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Research Article

Legal aspects of preventing the spread of pandemics across national, state or regional borders: Legislative framework in Ukraine and international practice

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Abstract

This article examines the legal aspects of pandemic prevention at national, state, or regional borders. It also analyzes international norms and agreements governing the movement of people. The article focuses on international cooperation and coordination during pandemics. It investigates the effectiveness of various border control measures, such as travel bans, quarantines, and health screenings, in preventing the spread of infectious diseases. Although timely border restrictions can lower infection rates, their effectiveness relies on the internal strategies in place. The article proposes recommendations for improving legal regulation and leveraging innovative technologies. It underscores the critical role of global coordination in bolstering preparedness for future pandemics.

Keywords: epidemic prevention measures, national, state or regional borders, prevention of epidemic infiltration, control of movement of individuals, international cooperation at borders.

Introduction

This article is particularly relevant due to the growing global threats from epidemics and pandemics. Recent outbreaks, including Severe Acute Respiratory Syndrome, Middle East Respiratory Syndrome, tuberculosis, Ebola virus disease, COVID-19, and the recent Dengue epidemic in America [1,2] exemplify the urgency of addressing these challenges. These threats highlight the imperative for improved legal regulation and effective cooperation [3] to control the spread of diseases across national, state, or regional borders (NSorRB) [4]. This need is increasingly critical due to global integration and rising international migration [5].

The problem is that existing legal mechanisms do not always meet the modern challenges of global health and need adaptation. There is a need to find an optimal balance between ensuring public health interests and protecting human rights, which is especially relevant in the context of globalization and increased population mobility.

The aims of this article are to review the current state of legal regulation of pandemic prevention measures, including an analysis of international and Ukrainian legal acts, to identify the main challenges and issues in implementing such measures at NSorRB, and to assess their impact on human rights protection. Additionally, the article aims to develop recommendations for improving the legal framework and enhancing the effectiveness of disease control across borders.

Methods

This review employs statistical analysis, comparative studies, and formal legal interpretation to examine and address legal issues related to pandemic prevention measures aimed at protecting NSorRB from disease entry from other regions. The statistical analysis included studies of scientific works, legal acts, resources from international organizations, and individual review articles or websites, allowing for a critical assessment of the strengths and weaknesses of Ukrainian legislation in accordance with international standards. Comparative studies involved examining specific legal aspects of selected continental and island countries to identify best practices for preventing the spread of infectious diseases through NSorRB. Formal legal interpretation enabled the synthesis of legal norms related to epidemic prevention into descriptive tables. The comprehensive use of these methods facilitated the identification of the most effective legal systems and practices for preventing the spread of pandemics. Additionally, it helped prepare general recommendations on organizational and legal measures for pandemic

prevention in the form of an activity model with specific emphases for each type.

Recommendations

Strengthening cooperation with international partners in creating and harmonizing international standards for pandemic management at borders is crucial for ensuring consensus and mutual understanding between countries on security and human rights protection issues [6]. This cooperation should further improve legal norms to support the development and implementation of innovative technologies, such as electronic contact monitoring systems, to enhance border control effectiveness [7].

The study by Jit et al. [8] contributes to understanding that establishing international information-sharing mechanisms is critical for effectively responding to pandemic threats and improving coordination between countries and international organizations. Creating such information-sharing mechanisms will enable countries to share data on pandemic outbreaks and coordinate their response measures, helping to prevent the spread of infectious diseases.

Additionally, within efforts to ensure human rights during the implementation of pandemic control measures, it is important to establish mechanisms that guarantee fairness, transparency, and the ability to appeal decisions regarding restrictions at NSorRB [9]. This will ensure that pandemic control measures are non-discriminatory and respect human rights for all groups.

The following activity model presents recommendations for organizational and legal measures of border control at NSorRB, which are in line with the zero draft of the WHO Convention and other international pandemic prevention documents (Table 1).

Table 1. Activity model.

