovations do not lead to future harm to human health and the environment. The Protocol preserves health rights principles by mandating full risk assessments and informed decision-making for importing and utilizing LMOs.[16] The transparent disclosure of such measures and public participation strengthening the relationship between biosafety and human rights, guaranteeing that biotechnology evolves without jeopardizing public health.[17] The WHO's International Health Regulations provide a framework for global public health responses to biological threats. These restrictions outline the requirement of robust healthcare systems capable of identifying and resolving public health emergencies while respecting human rights. The IHR promotes the right to health

11 Sutherland, "The Child's Right to Life, Survival and Development: Evolution and Progress."
12 Tucker, "The BWC New Process: A Preliminary Assessment."
13 Ward, "The BWC Protocol Mandate for Failure."
14 Beeckman dan Rüdelsheim, "Biosafety and Biosecurity in Containment: A Regulatory Overview."
15 Zhao, "The Role of International Organizations in Preventing Conflicts Between the SPS Agreement and the Cartagena Protocol on Biosafety."
16 Kafi, "Regulation of Genetically Modified Organisms in India and the Influence of Cartagena Protocol on Its Biosafety Framework."
17 Pereira, "The Cartagena Protocol on Biosafety and the Regulation of Transboundary Movement of Living Modified Organisms."

by mandating fast and effective responses to health concerns while maintaining proportionality and respect for individual rights. For example, quarantine and travel limitations must be reconciled with free movement and non-discrimination rights during an outbreak. The IHR's focus on capacity building and international collaboration is crucial for a holistic approach to biosecurity, wherein the protection of public health and human rights are not conflicting aims but rather mutually supporting objectives.[18]

An integrated approach to the relationship between human rights and biosecurity require the consolidation of these frameworks to ensure that biosecurity measures do not violate human rights. Policies should be designed to protect the right to health by guaranteeing access to healthcare and essential medical interventions during biological emergencies. Additionally, biosafety regulations must safeguard biodiversity and human health without hampering technological innovation. Public health regulations, established by the IHR, should coordinate global efforts to address biological risks while upholding human rights standards.

One Health is a comprehensive approach focused on harmonising and increasing the health of humans, animals, and ecosystems. It recognizes the link of human health, animal health, and the environment and supports cooperative, multi-sectoral, and transdisciplinary actions at local, national, and global scales to obtain optimal health outcomes.[19] This concept is vital in treating zoonotic diseases transferred between animals and people, including avian influenza, Ebola, and COVID-19.[20] One Health strengthens the capacity to predict, avert, and resolve health hazards at the human-animal-environment interface by increasing collaboration among public health, veterinary, and environmental health specialists. The World Health Organization (WHO), the Food and Agriculture Organization (FAO), and the World Organization for Animal Health (OIE/WOAH) recommend One Health as an essential approach for promoting global health security and sustainable development.[21] The interplay of the right to health, biosecurity, biosafety, and public health highlights the requirement of a balanced policy that secures communities from biological threats while respecting important human rights. By harmonizing these frameworks, policymakers can construct a resilient and equitable global society skilled at solving the intricate difficulties at the intersection of human rights and biosecurity.[22]

This article aims to examine the integration of international legal frameworks, specifically the ICESCR, the BWC, the Cartagena Protocol, and the IHR, to ensure that biosecurity measures advance, rather than undermine, the human right to health. It argues that biosecurity, biosafety, and public health measures mandated by international law are fundamentally compatible with the right to health. Actions taken during crises or pandemics, though sometimes perceived as restrictive, should be viewed as necessary efforts to protect the right to health. Rather than framing pandemic responses as inherently opposed to human rights, it is essential to recognize their purpose in safeguarding individual and community well-being. Limiting state power solely for the sake of rights may impede effective pandemic response; instead, strategies should balance the urgency of public health concerns with the preservation of human rights. This research argues that biosecurity measures under international law reinforce, rather than diminish, human rights protections.

2. Method

This study investigates the junction of the human right to health and biosecurity governance through a combination of doctrinal legal analysis and desktop research.

Normative mapping: Health-related obligations were identified in key international instruments, the International Covenant on Economic, Social and Cultural Rights (ICESCR),[23] the International Health Regulations (IHR 2005),[24] the Biological Weapons Convention (BWC),[25] and the Cartagena Protocol on Biosafety[26] with a focus on access to health services, non-discrimination, transparency, and state accountability.

