Identifying Community-Level Indicators of Arctic Maritime Health Security: *Results from a Pilot-Test Workshop*

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Abstract

Health is one of the seven areas identified by the UN Development Program (UNDP) as a critical pillar of human security. The human security mindset of health is focused on addressing the root causes of insecurities and strengthening local capacities. Conventional approaches to assessing health security, however, remain dominated by national-level frameworks focused on identifying vulnerabilities of the State as a whole, and not on strengthening the communities that form those systems. This scale is particularly problematic in the Arctic, where a substantial portion of the region's population is characterized by small, remote communities. The dynamics of health security differ greatly in these communities when compared to health security at the national scale, the nuances of which cannot be captured by conventional national-level health security frameworks. At the same time, maritime traffic is increasing in the Arctic, compounding the health security of the region. More community-level, human-security-minded tools are needed to provide situational awareness, identify existing gaps, and provide baselines for enhancing resilience and capabilities in the Arctic region. With that in mind, the Ted Stevens Center for Arctic Security Studies (TSC) conducted a pilot test workshop to assess the use of human-centered design (HCD) methodologies for identifying community-level indicators of Arctic maritime health security. The workshop identified 55 indicators categorized into 12 themes. Our thematic analysis revealed that existing health security tools are focused largely on indicators relevant to the human medical and public health fields, while the indicators identified in the pilot-test workshop catered more towards a One Health mindset. These findings revealed that HCD methodologies offer a promising, people-centered approach towards the development of new tools to assess Arctic maritime health security.

Keywords: human security, health security, human-centered design, Arctic

Introduction

Health is one of the seven areas identified by the United Nations Development Program's (UNDP's) 1994 "Human Development Report" as a critical pillar of human security (Stoeva, 2020). The concept of human security emerged following the end of the Cold War when the changing geopolitical landscape simultaneously caused a shift in the concept of "security" (Hossain et al., 2017). With less tension between Russia and the United States, global focus on other non-traditional security issues arose, such as climate change, environmental degradation, poverty, and ethnic and religious conflicts (Ibid). As a result, more complex, people-centered notions of security were developed, of which the concept of human security materialized within global political discourse (Hossain et al., 2017; Stoeva, 2020). According to the United Nations, "human security is an approach to assist Member States in identifying and addressing widespread and cross-cutting challenges to the survival, livelihood and dignity of their people." It calls for "people-centered, comprehensive, context-specific and prevention-oriented responses that strengthen the protection and empowerment of all people" (UN, 2024). A human security approach is aimed at providing a new way of conceptualizing the complex challenges the world faces in the 21st century by emphasizing their multidimensional and interconnected nature.

Health as a human security challenge is broadly defined as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (Stoeva, 2020). The human security mindset of health flips the conventional focus of security as a "State-down" approach focused on the health security of the nation or a region as a whole, to a "community-up" perspective in which national or regional health security is accomplished by addressing the root causes of insecurities, and by strengthening local capacities and resilience (Hoogensen, 2009; Middleton, 2019; Sergunin, 2018).

Despite the reconceptualization of health as a human security concept, a recent scoping review produced by the Ted Stevens Center for Arctic Security Studies (TSC) found that conventional indicator-based health security frameworks remain dominated by national-level indicators focused on identifying vulnerabilities of the State as a whole, and not on strengthening the communities that form those systems. The most commonly used health security frameworks include the Global Health Security Index (GHSI), the Joint External Evaluation (JEE) tool, and the States Parties Self-Assessment Annual Report (SPAR) (Lakoff, 2022; Razavi et al., 2020; Traore et al., 2023). While these frameworks are critical for international comparison and analysis of nation-wide health security systems, this scale eclipses security at the subnational-level. This limitation can lead to lapses in health security awareness and knowledge, while also potentially providing a false sense of preparedness (Erondu et al., 2021). This issue has been well studied, particularly in the wake of the COVID-19 pandemic. Lakoff et al. (2022) found that community-level characteristics, such as the quality of leadership, coordination of government, and local public health infrastructure, were more telling of COVID-19 mortality outcomes than the scores of the GHSI. Notably, the United States ranked the highest in the world for national health security according to 2019 GHSI scores, however, it ranks among the top ten countries with the highest number of cases per million (Abbey et al., 2020; Lakoff, 2022). Abbey et al. (2020) markedly found a negative correlation between the 2019 GHSI rankings and a country's response to the COVID-19 pandemic based on performance indicators. Traore et al. (2023) additionally found discrepancies in JEE scores when using the same indicators at both the national and subnational levels in Nigeria. The national score was higher, alluding to a greater level of preparedness for zoonotic disease outbreaks than what was reflected on a subnational level. This resulted in a false sense of preparedness for the COVID-19 pandemic, among other disease outbreaks in the country.