№	Types of activities	General measures	Emphases	Anti-epidemic measures of border control
1	International Cooperation	Establishing agreements with international partners on harmonized standards for pandemic management at borders	Collaborating on the development of legal frameworks for innovative surveillance and contact-tracing technologies	Exchanging information on the epidemiological situation and best practices
				Conducting joint research and developing new border control technologies
				Coordinating vaccination and testing measures at borders
2	Legal Framework Development	Reviewing and updating national laws and regulations to align with international standards	Developing legislation on the use of border technologies and data privacy; establishing procedures for pandemic control	Implementing clear rules and procedures for border control during pandemics
				Ensuring the protection of travelers' personal data
				Defining responsibilities for the implementation and compliance with anti-epidemic measures
3	Institutional Capacity Building	Strengthening border agencies with resources and qualified personnel	Implementing specialized training for staff and improving infrastructure and technological support	Providing border officials with necessary equipment and protective gear
				Training staff on epidemiological control protocols and the use of new technologies
				Preparing personnel for work in emergency conditions

4	Public Engagement and Transparency	Informing the public about border control measures	Implementing mechanisms for public oversight and accountability, including channels for raising concerns or appealing decisions	Publishing clear and accessible information about border control rules and procedures
				Providing opportunities for the public to give feedback and express concerns
				Establishing mechanisms for addressing complaints and resolving issues
5	Monitoring and Evaluation	Regularly monitoring the effectiveness of border control measures	Conducting periodic reviews of the legal framework and improving procedures based on data analysis and feedback	Collecting and analyzing data on the effectiveness of anti-epidemic measures
				Assessing the impact of measures on health, safety, and the economy
				Refining measures based on collected data and feedback

International legal context

Facilitating the free movement of people across international borders is a crucial part of modern international relations and a key element of the globalized world. The regulation of this issue relies on a framework of general international law norms, which define the responsibilities and rights of states in ensuring the free movement of people.

One of the core norms is the principle of freedom of movement, as defined in several international documents, including the Universal Declaration of Human Rights [10] and the International Covenant on Civil and Political Rights [11]. According to this principle, every person has the right to move freely and choose their place of residence within each state, as well as to leave any country, including their own, and return to their country.

Moreover, doctrinal international agreements assert [12-14] that human rights, including the right to freedom of movement and residence, may be restricted under law and are necessary for protecting national security, public order, health, or morals, or the rights and freedoms of others [11]. For instance, the social and economic impacts of health measures at borders can disproportionately harm vulnerable groups, countries, and communities, providing a convenient excuse for governments to engage in discriminatory practices [15]. Therefore, striving to balance human rights and public health protection is a key aspect.

In the context of globalization and increasing interdependence, states must actively cooperate both bilaterally and internationally. This cooperation involves sharing information and coordinating actions to address epidemiological threats collectively. Therefore, pandemic control measures are a crucial component of the health system and aim to prevent the spread of infectious diseases. These measures include a range of strategies such as vaccination, movement control, quarantine, isolation or self-isolation, and other interventions. The primary goal of these measures is to ensure public safety and minimize the risk of virus transmission and other contagious diseases. Achieving this goal requires effective actions across all areas, from organizing medical care to implementing legal norms regulating the movement of people across NSorRB during pandemics.

International organizations play a crucial role in shaping and developing strategies to control the movement of people to prevent the spread of infections. Notable organizations in this area include the World Health Organization (WHO) [16], the International Organization for Migration (IOM) [17] and the European Centre for Disease Prevention and Control (ECDC) [18]. They influence the development of international standards and protocols, engage in joint initiatives with member countries, and coordinate efforts for effective global management of human movement.

Pandemic prevention cooperation relies on various international conventions and agreements designed to coordinate actions and encourage joint efforts among states in preventing and managing pandemics. An examination of key international legal instruments aids in identifying the primary aspects of regulating the implementation of pandemic prevention measures.

World Health Organization (WHO) and International Health Standards: WHO Constitution (a universal instrument defining WHO's goals and functions in supporting global health, including coordinating pandemic control measures) [19]; International Health Regulations (outline state obligations in responding to pandemic threats) [20]; Biological Weapons Convention (regulates the use of biological agents and materials to prevent pandemics and bioterrorism) [21].

The mentioned normative documents establish international standards and state obligations for pandemic control. Table 2 summarizes these points and includes considerations for human rights compliance.

Table 2. Key international agreements.