Gap and coherence analysis: These instruments' approaches to biosecurity measures and normative tensions

18 Haoquan, "International Biosafety Legal Provisions and Application—Focusing on the Conflict between the Cartagena Protocol on Biosafety and the WTO Rules."
19 Shmueli, "Predicting Intention to Receive COVID-19 Vaccine Among the General Population Using the Health Belief Model and the Theory of Planned Behavior."
20 Singh, "Cartagena Protocol and Sustainable Development: Embracing a One Health Perspective."
21 World Health Organization, "One Health."
22 El Zowalaty dan Järhult, "From SARS to COVID-19: A Previously Unknown SARS-Related Coronavirus (SARS-CoV-2) of Pandemic Potential Infecting Humans—Call for a One Health Approach."
23 See article 12 UN General Assembly, "International Covenant on Economic, Social and Cultural Rights."
24 "International Health Regulations."
25 United Nations Office for Disarmament Affairs, "Biological Weapons Convention."
26 "Cartagena Protocol on Biosafety to the Convention on Biological Diversity."

between security imperatives and rights-based protections were thoroughly analyzed.[27]

A comprehensive literature review was undertaken using Scopus, HeinOnline, PubMed, and Google Scholar with keyword searches including "right to health AND biosecurity," "biosafety AND human rights," "International Health Regulations AND equity," "One Health AND sovereignty."

Inclusion criteria included peer-reviewed articles, official reports from the WHO, UN, and policy documents published between 2000 and 2024 addressing legal, ethical, or governance aspects relevant to health rights and biosecurity[28] Exclusion criteria included technical biosafety measures, scientific research lacking legal or regulatory context, and non-English sources.

The study focuses on the moral and governance components of biosecurity as connected to health rights, considering its particular biosecurity issues and governance capacities.[29] Empirical case data and sophisticated ethical theory are outside the scope, while broader ethical implications are highlighted.[30]

Limitations include restricted availability of up-to-date legal and policy materials. The absence of field interviews and case law study may further impede insights into domestic implementation.

3. Findings and Discussion

The integration of human rights and biosecurity creates a complicated challenge that requires a coordinated strategy to ensure public health while preserving individual liberty. Academic discussion has migrated to the junction of these fields, especially involving global health emergencies, biotechnological advances, and international security. This literature study encapsulates major contributions to comprehending the alignment between human rights principles and biosecurity measures.

Article 12 of the ICESCR delineates the right to health as a fundamental human right covering disease prevention, treatment, and access to medical care.[31] This standard obliges creates conditions that ensure the highest attainable standard of health for all, not only through medical services but also through protective measures against public health threats. Researchers like Toebes[32] and Yamin[33] have examined the ramifications of this right concerning public health emergencies, argued that health security protocols including biosecurity measures must align with human rights obligations. Gostin and Wiley[34] stress that biosecurity measures, including quarantine and surveillance, must be harmonized with the necessity to promote equal access to healthcare, especially for marginalized communities.

Biosecurity, as governed by international laws such as the BWC is crucial for biosecurity as it prevents the production and utilization of biological weapons.[35] Enemark[36] and Tucker[37] stress the need of adhering to the BWC to prevent bioterrorism and defend public health. .However, implementing these protections raises issues with human rights, especially with regard to freedom of movement and privacy.

Fidler (2005) and Resnik (2009) propose frameworks that include human rights concerns into biosecurity tactics to address these conflicts.

Such integration guarantees that emergency actions adopted for population protection do not disproportionately damage disadvantaged people or compromise key human rights standards, but rather contribute to a holistic, rights-respecting public health policy.

The Cartagena Protocol on Biosafety especially addresses the secure management of living-modified organisms (LMOs) and their prospective consequences on biodiversity and human health.[38] Researchers such as Gupta[39] and Falkner[40] study the precautionary principle of the Protocol, which tries to prevent harm before its

27 Gostin dan Katz, "The International Health Regulations."
28 (WHO & United Nations Development Programme, n.d.; The Lancet, BMJ Global Health, n.d.).
29 World Bank, *People, Pathogens, and Our Planet: The Economics of One Health.*
30 Gostin dan Katz, "The International Health Regulations."
31 UN General Assembly, "International Covenant on Economic, Social and Cultural Rights."
32 Toebes, *The Right to Health as a Human Right in International Law*.
33 Yamin, "The Right to Health under International Law and Its Relevance to the United States."
34 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3 ed.
35 United Nations, "Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and their Destruction."
36 Enemark, *Disease and Security: Natural Plagues and Biological Weapons in East Asia*.
37 Tucker, *Toxic Terror*.
38 "Cartagena Protocol on Biosafety to the Convention on Biological Diversity."
39 Gupta, "Governing Trade in Genetically Modified Organisms: The Cartagena Protocol on Biosafety."
40 Falkner, *The International Politics of Genetically Modified Food: Diplomacy, Trade and Law*.