The national-scale of conventional health security tools is particularly problematic in the Arctic, where small, remote communities comprise a substantial portion of the region's population. The dynamics of health security differ greatly in these communities when compared to health security at the national scale, the nuances of which cannot be captured by conventional State-level health security indicators. As emphasized by Stoeva (2020), "[t]he main consequence of focusing on the state as the sole referent object of security is that only a narrow set of health problems, which are perceived to cause acute state instability, state failure or destabilize other interstate relations, qualify as relevant security challenges, while many others remain ignored, excluded, and understudied" (pg. 4). Many Arctic communities maintain mixed cash-subsistence-based economies, and rely heavily on the health of wildlife and the environment to sustain physical, cultural, spiritual, and economic well-being (Hueffer et al., 2019; Ready, 2016; Walch et al., 2018). As a result, health security in the Arctic requires an interdisciplinary lens, with risks associated with climate change, the expansion of zoonotic diseases and vectors, changing wildlife migration patterns, the retreat of seasonal sea ice, impacts on water availability and quality, and food security (Hossain et al., 2017). These risks are additionally embedded in the context of historical and contemporary social injustices, including colonization, forced assimilation, and conflicts over land rights and the use of natural resources. National-level indicators do not contain the granular scale needed to account for these unique characteristics of health security in the Arctic.

The Arctic's increasing maritime traffic compounds the future of health security in the region. A recent report published by the Arctic Council Working Group on the Protection of the Arctic Marine Environment (PAME) stated that the number of unique ships[1] entering the Arctic Polar Code area increased by 37% between 2013 and 2023 (PAME, 2024). Approximately one

[1] Unique ships refers to each ship only counted once, although it might enter the area multiple times over each year.

million people live along coastlines in the Arctic region, many of which are distinct Indigenous peoples who make up approximately 10% of the Arctic's population (Huntington et al., 2022; Ramage et al., 2021). Livelihoods of Arctic peoples include commercial fishing, transportation, resource extraction, and traditional practices, such as hunting, fishing, and gathering (Huntington et al., 2022). Increased shipping in the Arctic can impact all of these activities, each of which is inextricably intertwined with the health security of the region. Furthermore, these communities represent the front line of any major maritime health security event, and will be disproportionately burdened by potentially deleterious impacts. As a result, community resilience is foundational to Arctic regional resilience. This represents an urgent call for increased monitoring and data collection to strengthen local resilience and capacity building, improve situational awareness, and to mitigate health security crises before they occur. To our knowledge, however, there are no existing frameworks that utilize community-level indicators of Arctic maritime health security. More interdisciplinary, people-centered approaches are needed to capture the indicators of health security relevant to the Arctic's coastal communities.

Not unlike the contemporary framework of human security, human-centered design (HCD) is an interdisciplinary approach that places the needs, capabilities, and capacities of people at the core of the design process (Hashmi et al., 2023). It is becoming increasingly popular among health researchers as an iterative methodology that prioritizes collaborative, interdisciplinary teamwork, and stakeholder participation to develop holistic, evidence-based solutions (Göttgens & Oertelt-Prigione, 2021; Hashmi et al., 2023; Holeman & Kane, 2020). HCD has been described as both a philosophy and a set of methodologies in which the end-users are involved in the design. With an emphasis on context, ideation, and iteration, HCD has been recognized as a well-suited approach to population and global health (Bazzano et al., 2017). It has been used in studies focused on global

health equity (Holeman & Kane, 2020), health innovations (Göttgens & Oertelt-Prigione, 2021), health-service delivery (Hashmi et al., 2023), and to design health technology (Bazzano et al., 2017). To our knowledge, however, it has not been applied to the field of health security. With that in mind, a pilot test workshop was conducted to evaluate the application of HCD in the preliminary development of an Arctic maritime health security risk index. The pilot test used HCD methodologies to identify a set of community-level Arctic health security indicators specific to the increase of maritime traffic in the region. The following sections discuss this process and the results.

Process for Identifying Community-Level Indicators

The pilot test was conducted in a workshop format at the 2024 Arctic Science Summit Week (ASSW). This process used three overall phases:

1. Phase 1: Identify and categorize indicators of Arctic maritime health security,
2. Phase 2: Prioritize the indicators based on feasibility,
3. Phase 3: Analysis of the results through comparison with existing health security frameworks.