Nº	Agreements	Short descriptions	Observance of human rights
1	International Convention for Mutual Protection Against Dengue Fever (1934)	Coordination of international measures for Dengue fever control	Does not have a direct impact on human rights
2	Constitution of the World Health Organization (1946)	Establishing health frameworks for WHO	Emphasizes the importance of human rights in health care
3	Universal Declaration of Human Rights (1948)	Defining fundamental human rights, including health protection	Provides a foundation for the protection of human rights in health care
4	International Covenant on Civil and Political Rights (1966)	Protecting civil and political rights, including the right to life	Highlights the importance of respecting human rights in health care
5	International Sanitary Regulations (1951)	International health practice standards	Does not directly focus on human rights but contributes to health protection
6	International Health Regulations (1969)	Updated sanitary regulations for international cooperation	Does not directly focus on human rights but contributes to health protection
7	Biological Weapons Convention (1972)	Prohibition of biological weapons and health protection	Emphasizes the importance of protecting human health from biological threats
8	Basel Convention on Transboundary Movements of Hazardous Wastes and Their Disposal (1989)	Regulating international movement of hazardous waste (including infectious medical waste)	Promotes environmentally safe handling of hazardous waste and protects the right to a healthy environment
9	World Trade Organization Agreement on the Application of Sanitary and	Establishing international standards for food safety and protection of animal and plant health	Protects the right to healthy food and biodiversity

	Phytosanitary Measures (1994)		
10	Cartagena Protocol on Biosafety to the Convention on Biological Diversity (2000)	Regulating international trade of genetically modified organisms	Protects the right to a healthy environment and information on GMOs
11	Stockholm Convention on Persistent Organic Pollutants (2001)	Eliminating or restricting the production and use of persistent organic pollutants	Does not directly focus on human rights
12	International Health Regulations (2005)	Updating sanitary rules for international health security	Does not directly focus on human rights
13	Future Pandemic Prevention Agreement (Draft 2023)	Proposed agreement for improving pandemic preparedness and response	Expected to be adopted by 2025

International law also mandates the establishment of necessary procedural safeguards when restricting freedom of movement. This includes the right to a fair trial [22,23], the opportunity to appeal decisions, and access to information regarding the reasons for restrictions [24].

States are required to establish and maintain effective monitoring and control systems at their borders to ensure citizen safety. This may include electronic identification systems, temperature measurement terminals, and other technological innovations. Efforts should focus on public engagement through the dissemination of information and the correction of misinformation [25] related to pandemic control measures and the current situation. Effective communication and notification enhance public awareness of the necessity and importance of safety measures.

Disseminating information on NSorRB regarding pandemic control measures involves developing and implementing campaigns on citizen responsibility for adhering to pandemic requirements. Such campaigns aim to raise public awareness of the need to follow rules and recommendations, contributing to effective infection control. Additionally, it is important to establish an open dialogue with citizens, involving them in discussions about the necessity of pandemic control measures and their positive impact on community safety.

Ukrainian national legislation

National legislation serves as a tool for regulating and coordinating pandemic control measures at the state level. Reviewing legislation helps to understand the legal aspects and mechanisms of controlling movement during pandemics.

Pandemic prevention measures in Ukrainian legislation include a range of organizational, medical, veterinary, engineering, technical, administrative, and other actions. These measures aim to prevent the spread of infectious diseases, localize and eliminate their sources, cases, and outbreaks [26].

Preventive measures that precede and accompany pandemic prevention efforts include vaccination (administering vaccines to build immunity and prevent infection); hygiene and sanitation measures (promoting knowledge of basic hygiene and sanitation principles and creating conditions for cleanliness and safety); and educational and informational campaigns (providing the public with information on epidemiological risks and safety rules).

Medical and therapeutic measures include medical care and treatment (ensuring access to medical assistance, treatment, and patient rehabilitation) and pharmaceutical measures (developing and using drugs for treatment and disease prevention).

Control and restrictive anti-epidemic measures (medical-sanitary and administrative) [27] include various approaches. Monitoring and

diagnostics involve systematic surveillance of disease spread and pandemic development, rapid diagnostics, and determination of isolation needs. To prevent the spread of infection, temporary movement restrictions are enforced. To prevent further spread of the disease, quarantine measures involve isolating potentially infected individuals.

To ensure sanitary protection, Ukraine conducts sanitary measures both at border crossing points and throughout the country. These measures aim to prevent the introduction and spread of diseases of international significance (related to infectious, chemical, radioactive, or unknown agents), and to localize and eliminate outbreaks and epidemics. Appropriate public health measures, which match health risks and avoid imposing unnecessary barriers to international transport and trade, accomplish this [27].

Currently, the responsibility for conducting medical (sanitary) inspections at Ukraine's border crossing points falls to medical institutions. The central executive body responsible for health policy selects these institutions [27].

