

# INTEGRATED ENVIRONMENT AND HEALTH SURVEILLANCE: A systematic realist review

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## Goal

Identify, describe, and synthesize peer-reviewed literature on integrated environment and health surveillance strategies in Circumpolar Arctic and Subarctic regions.

## Introduction

Arctic and Subarctic regions across the Circumpolar North are experiencing some of the most drastic and rapid environmental changes in the world, resulting from stressors such as climate change and resource development.<sup>1</sup> These changes are creating new, unprecedented challenges for the health of Northern populations.<sup>2-4</sup>

Integrated surveillance strategies that are designed to consider the range of potential interactions between environmental changes and human health within dynamic cultural, social, economic, and political contexts can help generate data, monitor trends, and identify opportunities for public health responses.<sup>5-7</sup>

However, few studies have synthesized information from peer-reviewed literature about integrated surveillance strategies for Arctic and Subarctic regions.

## First Objective

Provide an overview of the range, extent, and distribution of integrated surveillance strategies in the Arctic and Subarctic outlined in the peer-reviewed literature.

## Second Objective

Compare, contrast, and characterize the key components of integrated surveillance development, implementation, and uses that are described in the peer-reviewed literature.

## Methods

This modified systematic realist review (SRR) applied the transparent, replicable methods of a systematic review to search for and identify relevant peer-reviewed literature,<sup>8,9</sup> and drew upon realist review methods to synthesize and analyze the included studies.<sup>10</sup>

## Searching the Literature



- Used a search string to conduct searches in MEDLINE® and Web of Science™ aggregator databases
- Hand-searched three key journals: *Arctic*; *Environmental Health Perspectives*; and *International Journal of Circumpolar Health*

## Selecting Studies and Assessing Relevance



- Established inclusion and exclusion criteria
- Uploaded articles to DistillerSR® online software to remove duplicates and facilitate screening
- Two independent reviewers screened titles and abstracts, and subsequently conducted full text reviews to select relevant articles based on inclusion and exclusion criteria

