BMJ Open

Use of environmental scans in health services delivery research: a scoping review

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-050284
Article Type:	Original research
Date Submitted by the Author:	15-Feb-2021
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Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Manuscript Title

Use of environmental scans in health services delivery research: a scoping review

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Word count: 5741

February 15, 2020

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ABSTRACT

Objectives To describe the extent and nature of evidence that describes the use of environmental scans (ESs) in the health services delivery research literature including the characteristics and design of these studies, and to propose a working definition in this context.

Design Scoping review

Methods This scoping review followed the five-stage scoping review methodology outlined by Khalil et al. The search strategy included searches of seven electronic databases and the grey literature. A Peer Review of Electronic Search Strategies (PRESS) was completed. A team of reviewers worked in pairs to independently perform the two levels of screening and the data extraction. Data were analyzed using qualitative content and thematic analysis.

Results. Ninety-six studies were included in the scoping review. ESs were conducted for many purposes, the most common being to examine current state of programs, services, or policies. Researchers conducted ESs to examine trends, issues, services, policies, practices, policies, guidelines and standards, strategies, technologies, tools and resources, structures, and/or client/patient/provider perceptions and experiences. A variety of data collection methods were used, and 49% of the studies used both passive and active data collection approaches. Personal and impersonal sources of data were used to a similar extent, and external sources were more common than internal sources. Research gaps

identified were inconsistencies in terminology, absence of a standard definition, and lack of guiding frameworks in the health services delivery context.

Conclusions ESs were conducted to gather evidence and inform decision-making on a range of policy and health services delivery issues across the continuum of care. Clarity in terminology and definition of ES, and more guidance on designing ESs may help to provide structure and consistency for researchers and other stakeholders and help advance ES as a methodological approach. A working definition is presented based on the findings of this scoping review.

Key Words: environmental scan, health care, health services delivery, scoping review, protocol, research design

Strengths and limitations of this study

Strengths

- This scoping review addresses a knowledge gap on a subject that has not been extensively examined and includes an analysis of the peer-reviewed and grey literature.
- The study followed established and systematic methods for conducting scoping reviews.

Limitations

- Limits were placed on the grey literature search, which may have resulted in some relevant studies being missed. Our comprehensive search strategy helped to mitigate this limitation.
- The quality of the studies included in our review were not assessed for methodological quality.
- This scoping review included studies that were in English only and that were available in the public domain.

Use of environmental scans in health services delivery research: A scoping review

INTRODUCTION

Environmental scanning involves the process of gathering pertinent information from an organization's external environment to identify trends and issues that present a threat or opportunity to the organization's success, and making effective use of that information to inform future response.[1–4] Evaluating and understanding environmental factors can equip organizations with the knowledge needed to inform decisions and formulate strategies to respond and adapt successfully to changing environmental conditions.[2–7]

Scanning the external environment and internal environments is integral to business and strategic planning.[8–11] The external environment includes elements outside the boundaries of an organization that can impact operations and performance and include: (1) the general (or macro) environment (e.g., political, technological, political/legal, economic, socio-cultural environments) and; (2) the task (or micro) environment, which includes those elements or groups with which the organization has direct interaction (e.g., customers, suppliers, resources, competitors, strategic partners).[9,12,13] The internal environment (e.g., structure, budget, workforce capacity and skills, organizational culture, leadership) must adapt to the demands or shifts in the external environment in order to evolve and succeed.[5,13–16]

Scanning activity can be formal or informal and is influenced by individual, contextual and organizational factors.[17–19] These factors include the size of the organization, educational level of individuals responsible for scanning, organizational strategy, availability and accessibility of information, and the perceived level of

environmental uncertainty (i.e. number of factors or complexity, and rate of change in the external environment), especially in those sectors that are most important to the organization's performance.[4,5,12,17–25]

Data collection methods and sources used in environmental scanning depend on an organization's information needs and scanning objectives.[17,19,23] Information is drawn from personal and impersonal sources that are internal and/or external to the organization but personal sources tend to be preferred.[4,5,20,22,24] Accessibility and quality of information (i.e. relevancy and reliability) are key factors in choosing data sources but other factors such as environmental uncertainty have also been shown to influence the selection of information sources.[5,19,20,22,24]