Legislation aimed at restricting movement establishes conditions and procedures for implementing temporary restrictions and prohibitions to prevent the spread of infections. It focuses on defining types of responsibility and sanctions for violating established rules and restrictions. This legislation provides a legal framework for effective control and management of movement during pandemics, serving as a crucial tool for public health preservation.

For example, Ukrainian legislation permits crossing the state border of Ukraine for passengers, crew members, and others, including those with symptoms of infectious diseases, only after a medical examination [26]. Ukraine's diplomatic missions, consular institutions, and trade representatives abroad must swiftly inform the central executive authority responsible for health policy upon detecting any infectious diseases of international significance in the host country. Depending on the epidemiological situation, the Cabinet of Ministers of Ukraine (CMU) may impose temporary restrictions and special conditions based on the recommendation of the central executive authority. These may include measures related to transportation links with affected countries, entry of foreigners and stateless persons into Ukraine, exit of Ukrainian citizens to these countries, and mandatory observation or self-isolation for those at risk of infection or disease spread [27].

Quarantine (administrative-sanitary measures) in Ukraine is established, extended, and lifted by the CMU. During quarantine, anti-epidemic measures include special conditions and border crossing regimes for foreigners and stateless persons [27].

A typical example of implementing quarantine is the Resolution of the CMU "On the Introduction of Quarantine and Implementation of Restrictive Anti-Epidemic Measures to Prevent the Spread of Acute Respiratory Disease COVID-19 Caused by the SARS-CoV-2 Virus" [28]. This regulation governs the authority of officials from the State Border Guard Service to deny foreigners and stateless persons entry at the border under Article 14 of the Law of Ukraine "On Border Control" [29] in the absence of required documents [28]. The State Border Guard Service of Ukraine, including its authorities, units, military personnel, and employees, is empowered to restrict or temporarily ban access to specific areas or facilities. The application of these measures is restricted to the border zone and controlled border districts. The aim is to address the aftermath of outbreaks of particularly dangerous infectious diseases [30].

The "Home Isolation" electronic service monitors self-isolation. This service is accessible via the Unified State Web Portal of Electronic Services as well as its mobile application. The monitoring process adheres to the guidelines outlined in the mentioned Resolution [31].

Legislation on medical control and testing at the national border establishes procedures and conditions for detecting signs of illness. This includes medical examinations and testing for infections. The legislation also sets rules for the use of medical information to ensure confidentiality and data security in epidemic situations. These legal requirements not only ensure the quality of medical control but also guarantee the protection of personal data during epidemic threats. They promote the effective and ethical use of medical information at the national border.

Monitoring epidemic measures emphasizes effective medical control and the use of modern technologies. Its goal is the timely detection of violations of medical requirements and the immediate implementation of necessary measures to prevent the spread of infection. The use of modern technologies, such as contact tracing systems, enhances control effectiveness and accurately identifies violations in the context of an epidemic threat.

Defining and establishing citizen responsibilities for not adhering to epidemic requirements is essential for an effective system of epidemic risk management.

Criminal liability in Ukraine applies to breaches of sanitary rules and norms intended to prevent infectious diseases and mass poisoning. This includes actions that breach rules and norms intended to prevent or combat epidemics and other infectious diseases, or mass non-infectious diseases (poisoning), if such actions caused or could have deliberately caused the spread of these diseases or resulted in fatalities or other serious consequences [32]. Additionally, administrative liability is provided for violations of quarantine rules, sanitary-hygienic, and sanitary-epidemiological regulations as stipulated by the Law of Ukraine "On Protection of the Population from Infectious Diseases," other legislative acts, and local government decisions. This includes non-compliance during quarantine in public buildings, facilities, or transport without appropriate individual protective equipment, such as respirators or masks covering the nose and mouth, including homemade ones [33], see Table 3.