manifestation. This concept is in line with the right to health by ensuring that biotechnological breakthroughs do not pose hazards to human health. Jasanoff[41] and Tait[42] highlight the difficulty of integrating innovation with safety, arguing for transparent risk appraisals and public involvement in decision-making procedures. It is argued that public involvement is a useful element of human rights.

The WHO instituted the IHR as a legal foundation for international public health security. Fidler[43] and Katz and Dowell[44] stress the role of the IHR in global responses to health crises, including pandemics. The IHR emphasizes the necessity of quick detection and response while protecting human rights, particularly non-discrimination and freedom of movement. Gostin[45] and Burci and Vignes[46] highlights the International Health Regulations' function in reconciling public health imperatives with individual rights, notably with interventions like travel bans and obligatory quarantines.

An integrated approach for biosecurity and human rights incorporates health security, biosafety, and public health within a human rights framework. Researchers such Weir and Mykhalovskiy[47] and Elbe[48] suggest developing comprehensive policies that cover biosecurity's ethical and legal issues. It guarantees that healthcare policies do not disproportionately harm marginalised people and that public health efforts are inclusive and equitable. Recent studies by Gostin et al.[49] and Habibi et.al[50] accentuate the necessity of global governance and collaboration in tackling the connected concerns of biosecurity and human rights. These experts promote international treaties and state policies anchored in human rights principles, ensuring that biosecurity measures are transparent, accountable, and equitable.

The connection between human rights and biosecurity is a multidimensional topic that requires a careful balance between maintaining public health and upholding individual freedoms. The literature study underscores the significance of interconnected frameworks synchronizing biosecurity protocols with human rights obligations. Policymakers may guarantee that health security programs do not infringe upon fundamental human rights, by implementing a comprehensive and inclusive strategy, ensuring a resilient and equitable global health framework.

Despite this literature, few studies have comprehensively explored the integration of biosecurity and human rights within international legal frameworks. This gap prevents knowledge of how both frameworks might be harmonized to successfully protect both public health and human rights in practice.

In summary, while the literature underscores the multidimensional nature of biosecurity and human rights, this study aims to contribute novel insights by bridging theoretical discussions with practical legal frameworks to support more coherent, inclusive, and rights-respecting biosecurity governance.

While prior literature has highlighted the importance of developing cohesive frameworks that synchronize biosecurity protocols with human rights obligations, this article advances the discourse by systematically examining existing international legal instruments, specifically the ICESCR, BWC, Cartagena Protocol, and IHR, to identify practical pathways for harmonization. Rather than merely reiterating the need for comprehensive and inclusive strategies, the article synthesizes current regimes, highlights areas of fragmentation and inconsistency, and proposes a unified governance model that operationalizes rights-based biosecurity measures in actual policy and legal contexts.

This study includes suggestions for policymakers on how to link biosecurity measures with human rights protections in both everyday practice and during public health emergencies. Through doctrinal analysis and policy synthesis, it offers tangible answers for creating robust and equitable global health governance that safeguards both security and rights.

It is argued that incorporating human rights into health and biosecurity standards is vital for designing policies that safeguard public health while preserving individual liberty. This detailed policy guarantees that

41 Jasanoff, *Designs on Nature: Science and Democracy in Europe and the United States*.
42 Tait, "More Faust than Frankenstein: The European Debate About the Precautionary Principle and Risk Regulation for Genetically Modified Crops."
43 Fidler, *SARS, Governance, and the Globalization of Disease*.
44 Katz dan Dowell, "Revising the International Health Regulations: Call for a 2017 Review Conference."
45 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3rd ed.
46 Burci dan Vignes, *World Health Organization*.
47 Weir dan Mykhalovskiy, *Global Public Health Vigilance: Creating a World on Alert*.
48 Elbe, *Security and Global Health: Toward the Medicalization of Insecurity*.
49 Gostin dkk., "The Legal Determinants of Health."
50 Habibi dkk., "The Stellenbosch Consensus on Legal National Responses to Public Health Risks."

the fundamental right to health is maintained in confronting biosecurity risks like bioterrorism, pandemics, and biotechnology hazards. The next sections describe the means for attaining this integration through matching international frameworks and principles, increasing global collaboration, adopting inclusive and transparent policies, and highlighting the role of sovereignty in executing international law.