Health system and environmental scanning

In highly complex healthcare systems, environmental scanning is a key component of strategic planning and is vital to identify and assess trends, and/or issues that can either hinder or support achievement of long-term goals and impact performance.[9,15,18,26–31] Among these issues are shifting demographics, emerging healthcare innovations (e.g. technology), fluctuating resource constraints, human resource challenges, ever-changing patient demands and expectations, and major emerging events such as COVID-19 pandemic.[10,15,31–40] Understanding environmental factors enables healthcare decision-makers to respond and adapt accordingly to emerging issues.[14,30,41] For example, a recent study about the influences of the macro environment (i.e. political, economic, socio-cultural and technological sectors) on health service strategy in private sector hospitals suggested that the technological sector was particularly influential in health services strategy.[30]

While environmental scanning is widely conducted by healthcare organizations as part of strategic planning,[42–46] an environmental scan (ES) is often reported as a methodological approach in published studies that are focused on a specific health issue or problem. For instance, ESs have been used to explore current patient safety education and health care provider training programs [47,48] and to create quality indicators for various health services such as fall prevention and care of critically ill adult patients.[49,50] Environmental scans have been used to inform the design of cancer prevention programs [51,52], and explore the availability of health information resources.[53] Several studies noted the utility of an ES for assessing community needs and for program and policy development.[51,52,54,55]

Despite the potential of ESs to inform policy and practice in health services delivery there appears to be no standard working definition for ES in this context to guide research and practice. [51,52,56] Terminology that describes an ES is inconsistent, [24,52,57] and limited practical guidance exists in the literature to assist researchers and practitioners to design and/or implement ESs. Guiding frameworks or models exist in the business and other sectors,[2,6,23,58–60] yet frameworks developed for the health services delivery context are comparatively lacking.[51,52,54–56] Health services related frameworks specific to ESs that are reported within the published health services delivery literature are limited. One exception is the framework developed by Wilburn et al. (2016) that highlights the value of an ES to public health practice in their study on human papilloma virus (HPV) vaccination.[52] Wilburn and colleagues outlined a seven-step process for conducting an ES which they maintain could be applied to other health issues and research.[52] In addition, a Canadian organization, the Canadian Agency for

Drugs and Technologies in Health (CADTH), conducts ES's to provide health care decision-makers with objective evidence to support informed decision-making about the optimal use of health technologies (e.g. drugs, devices, diagnostic tests, and medical, surgical and dental procedures).[61] Researchers within CADTH follow CADTH's specific organizational process for conducting ESs.[61] Still, some research suggests that more study, evaluation, and refinement of ESs may enhance this approach and its utility for supporting decision-making in health policy and practice.[51,52,56]

In an attempt to address this knowledge gap, this scoping review was conducted to examine the extent and nature of evidence on the use of ESs in a health services delivery context. A review of the evidence can increase understanding of the utility and limitations of this approach among stakeholders who are designing and implementing an ES for research and/or other initiatives (e.g., quality improvement projects).

This scoping review provides insight into how ESs are conceptualized, designed, and implemented. It elucidates characteristics of these studies such as ES purpose, setting, health domain (e.g., regulatory, technological environments), methods, data sources, data source mode, scanning mode, definitions, guiding frameworks, and limitations of these studies. Our results have yielded a working definition of ES in a health services delivery context and the findings will inform future research to investigate the development of a conceptual framework to guide practice. As such, this scoping review may help inform research and practice. To our knowledge, this will be the first scoping review conducted on this topic.

METHODS

A scoping review methodology was selected for three reasons: (1) this type of review employs a systematic approach to map the scope and volume of evidence on a specific topic; (2) scoping reviews can be helpful for clarifying concepts and definitions, and highlighting research gaps; and, (3) scoping reviews are particularly suitable for subject areas that have not been extensively reviewed such as is the case with the topic of our review. [62–66]