## Data Extraction, Analysis, and Synthesis

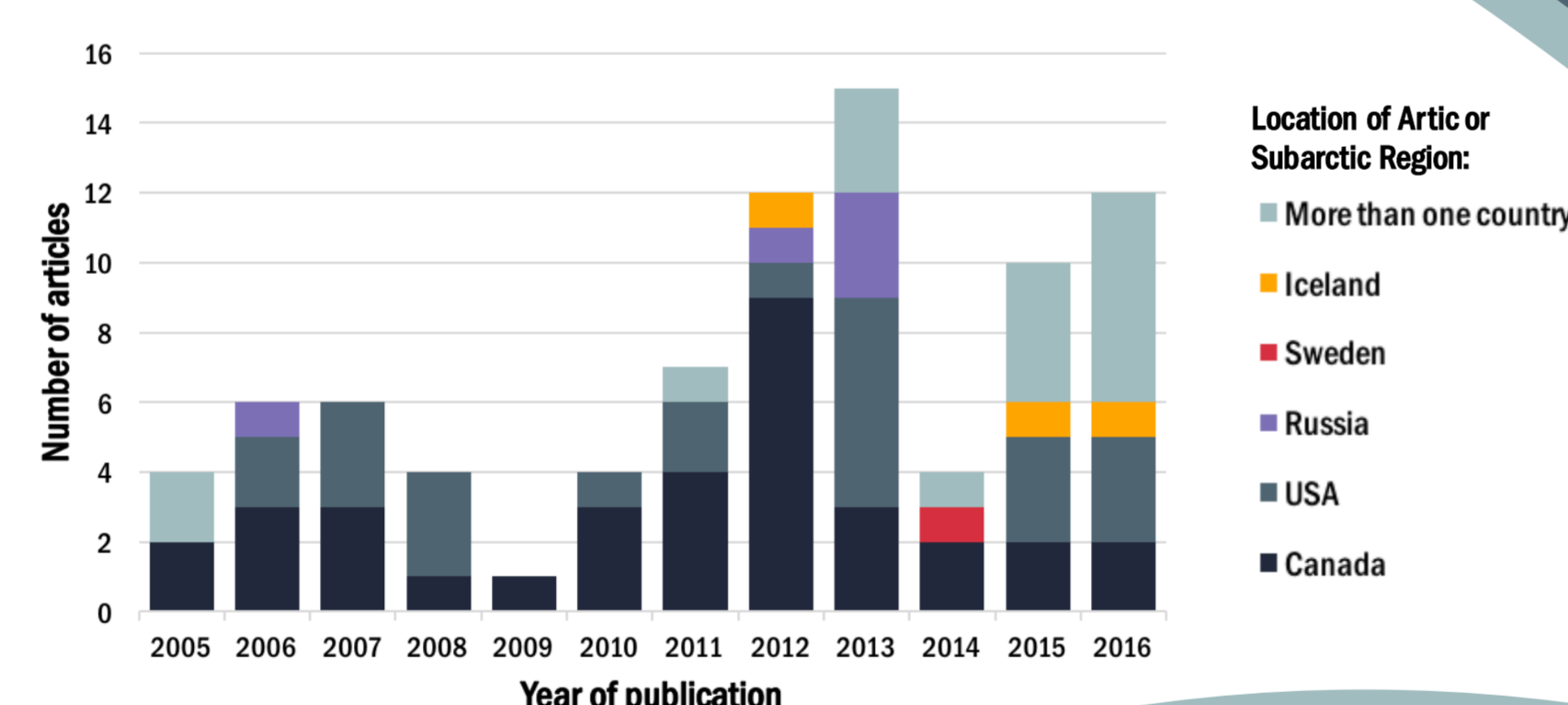


- Created data extraction forms to gather descriptive information from included articles
- Uploaded articles into NVivo®, a qualitative data management software, to facilitate thematic analysis, consisting of a comprehensive process of deductive and inductive coding<sup>11,12</sup>

## Characteristics of Included Articles

### Number of Articles

- 4040 hits from database searches; 621 duplicates removed
- 3419 titles and abstracts screened; of which 475 were deemed relevant
- 475 full texts reviewed; of which 73 met all of the inclusion criteria
- 12 additional relevant articles retrieved from hand searches
- 85 total articles included for data extraction, analysis, and synthesis



### Topics

65% of articles were primary or secondary studies that served to inform and/or recommend integrated surveillance strategies (n=55). These studies contributed to several different areas of environment and health research, including:

- Health and/or environmental impact assessments (n=10)
- Climate change adaptation strategies (n=19)
- Identifying indicators and threshold levels of risk (n=16)

The remaining 35% of articles were primary studies that dealt directly with the development, implementation, and/or application of integrated surveillance strategies (n=30). The strategies described in these studies focused on monitoring and responding to a variety of environmental and human health concerns, including:

- Climate change impacts on health outcomes (n=4)
- Environmental contaminants (n=4)
- Wildlife health and harvesting (n=3)
- Food and water security (n=3)

## Components of Integrated Surveillance

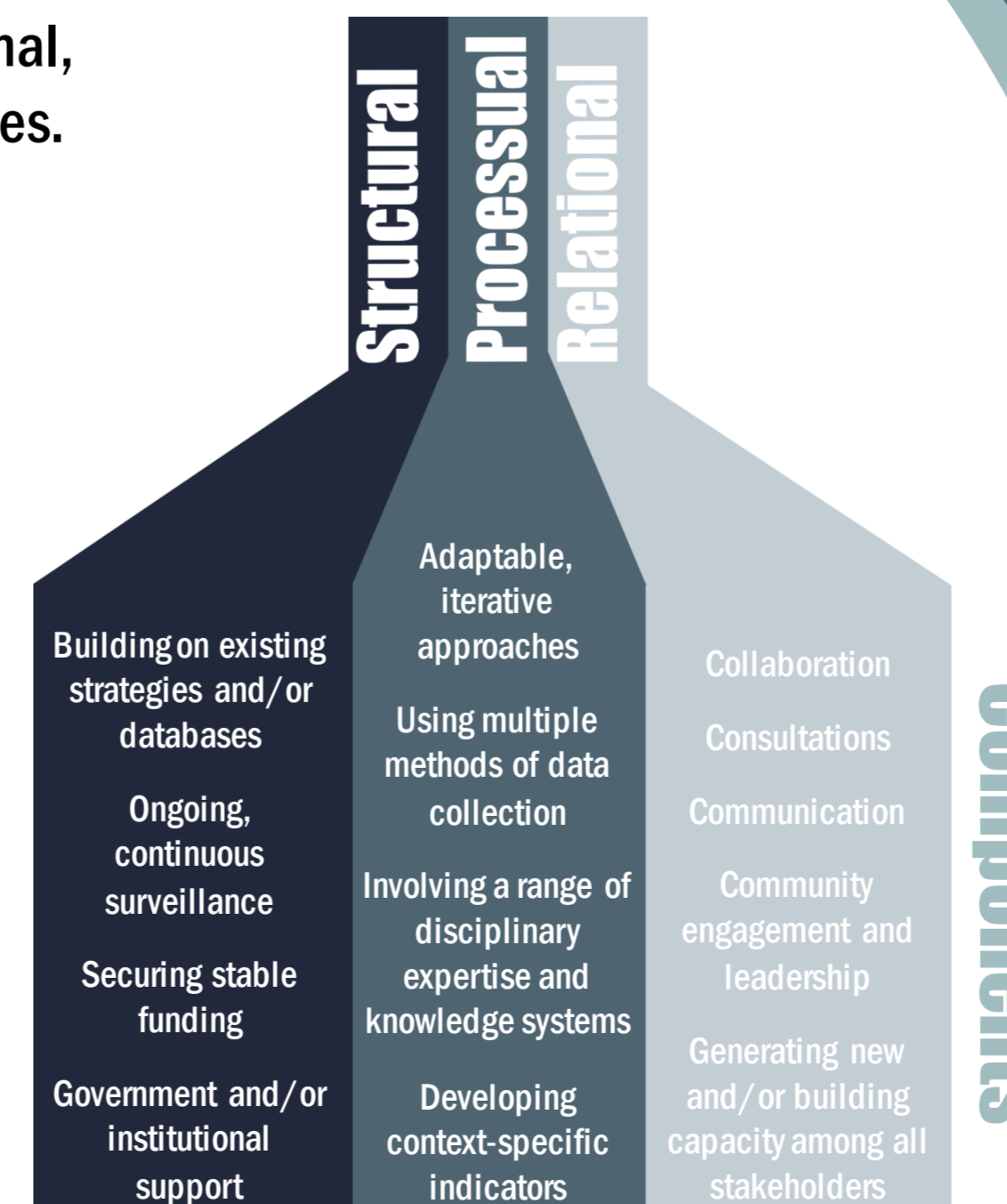
The components of integrated surveillance discussed in included articles fell into three main categories:

- Structural** components described the logistical, organizational, and operational components of integrated surveillance strategies.
- Processual** components described the approaches and methods used within integrated surveillance strategies.
- Relational** components described the interpersonal elements involved in integrated surveillance strategies that helped to build and sustain connections between stakeholders.

Integrated surveillance strategies operated at local, regional, national, and international levels and used various types and combinations of structural, processual, and relational components to work towards certain priorities.

Studies that described a greater total number of total components of integrated surveillance were more likely to describe components from across all three categories.

### Categories



## Discussion

The literature indicated that environmental change cannot be adequately responded to in the North without involving numerous sources of information, focusing on multiple stressors and geographic coverage, and incorporating different knowledge systems, to produce real-time, usable environment and health surveillance data that can inform public health research, policy, programming, and decision-making.<sup>13</sup>

Based on the literature, one type of strategy does not fit all types of problems: examining the components of integrated surveillance strategies can help to understand how and why certain strategies can be structured to be more responsive to public health concerns within rapidly changing Northern environments.<sup>14,15</sup>

### First Implication

An overview of the range and distribution of integrated surveillance strategies across different disciplines and scales can help public health research and practice understand how to use similar tools with different lenses, to address complex environment and health issues in the North.

### Second Implication

The diversity of integrated surveillance strategies identified in the literature demonstrates that not all strategies can or should include the same types and combinations of components. Understanding how integrated surveillance strategies are structured to achieve certain priorities can support public health researchers and practitioners in decision-making about how, and in what combinations, to use structural, processual, and relational components to design and evaluate appropriate strategies for addressing environment and health concerns of Northern populations.

## References

- IPCC. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva, Switzerland, 2014.
- Ford JD, Biering Ford L, King M, Furgal C, Vainane M, et al. Vulnerability of Aboriginal health systems in Canada to climate change. *Glob Environ Chang* 2010;20(4):668-680. doi:10.1016/j.gloenvcha.2010.05.003.
- Harper SL, Edge V, Ford JD, Cunsolo-Wilton A, Wood M, McQueen S. Climate-sensitive health priorities in Nunavut, Canada. *BMC Public Health* 2015;15(1):605. doi:10.1186/s12889-015-1874-3.
- Nickels S, Furgal C, Buel M, McQueen H. *Urukkaupiglit: Putting the Human Face on Climate Change Perspectives from Inuit in Canada*. Ottawa, ON: 2005.
- Liu H-Y, Babonova A, Pascal M, Smolenski S, Skjelvåg E, Basinska M. Approaches to integrated monitoring for environmental health impact assessment. *Environ Heal* 2012;11(1):1. doi:10.1186/1476-069X-11-88.
- Chamron DF, ed. *EcobHealth Research in Practice: Innovative Applications of an Ecosystem Approach to Health*. Ottawa: International Development Research Centre and Springer; 2012. <http://www.springer.com/series/8850>. Accessed September 20, 2016.
- Wesche SD, Amillage DR. Using qualitative scenarios to understand regional environmental change in the Canadian North. *Reg Environ Chang* 2016;14:1095-1108. doi:10.1007/s10113-013-0537-0.
- Mohr D, Liberati A. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med* 2009;151(4):264-269.
- Shamsseer L, Moher D, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMC Med* 2015;13(1):747. doi:10.1186/s12916-015-0473-9.
- Pawson R, Greenhalgh T, Harvey G, Walteris R. *Realist Synthesis: An Introduction*. 2004. <http://www.cesr.ac.uk/130102/>.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3(2):77-101. doi:10.1191/1478088706qp0630a.
- Fereday J, Muir-Cochrane E. Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *Int J Qual Methods* 2006;5(1):80-92. doi:10.1083/ijq.5.1.2012295.
- Polar Knowledge Canada. State of Environmental Monitoring in Northern Canada. <https://www.canada.ca/en/polar-knowledge/publications/epc-state/en.html#10>. Published 2015; [14] Lavoie T. Adaptation strategies to climate change in the Arctic: a global patchwork of reactive community-scale initiatives. *Environ Res Lett* 2014;9(11):1-3. doi:10.1088/1748-9326/9/11/111006.
- Everghart B, Larsen JN, Paasche O. *The New Arctic*. New Arct. 2015;1:352. doi:10.1007/978-3-319-17602-4.

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