Table 3. Ukrainian Legislation: Strengths and Weaknesses, General Issues

Nº	Legislative acts	Description	Strengths and weaknesses
1	Code of Ukraine on administrative offenses (1984)	Defines administrative offenses and responsibilities for them	Strengths: Establishes responsibility for violations of epidemic control rules
			Weaknesses: Weak relevance
2	Fundamentals of the Legislation of Ukraine on Health Care	Fundamentals of health legislation, including health rights and sanitation	Strengths: Covers a wide range of health issues, including rights to sanitary-epidemiological protection
			Weaknesses: Limited attention to individual constitutional rights
3	Law of Ukraine: On Protection of Population against Infectious Diseases (2000)	Fundamentals of protecting the population from infections, duties, and rights	Strengths: Effective protection, clear duties and rights
			Weaknesses: Lack of a specific list of rights and freedoms that may be restricted
4	The Criminal Code of Ukraine (2001)	Defines crimes and responsibilities for them	Strengths: Imposes penalties for crimes in the field of epidemic security
			Weaknesses: Difficulty in proving guilt
5	Law of Ukraine: On the State Border Guard Service of Ukraine (2003)	Structure and powers of the border guard service	Strengths: Rights and duties regarding border control
			Weaknesses: Requires additional resources
6	Law of Ukraine: On Border Control (2009)	Procedure for border control	Strengths: Effective border control procedures during pandemics

			Weaknesses: Insufficient specific provisions for protecting citizens' rights during epidemics
7	Resolution of the CMU: On the Prevention of the Spread of Acute Respiratory Disease COVID-19 Caused by the SARS-CoV-2 Coronavirus in Ukraine (2020)	Measures for preventing COVID-19: quarantine, social distancing, mask mandates, assembly restrictions	Strengths: Rapid response, clear measures, public information
			Weaknesses: Introduction of strict measures has led to social tension
8	Resolution of the CMU: On the Establishment of Quarantine and the Implementation of Enhanced Anti-epidemic Measures in Areas with Significant Spread of Acute Respiratory Disease COVID-19 Caused by the SARS-CoV-2 Coronavirus (2020)	Measures in regions with high levels of COVID-19	Strengths: Targeted implementation of specified measures and the possibility of local control
			Weaknesses: Insufficient transparency and uneven impact on the population and economy
9	Resolution of the CMU: On the Establishment of Quarantine and the Implementation of Restrictive Anti-epidemic Measures to Prevent the Spread of Acute Respiratory Disease COVID-19 Caused by the SARS-CoV-2 Coronavirus in Ukraine (2020)	Nationwide restrictive measures for preventing COVID-19	Strengths: National strategy focused on minimizing contact
			Weaknesses: Economic and social difficulties, such as job loss, reduced income, and isolation
10	Law of Ukraine: On the public health system (2022)	Fundamentals of establishing and operating a public health system	Strengths: Systematic approach
			Weaknesses: Lack of mention of fundamental human rights and insufficient detail on measures for different epidemics
The general issue for the specified legislative acts	the need to protect the economic rights of individuals crossing international borders during pandemic control measures [26]		
Possible solutions	Development of Legal Mechanisms, Economic, and Social Initiatives:		
	Introduce legal norms and measures for financial support for individuals in quarantine		
	Create a special government fund providing grants or compensation for living expenses and other needs during self-isolation		
	Implement mandatory insurance for travelers covering quarantine and medical expenses		
	Negotiate agreements with hotels to offer special rates for individuals in quarantine, partially or fully subsidized by the government		
	Provide financial incentives or compensation for lost income to support business retention		
	Mobilize additional resources and support through cooperation with international organizations for implementing pandemic control measures		

Thus, Ukraine's legislation on pandemic prevention aligns with international standards. It includes comprehensive measures for regulating and coordinating actions on infectious disease control, such as medical examinations at borders, isolation of infected individuals, vaccination, hygiene and sanitary measures, and educational and informational campaigns. The legal framework establishes administrative and criminal responsibility for violations of sanitary rules. Overall, the legislation provides a legal basis for pandemic control but requires improvements for increased effectiveness, particularly concerning adequate funding and resource allocation for epidemic measures.

The practice of anti-epidemic measures at national, state or regional borders

Through research conducted by various groups of scholars, it becomes evident that strategies for controlling the spread of infectious diseases vary in effectiveness and are subject to extensive debate. Specifically, Dieminger et al. highlight a critical issue for both national and international health authorities: integrating the realities of current integration and globalization into existing national health and safety strategies [34].

In their work, Dieminger et al. highlight studies from specific countries (regions) such as Australia, Hong Kong, New Zealand, and Taiwan, where strict early-stage border control measures led to a significant reduction in COVID-19 cases. Meanwhile, border policies implemented by EU member states proved ineffective, hindered international cooperation, and caused dissatisfaction, especially in dynamic border regions [34].