3.1 Harmonizing International Frameworks

The integration of human rights and biosecurity is most obviously articulated in the right to health. Article 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) stipulates that governments respect "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health." This service involves both curative and preventative aspects—access to healthcare as well as the implementation of measures to address epidemics and other hazards. Biosecurity, principally expressed through international law frameworks like the Biological Weapons Convention,[51] strives to forestall the intentional or incidental exploitation of biological agents.[52] When compared, these frameworks show a shared normative foundation: defending human life and dignity from biological threats. However, issues develop when biosecurity efforts, under the pretense of prevention, restrict or hinder access to health treatments.

The BWC forbids the production and accumulation of biological weapons; yet it is conspicuously lacking in stipulations about the affirmative responsibilities of nations to incorporate human rights protections into its execution. To remedy this gap, adherence to ICESCR principles guarantees that security does not overwhelm health rights. For example, the COVID-19 pandemic revealed how stringent biosecurity measures, including border closures and travel bans, severely obstructed medical supply chains and disproportionately affected marginalized groups, raising issues about restrictions on the right to movement and equitable access to care.[53] This calls for the crucial need to examine emergency biosecurity responses using proportionality tests, balancing whether regulations sufficiently safeguard public health without unjustly infringing upon the right to health, freedom of travel, and non-discrimination.

Tensions also occur between international trade liberalization and biosafety limitations. For instance, while trade agreements promote free movement of products, biosafety laws such as import bans on genetically modified organisms (GMOs) can contradict with these promises. Malaysia's implementation of the Cartagena Protocol through its Biosafety Act 2007 demonstrates this tension. The Act mandates previous risk assessments and permissions for LMOs, thereby defending public health and biodiversity, but simultaneously raises problems regarding conformity with trade commitments under the World Trade Organization agreements. This demonstrates the legal and policy challenge of reconciling biosafety restrictions with economic and trade obligations.

The Cartagena Protocol on Biosafety, established under the Convention on Biological Diversity, introduces an additional layer of regulation for living modified organisms (LMOs). The precautionary principle necessitates that nations perform risk assessments before approving GMO utilization or release.[54] Malaysia's Biosafety Act illustrates how domestic legislation can align biosafety governance with the right to health while navigating these complex trade-offs.

The International Health Regulations[55] represent a vital framework serving as the legal basis for global health security. The IHR mandates states to inform the World Health Organization (WHO) of public health emergencies of international significance and to enhance essential surveillance and response capabilities. Moreover, the IHR balance public health protection with human rights commitments by requiring that quarantine, isolation, and travel restrictions respect human dignity, rights, and fundamental freedoms.[56]

A thorough and practical strategy at the national and international levels is required to integrate these perspectives. At the international level, harmonization can be pursued through cross-instrument guidelines and joint working groups under the auspices of organizations such as the WHO, UN, and relevant treaty bodies. These forums can develop unified protocols and best practices drawing from the standards set by the BWC, the Cartagena Protocol, and the IHR, while ensuring alignment with the ICESCR's right to health requirements. At

51 United Nations Office for Disarmament Affairs, "Biological Weapons Convention."
52 United Nations, "Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and their Destruction."
53 Gostin dkk., *Global Health Law and Governance*.
54 "Cartagena Protocol on Biosafety to the Convention on Biological Diversity."
55 "International Health Regulations."
56 World Health Organization, "International Health Regulations (2005)."

the national level, states should fulfill their obligations by embedding these harmonized standards into domestic legislation, regulatory frameworks, and biosecurity strategies. This includes mandating transparent reporting, upholding scientific integrity, guaranteeing environmental and health safeguards, and providing equitable healthcare access in accordance with both international commitments and national priorities. By linking legal instruments in these concrete ways, biosecurity governance will encompass not only containment and prevention, but also the proactive facilitation of fair, safe, and rights-respecting health systems for all populations.