To begin the workshop (from here on referred to as the "ASSW24" workshop), participants individually identified a list of community-level indicators that they felt were critical to maritime health security in the Arctic. Next, as a group, the

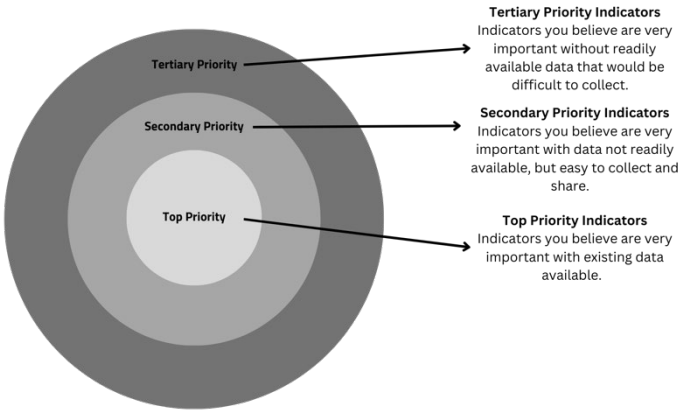


Figure 1 - Illustration of the HCD "bull's eye" method used to prioritize the indicators based on feasibility.

participants used the HCD approach called "affinity clustering" to categorize the indicators into thematic groups. Lastly, breakout groups were formed to use the HCD's "bulls-eye" approach, which required participants to rank and prioritize the indicators based on the feasibility of data availability. In this study, "feasibility" referred to how easily data could be collected on the identified indicators. Figure 1 illustrates the bull's-eye diagram used. Participants were asked to place indicators in the smallest ring, labeled "primary priority," if the indicators were considered very important, and the data for the indicators was readily available or feasible to collect. The second ring, labeled "secondary priority," was for indicators perceived as very important, but with difficult data to collect. Finally, the third ring, labeled "tertiary priority," was for indicators perceived as very important, but with no data readily available and/or the data was unfeasible to collect.

To analyze the results of the workshop, the categorical indicator themes identified by the workshop participants were used as the initial thematic codes to compare the indicators identified by the pilot test workshop, with those of existing health security frameworks. Additional codes were added by identifying emergent themes throughout each of the frameworks. The existing health security frameworks used were the Joint External Evaluation (JEE) Tool, the Global Health Security Index (GHSI), and the States Parties Self-Assessment Annual Report (SPAR), each of which are self-assessment frameworks used to quantitatively evaluate health security at a national scale throughout the world. Indicator themes were used as a metric of comparison, as opposed to comparing the indicators themselves, because the indicators varied in their measurement scale, and each framework contained a different number of indicators. To compare the prevalence of indicator themes, the percentage of indicators belonging to each theme was calculated for each framework

and the indicators identified by the pilot-test workshop. The indicator themes that emerged in the pilot test workshop were then compared with those of existing health security frameworks.

Preliminary Results

Phase 1: Identifying the Indicators

Table 1 lists a total of 55 community-level maritime health security indicators identified by the workshop participants, organized into 12 categorical themes. As illustrated by the table, the largest indicator categories were governance (n=11) and environmental (n=10), closely followed by infrastructure (n=9) and disaster response (n=8). The remaining categories included climate (n=4), economic security (n=4), human capacity (n=3), local observations (n=3), safety and security (n=2), and cyber security (n=1).

Table 1: Indicators and Themes Identified at the ASSW24 Workshop

Theme	Indicators
Governance	• Ability to enforce laws • Capacity to identify and enforce violation of maritime law • Access to government and representatives • Local governance and tribal sovereignty upheld • International regulations for shipping through the Arctic • Lack of political incentive to change • Adequacy/strength/Precision of legal frameworks • Strength between local/national policy makers • Coordination between local/state governments • Adequacy of SAR and OSR in region/community • Safety standards for transiting vessels
Environmental	• Migration patterns of animals in and out of the Arctic • Marine life impacted within shipping routes and shorelines • Fog • Ice breaking: hunting access and transportation impacts • Protection of marine mammal migration routes • Clean environment, waters, air, with increased shipping traffic • access to clean drinking water • marine mammals, fish, shellfish, ecological health • Stable population and migration • access to clean water (in quantity and quality)
Infrastructure	• Housing availability • Access to mail delivery • Communication capabilities • Access to internet • Healthcare infrastructure • Port infrastructure • Integrity of fiber optic • Accessibility of shipping for off-road communities • Access to full spectrum healthcare (travel inequalities reduced)