This scoping review followed the five-stage methodology outlined by Khalil et al. (2016) that builds on previous scoping review methodologies of Arksey and O'Malley, Levac et al., and the Joanna Briggs Institute: (1) identifying the research questions; (2) identifying relevant studies; (3) selecting studies using a team approach; (4) extracting and charting the data in a tabular and narrative format; and (5) collating the results to identify the implications of the study findings for practice, research, and/or policy (Khalil et al., pp.119-122).[62,66–71] The scoping review followed the PRISMA Extension for Scoping Reviews (PRISMA-ScR) reporting guidelines.[67,72]

Protocol

The scoping review steps are briefly presented here. A full description of the protocol can be found in Charlton, Doucet, Azar et al. (2019).[57]

Identifying the research questions

The main objectives of this scoping review were to:

1. Map the extent and nature of evidence examining the use or application of ESs within the health services delivery literature;

2. Explore definitions, conceptualizations, theoretical underpinnings, and other characteristics including purpose, settings, design, health domain, methods, data sources, data source mode, scanning mode, guiding frameworks, and study limitations;
3. Propose a working definition for the ES specific to the health services delivery context;
4. Identify knowledge gaps and lay the groundwork for future research to explore the development of a guiding framework in this context.

The specific research questions were:

1. How have ESs been conceptualized and operationalized by stakeholders in the health services delivery literature?
    a. What definitions and frameworks are used to describe and guide ES studies in the context of health services delivery and what were the characteristics of these studies?
    b. What are the purposes for the ES? What healthcare issues are addressed and in what care settings?
    c. What are the environmental health domains in which the ES studies are focused in the context of health services delivery (e.g., regulatory, technological)?
    d. What types of study data collection approaches, methods, data sources, scanning modes and data source modes are used in ES studies in the context of health services delivery?

2. What limitations, if any, were described in the included studies that use ESs in the context of health services delivery?

Identifying relevant studies

The search strategy was developed by an experienced research librarian (LB) and the research team according to established scoping review methodology. [62,68,69] A peer review of the search strategy was conducted by a second experienced research librarian (KM) according to the Peer Review of Electronic Search Strategies (PRESS) guidelines.[73,74] Seven bibliographic databases were searched: CINAHL, MEDLINE, PsycINFO, ERIC, Embase, Canadian Business & Current Affairs (CBCA), and Academic Search Premier. As an example, supplementary file 1 outlines the search strategy for Medline.

To facilitate a comprehensive scope of the literature, the grey literature and Google Scholar were also searched. The grey literature search included the grey literature collection of the New York Academy of Medicine Library Online Catalog[75] and *Grey Matters*, a resource developed by CADTH (2018) of Canadian and international government health technology assessment (HTA) websites, health economics resources and health prevalence or incidence databases.[76] The search term "environmental scan" was used for these platforms. A Google search was also performed using two search terms "environmental scan and health services".

To balance comprehensiveness with feasibility, searches of Google, Google Scholar, and the NYAM were limited to the first 10 pages (or first 100 hits). For CADTH's *Grey Matters*, the top ten websites/databases deemed to be most relevant to the objectives of the study were selected to identify studies. Despite the limits placed on

the grey literature search, this comprehensive search strategy appeared to yield hits that were representative of literature related to the topic of interest. The reference lists of peer-reviewed sources were also hand searched for relevant studies.

Selecting Studies

Table 1 outlines the specific inclusion and exclusion criteria for selection of studies. No specific limitations were placed on publication date, population, health service, health care setting (e.g., primary care, acute care, etc.), health care discipline, or geographic location. Studies at full-text assessment were excluded from our review if they were conference abstracts, protocols, poster presentations, review articles, and/or did not reflect health services delivery. This scoping review specifically focused on studies which reported using an "environmental scan" as a methodological approach. The scoping review excluded studies that used other similar terms that may be similar to ES such as 'jurisdictional scans' and 'situational analysis', and those where environmental scanning is a component of broader planning techniques used in formal business and strategic planning. [9,77]

Table 1 Eligibility criteria

Inclusion criteria
Studies were included if they were: • specific to health services delivery • specified that the study reported the use of an "environmental scan" • published in English

- (1) peer-reviewed academic journal papers (primary research studies) or; (2) grey literature (government and non-governmental environmental scan reports, and dissertations)

Exclusion criteria

Studies were excluded if they (were):

- not specific to health services delivery (e.g., focused on professional development and performance measurement or management)
- did not report the use of an "environmental scan"
- published in languages other than English
- review papers