3.2 Facilitating International Cooperation

The globalized nature of biological threats, spanning epidemics, laboratory incidents, and deliberate misuse, means that no nation can ensure biosecurity in isolation. The SARS-CoV-2 pandemic demonstrated how infectious diseases traverse borders faster than bureaucratic coordination can respond.[57]

Building Capacity in Developing Countries

Many low and middle-income nations lack advanced laboratory infrastructure, biosafety training, and surveillance systems, creating blind spots in global disease preparedness.[58] Pathogens that originate in resource-limited regions may be detected too late, risking unchecked international transmission. Capacity-building initiatives, such as technological support and financial assistance, empower developing countries to fulfill biosecurity requirements while preserving the right to health. The World Health Organization's Joint External Evaluation framework enables states to assess their compliance with International Health Regulations (IHR), but true improvement hinges on equitable funding and sustained technology transfer.

3.2.1 Transparency and Outbreak Reporting

Transparency is essential to both international collaboration and the protection of health rights. States that conceal outbreaks for political or economic reasons endanger global health and violate their citizens' right to timely information. The 2003 SARS outbreak, initially withheld by authorities in China, showed how secrecy exacerbated transmission and eroded public trust.[59] In contrast, rapid and transparent data sharing strengthens collaborative containment; platforms such as ProMED-mail and GISAID exemplify how open information flow is crucial for scientific progress and rights-based governance.

3.2.2 Equity in Distribution: The COVAX Example

Equitable access to medical countermeasures is a core human rights concern. The COVAX initiative for instance a global program to distribute COVID-19 vaccines more fairly, illustrates both promise and frustration: while designed to prevent marginalization of low-income nations, its effectiveness was undermined by vaccine nationalism and delays, leaving billions without prompt access.[60] This outcome emphasizes that meaningful cooperation must extend beyond technical partnerships to address distributive justice. Achieving sustainable biosecurity thus requires not only collaborative action but also equity, ensuring that all populations are equally protected regardless of national wealth.

In the context of biosecurity and public health emergencies, the COVAX experience underscores the need for sustainable governance models that combine cooperation with equity, ensuring that all populations, regardless of economic status, are protected and no one is left behind.

3.3.3 Geopolitical Collaboration and Ethical Imperatives

Global forums such as the UN Security Council, the Global Health Security Agenda (GHSA), and others, provide platforms to align biosecurity efforts with human rights norms. The GHSA focuses on measurable biosafety improvement and ethical protection while recognizing the constraints posed by geopolitical competition.[61] Overcoming these barriers demands renewed solidarity, prioritizing vaccine equity, fostering inclusive treaty negotiations, and embedding human rights considerations in international agreements.

57 Zhang dan Holmes, "A Genomic Perspective on the Origin and Emergence of SARS-CoV-2."
58 Mphande-Nyasulu dkk., "Outbreak Preparedness and Response Strategies in ASEAN Member States."
59 Elisabeth Rosenthal, "A Beijing doctor questions data on illness."
60 Kamradt-Scott, *Managing Global Health Security*.
61 Katz dan Dowell, "Revising the International Health Regulations: Call for a 2017 Review Conference."

3.3 Implementing Inclusive and Transparent Policies

The validity of biosecurity measures relies on their technological effectiveness, inclusivity, ethical foundation, and transparency. Policies that neglect human rights may incite opposition, diminish trust, and compromise adherence. In contrast, rights-based approaches promote legitimacy and enduring efficacy.

Public engagement in decision-making improves democratic accountability. Communities impacted by biosecurity measures—such as quarantine, vaccination, or GMO deployments, must be adequately consulted. This corresponds with the notion of free, prior, and informed consent, a fundamental aspect of bioethics and human rights law. In the realm of vaccine trials, involving communities and honoring informed consent safeguards autonomy while bolstering trust in science.[62] Incorporating deliberative procedures into biosecurity governance enables states to diminish suspicion and enhance compliance.

Ethical considerations are especially prominent in forceful measures. Quarantine, isolation, and compulsory vaccination, although occasionally essential, impose limitations on freedom. Human rights law allows such measures if they are legal, essential, proportionate, and non-discriminatory. The 2019 COVID-19 outbreak resulted in the forcible isolation of many world populations under severe conditions, prompting concerns regarding excessive restrictions on rights. In contrast, countries that used supportive quarantine measures—offering food, healthcare, and communication access—attained superior compliance and outcomes. This demonstrates that ethics and rights are not impediments to biosecurity, but rather essential conditions for its success.