Disaster Response	• Number of hospitals per capita • Number of healthcare workers per capita • Pollution response • Oil spill response and prevention • Reduction of pollution and pathogens • Search and rescue capabilities • Disaster response capabilities • Petrol/critical mineral extraction elevates spill risk and impacts hunting access
Food Security	• Food sovereignty • Protection of local food economies • Marine mammal conflicts impacting hunting/fishing access • Access to cost efficient healthy non-traditional food substitutes (for traditional food) • Ice integrity • Safety and accessibility of fishing as a result of sea ice conditions • Presence of healthy marine mammals and migration routes
Climate	• Indicators of extreme weather, temp, wind, precipitation, ice • Permafrost degradation • Resilience to new climate conditions • Weather pattern changes
Economic Security	• Fuel Costs • Jobs and rates of employment • Job security and justice transformation and green transition • Tourism - positive and negative impacts to health/wellbeing
Human Capacity	• Community capacity to track, monitor traffic, known about cargo, operator • Birth rates, home births, reproductive justice • Working conditions
Economic Security	• Fuel Costs • Jobs and rates of employment • Job security and justice transformation and green transition • Tourism - positive and negative impacts to health/wellbeing
Local Observations	• Observations of maritime conditions • Presence of animal health observation networks • Contaminant monitoring (algae blooms, heavy metals, zoonotic diseases)
Safety & Security	• Violent crime in port towns • Criminal activity patterns and changes
Cyber Security	• Influence of Artificial Intelligence (AI)

Phase 2: Prioritizing the Indicators

Table 2 lists the results from the refinement and prioritization session of the workshop using the HCD bull's eye method. Overall, the indicator category, disaster preparedness and response, had the most indicators prioritized as "primary importance" (n=4), followed by infrastructure (n=3) and climate (n=3), food security and local observations (n=2), and environmental (n=1). Indicators prioritized as "secondary importance" included those in the indicator categories environmental (n=4), infrastructure (n=3), and governance (n=3). Lastly,

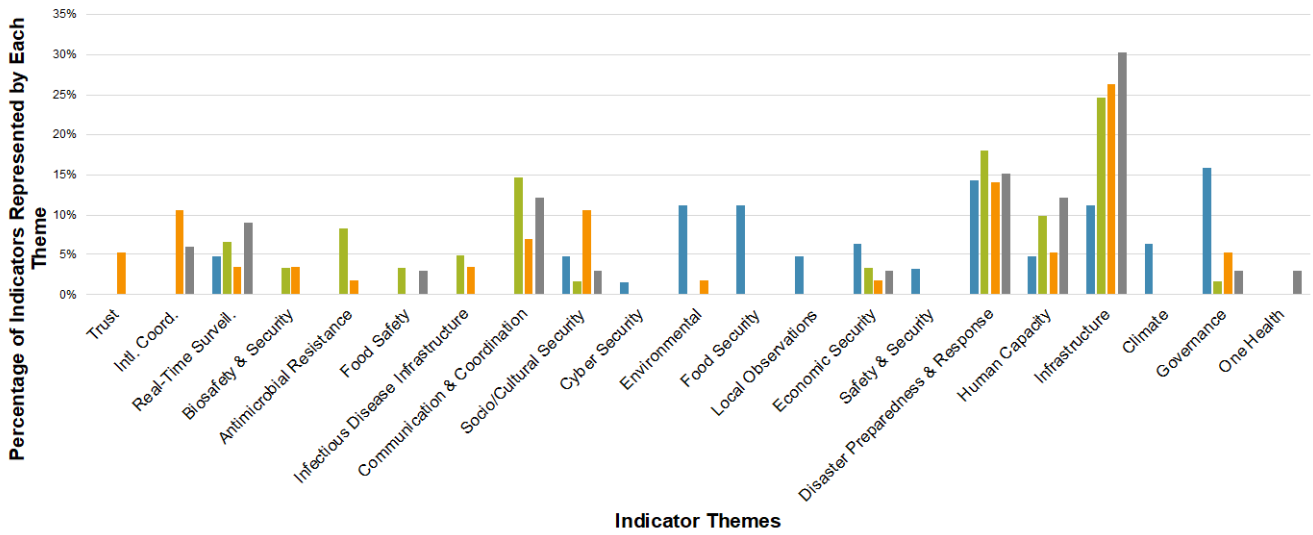
indicators ranked as "tertiary importance" were from indicator categories disaster preparedness and response (n=4), human capacity (n=3), and governance (n=4).