Among the mentioned countries (regions), it is pertinent to highlight the following positive practices of Taiwan [35]: Strong legal framework: Taiwan conducted a comprehensive review of its public health laws following the 2003 SARS pandemic, including a complete revision of the Communicable Disease Control Act (CDC Act) in 2004. Having a modern and functional legal framework has been a significant advantage for Taiwan in combating the pandemic.

Institutional readiness: By elevating the public health agency to an executive level, Taiwan ensured swift coordination among various ministries and agencies.

Legislative and judicial oversight: Congress and the courts continued to operate normally despite the health crisis. To ensure compliance with human rights in implementing CDC policies, a legal team was set up to review the legitimacy of orders and strategies from the Central Epidemic Command Center (CECC).

Transparency and open communication: Taiwan took early measures against the coronavirus, including timely public health information. The government also held daily press briefings to combat misinformation, increase public awareness, and build trust in pandemic measures.

Indeed, Australian researchers Beck and Hensher, through descriptive analysis, found that prompt and decisive actions to restrict travel and movement highlight the advantages of island nations in managing their borders. The greatest risk for infection transmission remains breaches of quarantine in hotels for incoming travelers [36].

Grout et al. note that New Zealand and some Australian [37] territories [38] predominantly used hotel quarantine for returning citizens. They required a 14-day quarantine period, PCR testing, and mask use in common areas (in New Zealand, but not in most Australian territories) [39].

Interestingly, Shiraef et al. reach different conclusions from previous researchers. Their results show that national policies aimed at restricting internal movement were more effective in responding to the coronavirus pandemic than closing borders between administrative regions. However, island nations and territories that implemented complete lockdowns did not observe a reduction in the spread of SARS-CoV-2 [40].

Therefore, it was necessary to refer to the mathematical modeling by Hossain et al., who established that implementing rapid infection control measures is crucial for reducing the impact of epidemics. This applies both to preventing an increase in the number of casualties and to shortening the duration of the epidemic. A delay of 1 week in implementing control measures would nearly triple the size of the epidemic and extend its expected duration by 4

weeks. Previous research has shown that control measures and border screening affect the reduction of infectious disease spread. Border screening systems are essential for preventing outbreaks, but they cannot completely prevent the entry of infected individuals during their incubation period [41].

Additionally, Bays et al. conducted a study where a simple model showed that border screening detected no more than 9% of incoming individuals with COVID-19. Their model, applied to flu and Ebola outbreaks, showed maximum detection rates of 34.8%, 9.7%, and 3.0%, respectively. Since real-world screening methods are less than ideal, the actual detection rates are likely to be significantly lower. The authors suggested that border screening might be more effective for diseases that have shorter incubation periods. However, the results indicated that screening alone does not provide sufficient protection against international outbreaks [42].

Mathematical models proposed by Zhu et al. show that the effectiveness of border closure depends on the combination with internal restrictions. They confirm that extremely strict border control is justified in regions where internal transmission is not a concern (e.g., China). However, such stringent measures are not necessary for other locations. Areas successfully controlling the virus with internal measures may open to similar entities without additional border controls, as long as the import risk does not increase. To manage the risks of opening borders to entities with insufficient internal virus control, it is essential to combine pre-departure screening with post-arrival testing [43].

According to N Lee et al., Yunnan saw a significant reduction in Dengue fever cases in 2020, linked to border restrictions. From 2013 to 2019, Yunnan recorded over 15,000 Dengue cases, peaking at 6,840 cases in 2019. However, in 2020, the number of cases dropped to 260, a substantial decrease compared to previous years. The authors clearly associate the implementation of border restrictions in Yunnan in 2020 with the significant reduction in Dengue fever incidence in the region [44].

Grépin et al. evaluated various border control measures and found that diagnostic screening, typically PCR tests, increased detection rates but only identified approximately 50% of infected travelers. Targeted travel restrictions proved more effective with bilateral or international agreements, though unilateral measures also yielded positive results. Quarantine was most effective when enforced during known symptom onset periods. A comprehensive border control regime, incorporating quarantine, expanded testing, and ongoing surveillance, demonstrated the highest efficacy, but its effectiveness waned with increased population immunity through infection or vaccination [45].

Milazzo et al. conducted a detailed study on the impact of non-pharmaceutical interventions on COVID-19 cases. The results demonstrate that Australia's early enforcement of restrictive measures, including border closures, lockdowns, and mandatory face masks, was associated with relatively low COVID-19 case counts and mortality [46].