Proportionality serves as an additional guiding principle. Measures must be the least restrictive required to accomplish public health goals. Digital surveillance technology can improve contact tracing while simultaneously raising privacy problems. Countries' rigorous digital tracing during COVID-19 was effective but ignited discussions around data privacy and stigmatization. Incorporating safeguards like data minimization, supervision measures, and sunset provisions maintains equilibrium between biosecurity effectiveness and the protection of rights.

Ultimately, ongoing supervision and assessment are important. Independent monitoring entities, legislative committees, or human rights commissions can evaluate the proportionality and equity of biosecurity measures. Incorporating rights impact assessments into emergency preparedness frameworks ensures alignment with constitutional and international commitments. The relationship between human rights law and biosecurity should be institutionalized rather than regarded as a secondary consideration during crises.

3.4 The importance of sovereignty in enforcing international law

Sovereignty is essential for enforcing international law, particularly in advancing human rights, peace, and innovation. It allows governments to tailor international norms and agreements to their national or regional contexts, ensuring effective and acceptable implementation for local populations.

The principle of sovereignty enables states to make decisions that mirror their unique political, cultural, and social contexts. It is particularly significant where each nation possesses distinct legal systems, governance frameworks, and cultural values. Sovereignty guarantees that international laws, including human rights and biosecurity, are adapted to the local context, enhancing their acceptability and efficacy. The IHR mandates that nations establish and sustain fundamental public health capabilities for detecting, assessing, reporting, and responding to public health emergencies. Sovereignty enables each nation to ascertain the most effective means of attaining these capabilities within their national health systems and resources.[63]

Sovereignty is crucial for the advancement of human rights. It allows states to integrate international human rights standards into domestic laws and policies while honoring and mirroring their legal traditions and societal norms. This strategy can enhance local communities' legitimacy and acceptance of human rights initiatives. The ASEAN Human Rights Declaration exemplifies a dedication to human rights, recognizing the region's varied cultural and historical contexts. The equilibrium between international standards and local values is crucial for advancing and safeguarding human rights.[64]

Sovereignty enables states to tackle security challenges and foster technological progress in manners tailored to their unique contexts. Regional cooperation frameworks, like the ASEAN Regional Forum, facilitate collaboration among nations on security matters while honoring each other's sovereignty. This deference to

62 London dan Kimmelman, "Against Pandemic Research Exceptionalism."
63 Gostin, Global Health Law.
64 Davies, *ASEAN and Human Rights: Reshaping ASEAN's Role in the Regional and International Setting*.

sovereignty cultivates trust and collaboration among nations, leading to regional stability and peace.[65] Moreover, sovereignty allows nations to implement innovative policies aligned with their developmental goals and capacities. National biotechnology and biosafety strategies can be formulated to leverage local strengths and meet specific needs, fostering long-term development and innovation within international agreements like the Cartagena Protocol on Biosafety.[66] Sovereignty is a crucial principle that underpins the effective enforcement of international law. It guarantees that international standards are adapted to local contexts, enhancing their acceptability and effectiveness. Sovereignty fosters human rights, peace, and innovation across the region by enabling states to make decisions tailored to their specific circumstances. However, excessive emphasis on sovereignty can hinder regional transparency and cooperation during health crises, as seen in delayed outbreak reporting or selective data sharing.

In light of this issue, the proposal to establish a pandemic treaty is a good move to address the issues of global public health and biosecurity concern when pandemic occurs. The draft pandemic agreement text, serving as the foundation for negotiations, reaffirms the principle of State Parties' sovereignty in public health matters, asserting that States possess, in accordance with the United Nations Charter and general principles of international law, the sovereign right to legislate and implement legislation in pursuit of their health policies.[67]

3.5 Challenges and Consequences of Incorporating Human Rights into Health and Biosecurity

Enforcing biosecurity measures, including quarantines and travel restrictions, often infringes upon individual freedoms and privacy rights.[68] To prevent biosecurity measures from infringing on human rights, meticulous planning and supervision are essential, along with implementing the least restrictive measures feasible.[69]

Biosecurity threats may intensify pre-existing inequities in healthcare access, particularly in resource-limited environments.[70] Consequently, policies must be formulated to guarantee equitable access to health resources during biosecurity crises, preventing marginalized communities from disproportionately suffering the consequences of biosecurity measures.[71]

Coordinating biosecurity measures among nations with varying capabilities, legal frameworks, and health systems is challenging.[72] Efficient international cooperation and information dissemination are essential. Neglecting to do so may lead to disjointed responses and diminish the overall efficacy of biosecurity protocols.[73]