Table 2: Indicators Prioritized based on Feasibility of Data Collection	
Primary Importance	Search and Rescue Capabilities Disaster Response Capabilities Indicators of extreme weather Permafrost degradation Weather pattern changes Animal health observation networks Access to internet Communications capabilities Contaminant monitoring Observations of maritime conditions Integrity of fiber optic cable Clean environment, waters, air with increased shipping and traffic Protection of local food economies Adequacy of SAR + OSR region/community Number of healthcare workers per capita Access to cost efficient healthy non-traditional food substitutes
Secondary Importance	Port infrastructure Coastal infrastructure Shipping accessibility - increase for rural/off road system communities Healthcare infrastructure Access to full spectrum healthcare (travel inequities reduced) Migration patterns of animals in and out of Arctic Capacity to identify and enforce violations of maritime law Protection of marine mammal migration routes Marine mammal, fish, shellfish, ecological health Adequacy, strength, and precision of legal frameworks Ability to enforce laws Presence of marine mammals, healthy, normal migrations, safety of marine mammals
Tertiary Importance	Petrol/critical mineral extraction Working conditions Access to delivery Birth rates - home births - reproductive justice Female reproductive access Pollution response Oil spill response and prevention Reduction of pollutants and pathogens Coordination between local/state governments Lack of political incentive to change Strength between local and national policymakers Access to government and representatives

Phase 3: Comparison with Existing Health Security Frameworks

The thematic coding process identified a total of 21 themes illustrated in Figure 2. When comparing the indicators identified by the pilot-test workshop with those of existing health security frameworks, multiple indicator themes were uniquely identified by the ASSW24 workshop that are not included in existing frameworks (Table 3 in the Appendix lists all codes and corresponding segments). Figure 2 highlights the five (24%) indicator themes that were uniquely identified by ASSW24, including (1) cyber security, (2) food security, (3) local observations, (4) safety and security, and (5) climate. Three additional indicator themes were notably much more prevalent in the ASSW24 workshop than in existing health security frameworks, including (1) environmental, (2) economic security, and (3) governance. Seven themes (33%) are shared among each of the existing frameworks and the indicators identified by the ASSW24 workshop, including (1) real-time surveillance, (2) social/cultural security, (3) economic security, (4) disaster preparedness and readiness, (5) human capacity, (6) infrastructure, and (7) governance. Overall, the ASSW24 and GHSI had the greatest variety of themes identified throughout their indicators (n=13), followed by the JEE (n=12), with SPAR containing the least variety (n=8).

Figure 2: Comparison of Indicators from ASSW 2024 Pilot Workshop, GHSI, JEE, and SPAR



Findings

The Application of HCD to Arctic Health Security Research

The findings from this pilot-test workshop indicate that HCD may be a successful methodology for identifying community-level indicators of Arctic maritime health security. The HCD methods used here were particularly useful in the context of Arctic maritime health security for two reasons. First, the methodology was designed to capitalize upon interdisciplinary perspectives, making it particularly applicable to tackling complex and multifaceted challenges, such as health security in the Arctic. Second, the "human" component of the approach implied augmenting human skills and emphasizing human values, both of which center stakeholders at the core of the design process (Hashmi et al., 2023). In this case, stakeholders include the Arctic communities at the front lines of increased shipping in the region, and those needing to utilize a maritime health security tool, such as maritime operators, public health practitioners, emergency responders, security and defense organizations, and decision-makers.

An HCD approach equips researchers and practitioners with a framework to deeply comprehend and cater to their target user's distinct needs and perspectives. In doing so, HCD can aid in developing research outcomes that are valuable to both the scientific and security communities, while benefiting the communities they aim to serve (Hashmi et al., 2023). The successful use of HCD for the development of an Arctic maritime health security tool will be contingent upon the participation of local community members and other Arctic practitioners. While this pilot-test workshop was not conducted with a representative sample of relevant stakeholders, the interdisciplinary nature of the indicators identified by the workshop does highlight the ability of HCD methodologies to capitalize upon interdisciplinary perspectives.

Identified Indicators of Community-Level Arctic Maritime Health Security

The community-level indicators of maritime health security identified by the workshop participants at ASSW24 represent a broad, interdisciplinary conceptualization of health security in the Arctic. This breadth is particularly apparent when contrasting the themes identified among the ASSW24 indicators, with those of the existing JEE, GHSI, and SPAR frameworks. Specifically, the existing national-level frameworks use indicators representative of the capacities of the human medical or public health sectors in addressing the impacts of biological threats (see Table 3 in the Appendix for a full list of indicators). This finding corresponds with contemporary criticisms surrounding the definition of health security, which suggest that health security literature remains broadly in line with a traditional security approach focused primarily on the cross-border impacts of emerging infectious diseases and bioterrorism on national security (Osterhaus et al., 2020; Stoeva, 2020; Zinsstag et al., 2023). While these indicators are critical to addressing acute public health crises, their narrow focus excludes the interdisciplinary biophysical and sociocultural variables involved with health security in the Arctic. In contrast, the ASSW24 indicators represent a deeper breadth of disciplines, with a substantial portion of the indicators drawing from a social-ecological-systems perspective, including indicators such as wildlife migration patterns, permafrost degradation, weather patterns, food sovereignty, and pollution response. These findings represent a holistic view of health security, and support calls for the greater use of One Health approaches in the Circumpolar North (Hueffer et al., 2019; Ruscio et al., 2015), and to improve global health security writ large (Elnaiem et al., 2023; Osterhaus et al., 2020; Zinsstag et al., 2023).