Although the effectiveness of border pandemic control measures is limited, they are crucial in combating virus spread. Key measures include establishing screening protocols for travelers, conducting temperature checks, mandating mask use and social distancing, allowing for the isolation of arrivals, using tracking systems, and providing early vaccination for border-crossing workers [47].

Thus, strategies for controlling the spread of infectious diseases vary in effectiveness depending on the country and region. Studies show that a comprehensive approach, combining border control, internal restrictions, testing, and quarantine, is most effective. Taiwan, for example, achieved a significant reduction in COVID-19 cases due to its modern legal framework and transparent communication. However, border screening has limited effectiveness, especially with a long virus incubation period. Mathematical models highlight the importance of a rapid response to reduce the size and duration of an epidemic, and a combination of internal and border measures is key to successful infection control. Additionally, strengthening global cooperation and coordination of border management methods will be crucial for improving preparedness for future pandemics [48]. Therefore, countries worldwide are joining forces to prevent, detect, and respond

to health risks through International Health Regulations. States are required to be prepared and report their progress. The SPAR tool assists in assessment and reporting, with Australia, which qualifies as both a continent and an island, showing the highest performance among the countries analyzed (Table 4). It should also be noted that the success of the island nations mentioned in the article was due not to their geography but to strict and swift actions to lockdown populations following early pandemic cases [49].

Table 4. International Health Regulations Capacity Progress [50].

№	Countries		Evaluation of legal and normative instruments for the implementation of International Health Regulations (C1): capacity %			Evaluation of points of entry (PoEs) and border health (C11): capacity %			Highlights of effective measures [49-54]
	Continental	Island	2021	2022	2023	2021	2022	2023	
1	Australia	Australia	100	100	100	100	100	100	Rapid imposition of travel restrictions, quarantine, establishment of a National Cabinet for coordination
2	China		90	90	90	100	93	100	Strict containment strategy, early quarantine, monitoring new cases, disinfection
3	Germany		90	90	90	67	87	73	Procurement of protective equipment for hospitals, doubling the number of intensive care beds, rapid development of PCR tests
4	Hong Kong		The results are not presented in the relevant World Health Organization resource						Rapid implementation of PCR testing, early case detection and management, strict quarantine measures
5		Iceland	60	60	60	87	87	80	Testing and management of cases
6		Japan	70	80	80	100	100	100	Long-term isolation and testing
7		New Zealand	100	100	100	93	93	87	Border control and short-term quarantine
8	Thailand		100	90	90	80	80	80	Volunteer work with basic medical training, distribution of masks, quarantine, airport checks
9	Ukraine		50	80	60	60	27	53	National strategy focused on minimizing contacts, systemic approach
10	Viet Nam		60	50	50	67	40	67	Quarantine, mandatory mask-wearing, “pool testing,” effective control measures, information dissemination through jingles and videos
All countries			52	56	54	62	63	63	

Conclusion

Freedom of movement, enshrined in international documents such as the Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights, is a key aspect of international relations and human rights. However, it can be restricted to protect national security, public order, health, or morals. In the context of global threats like COVID-19 or recent Dengue outbreaks, effective epidemic control requires close international cooperation and active involvement of organizations such as WHO, IOM, and ECDC in developing relevant standards and protocols. International agreements, including the WHO Constitution and International Health Regulations, regulate freedom of movement during pandemics, emphasizing human rights, fair judicial processes, and access to information. Information campaigns and the implementation of modern border monitoring technologies are crucial for preventing the spread of infections.

National legislation plays a crucial role in regulating pandemic control measures. In Ukraine, this includes organizational, medical, sanitary, and administrative actions to prevent the spread of infections, such as border control, medical examinations, movement restrictions, and quarantine measures. Medical screenings and testing at border checkpoints are vital for detecting signs of illness, and legislation regulates accountability for violations of epidemic requirements and the use of medical information. Analysis of practical measures shows that early strict control measures, such as quarantine and screening, demonstrate significant effectiveness in some countries, while other strategies may be less successful. To improve pandemic response, the legal system must be enhanced, international cooperation strengthened, innovative technologies developed, and transparency and public oversight ensured. Implementing new technologies, such as electronic contact monitoring systems, and creating effective information exchange mechanisms between countries will contribute to a coordinated and fair response to global health threats.

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