Legal frameworks regulating biosecurity and human rights may conflict, leading to legal and ethical dilemmas.[74] Policymakers must reconcile these conflicts to guarantee that biosecurity legislation aligns with human rights obligations and ethical principles.[75] Human rights violations can erode public confidence in biosecurity protocols, influencing adherence.[76] Clear communication and community involvement in decision-making can enhance trust and adherence to biosecurity protocols.[77]

Incorporating human rights considerations into biosecurity policy formulation and implementation presents multiple challenges and requires a commitment. Thus, human rights must be considered during the formulation and execution of biosecurity policies. Measures must be proportional, essential, and uphold human rights. It entails regularly reviewing and adapting policies to guarantee their efficacy and equity.[78]

A major challenge is enhancing health systems and biosecurity infrastructure is essential, especially in low and middle-income nations. It entails supplying sufficient resources, training, and support to enable these nations to execute biosecurity protocols efficiently while safeguarding human rights (Gostin, 2006).[79]

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65 Haacke, *ASEAN's Diplomatic and Security Culture: Origins, Development and Prospects*.
66 Buckley, *Implementing the Cartagena Protocol on Biosafety: Law and Policy of Access and Benefit Sharing*.
67 World Health Organization, "Governments continue discussions on pandemic agreement negotiating text."
68 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3 ed.
69 Fidler, *SARS, Governance, and the Globalization of Disease*.
70 Yamin, "The Right to Health under International Law and Its Relevance to the United States."
71 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3rd ed.
72 Hoffman, *Global Health Diplomacy: The New Recognition of Global Health in Foreign Policy*.
73 Katz dan Dowell, "Revising the International Health Regulations: Call for a 2017 Review Conference."
74 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3 ed.
75 Burci dan Vignes, *World Health Organization*.
76 Elbe, *Security and Global Health: Toward the Medicalization of Insecurity*.
77 Weir dan Mykhalovskiy, *Global Public Health Vigilance: Creating a World on Alert*.
78 Fidler, "From International Sanitary Conventions to Global Health Security: The New International Health Regulations"; Resnik, *Playing Politics with Science: Balancing Scientific Independence and Government Oversight*.
79 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3rd ed.

Coherent execution also depends on aligning national legal frameworks with international standards. Aligning national and international legal frameworks is essential for executing cohesive biosecurity and human rights strategies. It involves amending laws and regulations to tackle contemporary biosecurity issues and upholding human rights standards.[80]

Investments in research and innovation investments are essential for advancing safe, effective, human rights-compliant biosecurity technologies and strategies. Adherence to ethical guidelines in research and development is essential to guarantee that innovations serve all societal segments.[81]

Robust ethical and accountability mechanisms enhance public trust during biosecurity events. Accountability mechanisms, including independent review bodies and transparent reporting, enhance public trust and safeguard human rights.[82]

Finally, informing the public about biosecurity risks and the significance of adhering to health protocols can enhance comprehension and collaboration. Public health campaigns should address individual rights and responsibilities during biosecurity emergencies.[83]

Given the multifaceted nature of health security challenges discussed above, a siloed approach to public health, biosafety, and biosecurity is increasingly insufficient. This article argues that a holistic paradigm is needed, one that not only safeguards human rights in the context of health emergencies but also bridges gaps across related sectors. The One Health approach offers such an integrative framework by explicitly recognizing the interdependence of human, animal, and environmental health systems. The primary challenge in integrating the One Health approach with human rights, public health, biosafety, and biosecurity is the existence of fragmented and isolated frameworks. Each domain functions within unique regulatory and institutional frameworks, leading to potential disunity and lack of collaboration. It is important to encourage institution building for preventing future pandemics.[84] Public health initiatives typically concentrate on human populations, while animal health and environmental health may be governed by separate jurisdictions with varying priorities and policies (Gibbs, 2014). A further challenge is the fair allocation of resources across the diverse sectors engaged in the One Health approach. Ensuring sufficient resources for human, animal, and environmental health initiatives poses challenges, especially in low- and middle-income nations. Inadequate financial, human, and technical resources may hinder the effective execution of integrated One Health strategies, rendering specific sectors underfunded and ill-prepared.[85]