One Health recognizes the inextricable link between the health of humans, animals, and their shared environment (Hueffer et al., 2019). It has received substantial recognition as a perspective acutely relevant to life in the Arctic, particularly in reference to the significant portion of Arctic residents that maintain a subsistence way of life (Hueffer et al., 2019; Montesanti & Thurston,

2016; Ruscio et al., 2015). A growing body of research is also urging for the use of a One Health lens when addressing issues of global health security (Adisasmito et al., 2023; Elnaiem et al., 2023; Traore et al., 2023; Zinsstag et al., 2023). These calls to action, however, are accompanied by criticisms for its lack of operationalization, particularly in the wake of the COVID-19 pandemic (Elnaiem et al., 2023; Mwatondo et al., 2023; Zinsstag et al., 2023). Applying a One Health lens to the development of an Arctic maritime health security tool could be a particularly relevant and appropriate means in which to operationalize the perspective.

It is notable that among the 12 categorical indicator themes identified by the ASSW24 workshop participants, three are official dimensions of human security as determined by the UN: economic security, food security, and environmental security (UN, 2016). Indicators categorized into the "governance" and "safety and security" themes by the ASSW24 participants could also arguably correspond to two additional dimensions of the UN's human security framework: personal security, and political security. In other words, the indicators identified in the ASSW24 workshop encompass six of the UN's seven human security dimensions. This fuels the argument that human security challenges are inextricably linked, while also highlighting the interdisciplinary and multifaceted nature of health security in the Arctic.

Future Applications

A tangential security framework that was not mentioned by the ASSW24 workshop, yet warrants further exploration into its connections with Arctic maritime health security, is Women, Peace, and Security (WPS). WPS is a policy framework that recognizes that women must be critical actors in all efforts to achieve sustainable international peace and security (Ortiz & Ensor, 2023). It bridges multiple facets of human security, with significant overlap with health security. For instance, the COVID-19 pandemic highlighted the gendered impacts of health security crises, with more than 70 percent of the frontline pandemic workforce comprised of women. At the same

time, throughout the world, the risks of exploitation and abuse of women heightened significantly as a result of movement restriction, financial loss, and economic disempowerment. (UN, 2020). From a different angle, a study conducted by the Georgetown Institute for Women, Peace, and Security found a positive correlation between the status of women and a country's preparedness and resilience towards climate change (Ortiz & Ensor, 2023). This study used indicators of women's status classified under three dimensions of inclusion, justice, and security. These were compared against three well-known climate indices, the Notre Dame Global Adaptation Initiative Index, the State Resilience Index, and the Environmental Performance Index. These findings highlight the many ways that gender is intertwined with issues of health and environmental security, two concepts with significant relevance to the increase of shipping in the Arctic region.

Conclusion

Indicators have the power to shape the narrative. National indicators paint a broad picture of health security across countries. While this scale is important, relying on national-level indicators of health security alone can conceal subnational variation, and may provide a false sense of preparedness. More nuanced, people-centered approaches are needed to capture the community-level indicators of health security as they relate to increased shipping in the Arctic region. This requires interdisciplinary approaches and stakeholder expertise. HCD provides both a perspective and a set of methodologies acutely relevant to this gap, and may provide a critical means in which to develop new tools to measure Arctic maritime health security. Data-informed decisions are critical, and progress can be accelerated by relevant tools that provide situational awareness, identify existing gaps, and provide baselines for enhancing resilience and capabilities in the Arctic region.

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Appendix

Table 3: Coding Scheme for Comparison of ASSW24 Indicators with the JEE, GHSI, and SPAR

Thematic Code	Segment Source	Coded segments
One Health	SPAR	One Health collaborative efforts across sectors on activities to address zoonosis
Trust	GHSI	Trust in medical and health advice Trust medical and health advice from the government Trust medical and health advice from medical workers
International Coordination & Collaboration	SPAR	One Health collaborative efforts across sectors on activities to address zoonosis Multisectoral collaboration mechanism for food safety events
	GHSI	International Heath Regulations (IHR) reporting compliance and disaster risk reduction Cross-border agreements on public health emergency response International commitments JEE and PVS Financing Commitment to sharing of genetic and biological data and specimens
Real-Time Surveillance	SPAR	Early warning surveillance function Event management Healthcare acquired infection surveillance Resources for detection and alert
	JEE	Early warning surveillance function Early warning surveillance function Event verification and investigation Healthcare acquired infection surveillance
	ASSW Pilot Workshop	Observations of maritime conditions Animal health observation networks Contaminant monitoring (algae blooms, heavy metals, zoonotic diseases)
	GHSI	Real-time surveillance and reporting Accessibility and transparency of surveillance data
Biosafety & Security	JEE	Whole-of-government biosafety and biosecurity system is in place for human, animal and agriculture facilities Biosafety and biosecurity training and practices in all relevant sectors (including human, animal and agriculture)
	GHSI	Biosecurity Biosafety

Antimicrobial Resistance	JEE	Multisectoral coordination on AMR Surveillance of AMR Prevention of multidrug resistant organism (MDRO) Optimal use of antimicrobial medicines in human health Optimal use of antimicrobial medicines in animal health and agriculture
	GHSI	Antimicrobial resistance
Food Safety	SPAR	Multisectoral collaboration mechanism for food safety events
	JEE	Surveillance of foodborne diseases and contamination Response and management of food safety emergencies
Infectious Disease Infrastructure	JEE	Surveillance of zoonotic diseases Response to zoonotic diseases Sanitary animal production practices
	GHSI	Zoonotic disease Infection control practices
Communication & Coordination	SPAR	Advocacy for IHR implementation
	JEE	Strategic planning for IHR, preparedness or health security Analysis and information sharing Multisectoral workforce strategy Public health and security authorities (e.g. law enforcement, border control, customs)
	GHSI	Linking public health and security authorities Access to communications infrastructure Communications with healthcare workers during health emergency
	SPAR/JEE/GHSI	Risk communication
	SPAR/JEE	National IHR Focal Point functions Multisectoral coordination mechanisms Community engagement
Socio/Cultural Security	SPAR/JEE	Gender equality in health emergencies
	ASSW Pilot Workshop	Birth rates, home births, reproductive justice
	GHSI	Healthcare access Socioeconomic resilience Social inclusion Public confidence in government Inequality Access to quality healthcare

Cyber Security	ASSW Pilot Workshop	Influence of AI
Environmental	ASSW Pilot Workshop	Migration patterns of animals in and out of the Arctic Impact of marine life within the shipping rate and shorelines Fog Impacts of ice breaking on hunting and transportation Ice breaking -> hunting access and transportation impacts Protection of marine mammal migration routes Clean environment, waters, air Access to clean drinking water
	GHSI	Environmental risks
Food Security	ASSW Pilot Workshop	Food sovereignty Protection of local food economies Marine mammal conflicts impacting hunting/fishing access Access to cost efficient healthy non-traditional food substitutes (for traditional food) Ice integrity
Observation Network Data	ASSW Pilot Workshop	Maritime conditions observations Animal health observation networks Contaminant monitoring (algae blooms, heavy metals, zoonotic diseases)
Economic Security	SPAR/JEE	Financial resources for IHR implementation Financial resources for public health emergency response
	ASSW Pilot Workshop	Fuel Costs Jobs and rates of employment Job security and justice Green transition Tourism - positive and negative impacts to health/wellbeing
	GHSI	Financing
Safety & Security	ASSW Pilot Workshop	Violent crime in port towns Criminal activity patterns and changes
Disaster Preparedness & Response	SPAR	Planning for health emergencies Management of health emergency response emergency logistic and supply chain management Public health response at points of entry (PoEs) Risk-based approach to international travel-related measures Resources for detection and alert Capacity and resources
	JEE	Emergency risk assessment and readiness

		Public health emergency operations center (PHEOC) Management of health emergency response Activation and coordination of health personnel and teams in a public health emergency Emergency logistic and supply chain management Research, development and innovation Public health response at PoEs Risk-based approach to international travel-related measures Mechanisms established and functioning for detecting and responding to chemical events or emergencies Enabling environment in place for management of chemical events Mechanisms established and functioning for detecting and responding to radiological and nuclear emergencies Enabling environment in place for management of radiological and nuclear emergencies
	ASSW Pilot Workshop	Number of hospitals per capita Number of healthcare workers per capita Pollution response Oil spill response and prevention Reduction of pollution and pathogens Search and rescue capabilities Search and rescue Disaster response capabilities Petrol/critical mineral extraction elevates spill risk and impacts hunting access
	GHSI	Emergency preparedness and response planning National public health emergency preparedness plan Non-pharmaceutical interventions planning Exercising response plans Emergency response operation Linking public health and security authorities Trade and travel restrictions Communications with healthcare workers during health emergency
Human Capacity	SPAR	Human resources for implementation of IHR Workforce surge during a public health event Case Management Utilization of health services Capacity and resources
	JEE	Human resources for implementation of IHR Workforce training Workforce surge during a public health event Case management Utilization of health services