The successful incorporation of One Health (FAO; WHO; WOAH; UNEP) into public health, biosafety, and biosecurity requires robust interdisciplinary communication and collaboration. Experts from diverse disciplines, including medicine, veterinary science, and environmental science, often employ distinct terminology, methodologies, and objectives. Surmounting these obstacles to foster mutual understanding and collaboration is essential yet challenging. Establishing platforms and opportunities for interdisciplinary training and dialogue can bridge these gaps.[86] Legal and policy obstacles hinder the integration of One Health. Various countries' disparate laws and regulations regarding public health, animal health, and environmental protection complicate international collaboration and the execution of cohesive strategies. Aligning these legal frameworks to facilitate a holistic One Health approach requires substantial political commitment and coordination at both national and international levels.[87] Cultural and social factors affect the acceptance and execution of One Health initiatives. Public perceptions and actions regarding animal-human interactions, environmental conservation, and disease prevention can significantly differ, impacting the effectiveness of integrated health interventions. Engaging communities and honoring local customs and knowledge is essential for the efficacy of One Health strategies; however, this can be difficult to accomplish in diverse and complex societies.[88]

80 Fidler, "From International Sanitary Conventions to Global Health Security: The New International Health Regulations."
81 Jasanoff, *Designs on Nature: Science and Democracy in Europe and the United States*.
82 Gostin dan Wiley, *Public Health Law: Power, Duty, Restraint*, 3rd ed.
83 Yamin, "The Right to Health under International Law and Its Relevance to the United States."
84 Gallo-Cajiao dkk., "Global Governance for Pandemic Prevention and the Wildlife Trade."
85 World Bank, "Operational Framework for Strengthening Human, Animal, and Environmental Public Health Systems at Their Interface ('One Health')."
86 Atlas, "One Health: Its Origins and Future."
87 Karesh dkk., "Ecology of Zoonoses: Natural and Unnatural Histories."
88 Rock dkk., *One Health: Science, Politics and Zoonotic Disease in Africa*.

4. Conclusion

The convergence of human rights and biosecurity presents a multifaceted terrain that requires meticulous navigation to safeguard public health while maintaining individual liberties. This discussion examined the challenges, implications, and recommendations for integrating human rights principles into biosecurity measures. The convergence of human rights and biosecurity presents a multifaceted terrain that requires meticulous navigation to safeguard public health while maintaining individual liberties. This discussion has identified several core challenges: the fragmentation and lack of integration between biosafety, biosecurity, and public health frameworks; potential conflicts between urgent public health measures and the protection of individual rights; disparities in resources and capacities, especially among low and middle-income countries; and the difficulties in aligning national implementation with evolving international legal obligations. The implications are equally profound, effective biosecurity governance demands proportional, rights-respecting policies, robust ethical oversight, and transparent communication with the public. Failure to address these challenges risks undermining public trust, leaving populations vulnerable, and perpetuating inequities in health security measures.

A comprehensive approach is essential for effective and ethical biosecurity governance despite the inherent tensions between security requirements and human rights. This method involves establishing thorough legal frameworks that emphasize the right to health while reconciling public health interests with individual freedoms. The significance of sovereignty in executing international law must be considered, as it carries practical ramifications, especially in integrating international laws into domestic legislation. Enhancing international collaboration, investing in capacity development, and promoting public engagement and education are essential for attaining this objective.

Implementing ethical oversight mechanisms and promoting innovation in biosecurity technologies creates a robust framework for integrating human rights into biosecurity strategies. By adhering to these recommendations, policymakers can establish robust health systems that address biosecurity threats while upholding human dignity and rights. Integrating human rights into biosecurity measures is both a moral obligation and a practical necessity for effective global health governance. Adopting a rights-based approach guarantees that biosecurity measures safeguard public health while honoring all individuals' inherent dignity and rights.

This study contributes to the discourse by proposing a rights-based framework for biosecurity governance, firmly anchored in the One Health principle. Policymakers should prioritize (1) establishing permanent, cross-border surveillance mechanisms that facilitate rapid and transparent data sharing, and (2) investing in regional capacity-building partnerships to expand laboratory infrastructure and biosafety training in lower-resourced countries. These measures will simultaneously strengthen pandemic preparedness and ensure the protection of health-related human rights throughout the region. Despite a robust foundation, continuous adaptation is essential to align with the swift progress in science and technology, necessitating enhanced international collaboration, sustained investment in public health infrastructure, and adaptable legal and legislative frameworks; consequently, human rights could be safeguarded concurrently.

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