		Continuity of essential health services (EHS)
	ASSW Pilot Workshop	Community Capacity to track, monitor traffic, known about cargo, operator Birth rates, home births, reproductive justice Working conditions
	GHSI	Case-based investigation Epidemiology workforce Capacity to test and approve new medical countermeasures
Infrastructure	SPAR	Specimen referral and transport system Laboratory testing capacity modalities Laboratory quality system Effective national diagnostic network Implementation of a laboratory biosafety and biosecurity regime Continuity of essential health services (EHS) Infection Protection Control programs Safe environment in health facilities Healthcare acquired infection surveillance Core capacity requirements at all times for PoEs (airports, ports and ground crossings) Public health response at PoEs PoE. Risk-based approach to international travel-related measures Resources for detection and alert Capacity and resources
	JEE	Vaccine's coverage (measles) as part of national program National vaccine access and delivery Mass vaccination for epidemics of VPDs Specimen referral and transport system Laboratory testing capacity modalities Laboratory quality system Effective national diagnostic network Continuity of essential health services (EHS) Infection Protection Control programs Healthcare acquired infection surveillance Core capacity requirements at all times for PoEs (airports, ports and ground crossings) Public health response at PoEs Risk-based approach to international travel-related measures Enabling environment in place for management of chemical events Mechanisms established and functioning for detecting and responding to radiological and nuclear emergencies Enabling environment in place for management of radiological and nuclear emergencies

	ASSW Pilot Workshop	Housing availability Access to mail delivery Communication capabilities Healthcare infrastructure Port infrastructure Integrity of fiber optic cable Shipping accessibility increase for rural/off the road system communities Disaster response capabilities Access to full spectrum Access to healthcare (considering travel inequities)
	GHSI	Immunization Laboratory systems strength and quality Lab capacity for detecting priority diseases Laboratory quality systems Laboratory supply chains Case-based investigation Access to communications infrastructure Health capacity in clinics, hospitals and community care centers Facilities capacity Supply chain for health system and healthcare workers Medical countermeasures and personnel deployment Capacity to test and approve new medical countermeasures Infrastructure adequacy Public health vulnerabilities Access to quality healthcare
Climate	ASSW Pilot Workshop	Indicators of extreme weather, temp, wind, precipitation, ice Permafrost degradation Resilience to new climactic conditions Weather pattern changes
Governance	SPAR/JEE	Legal Instruments
	ASSW Pilot Workshop	Ability to enforce laws Capacity to identify and enforce violation of maritime law Access to government and representatives Local governance and tribal sovereignty upheld International regulations for shipping through the Arctic Lack of political incentive to change Adequacy/strength/Precision of legal frameworks Coordination between local/state governments
	GHSI	Trade and travel restrictions Political and security risk Government effectiveness

General Formatting

The paper should be written in Times New Roman size 12. Double Spaced.

APA Headings

Use the headings labeled as "TSC APA Level #" in the styles pane to format your papers. Examples of each heading are below:

Level 1: Centered, Bold, Title Case Heading

Text indented to start a new paragraph.

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Level 4: Indented, bold Title Case Heading Ending with a Period.

Paragraph text continues on the same line as the same paragraph.

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In APA Style, the Introduction section never gets a heading and headings are not indicated by letters or numbers. For subsections in the beginning of a paper (introduction section), the first level of subsection will use Level 2 headings — the title of the paper counts as the Level 1 heading. Levels of headings will depend upon the length and organization of your paper. Regardless, always begin with level one headings and proceed to level two, etc.

Special headings called section labels are used for certain sections of a paper which always start on a new page.

- Abstract
- Paper title
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These labels should be positioned on their own line at the top of the page where the section starts, in bold and centered.

Numbers

Use a numeral in these cases:

- a number 10 or higher anywhere in the paper
- a number right before a unit of measurement (3 m, 24 g)
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- a number denoting: time, a date, an age, a point on a scale, an exact amount of money, or a numeral (the 3 key on your keyboard, 7 years old, a 5 on the test)
- a number indicating a place in a series or a part of a book/table, if the number is after a noun (i.e., Item 4, but words are used in cases like "the fourth item")

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