Two reviewers independently screened titles and abstracts (PC,KT) and full-text articles of the peer-reviewed literature (PC, TK) to assess eligibility for inclusion in the study. Pilot tests were conducted at the beginning of first level (titles and abstracts) and second level (full-text) screening to evaluate reviewer agreement and to ensure consistency. For the grey literature, six team members met to discuss and review the screening process and then worked in pairs conduct both levels of screening (RHL, DAN, AL, TK, RA, and PC). Disagreements on study selection in the screening process were resolved through discussion or, if necessary, by a third reviewer (PC, TK, WJM). Figure 1 outlines a modified version of the PRISMA flowchart for scoping reviews.[72,78]

Charting the data

A standardized data extraction form (Microsoft Excel) was developed by the research team to extract data from the included articles. The data elements extracted were author,

country, publication year, publication type, purpose of the study, purpose of ES, health condition, health domain, setting, research approach, methods, data sources, data source mode, scanning mode, as well as other relevant information including existing definitions, guiding frameworks, and limitations.

Working definitions for the extracted data elements were developed to provide clarification and consistency among researchers in the data extraction process. In particular, "scanning mode" has been defined inconsistently in the research literature referring to a four levels of scanning in some literature (i.e. undirected viewing, conditioned viewing, informal search, and formal search) and to data source in other studies .[17,24] Similar to Naumann et al. [56] we categorized scanning mode into two of the four scanning modes described by Choo- conditioned viewing and searching.[1,17,79] Viewing information is considered "passive" data collection, and refers to "looking at" information, while searching is considered "active" data collection and involves "looking for" information.[17] Conditioned viewing and searching were chosen because they were most relevant to the objectives of the scoping review. For example, according to Choo (2003) searching involves a deliberate and planned effort for specific information using a pre-established methodology, which reflects this research activity.[17]

The term "data source mode" was chosen to refer to the environment from which the data source emerged (i.e. internal or external source) and the nature of the data source (i.e. personal/impersonal) to differentiate from the scanning mode term used by Choo.[17] Internal data sources reflected those sources within the boundaries of the organization, and external sources were those outside of those boundaries of the

organization. Internal sources could include sources from various geographical sites but that were under the same organization. Personal sources were human data sources (e.g., clinicians, health care staff, patients, experts from health and other sectors, community members, and other stakeholders), and impersonal were those non-human sources of data (e.g. reports, academic databases, administrative databases, web).

Four teams of paired reviewers (PC, TK, PC, RA, TK, AL, RHL, DN) independently charted the peer-reviewed and grey literature. Pilot tests on the peer-reviewed and grey literature were conducted by the paired teams to assess agreement and promote consistency in data extraction between reviewers.[68,80] Data charting was an iterative process. Initial categories for the data elements were identified before the extraction process, and additional relevant categories and sub-levels of categories were added as researchers became more familiar with the literature. Each pair of reviewers met regularly to review extraction results and to resolve any discrepancies through discussion.

Figure 1 here – PRISMA Flowchart

Collating results

Content and thematic analysis were used to analyze the results.[81,82] The content analysis included a descriptive analysis using frequency counts and percentages to describe study characteristics using SAS Edition 3.6. Qualitative thematic analysis was used to illustrate key findings and themes. For the thematic analysis approach, initial codes were applied to the data that reflected the content being generated for several data elements that were amenable to thematic analysis. Thereafter, the codes were collated into potential themes based on patterns of similar codes.

All authors (PC, TK, RHL, DAN, RA, SD, AL, WJM) reviewed and discussed the preliminary findings. The data are presented in a tabular form and includes a narrative and descriptive numerical summary of the studies' characteristics. Knowledge gaps and implications for policy, practice, and research are highlighted.

Patient and public involvement

Research ethics review of this scoping review was not required. No patients or members of the public were involved in the study.

RESULTS

A total of 96 studies were included in the scoping review, representing 60 from the peer-reviewed literature[51,56,77,83–139] and 36 from the grey literature.[140–175] A summary of general and design characteristics of specific studies appear in supplementary files 2, 3, 4 and 5. A summary of the characteristics of the studies are presented here in four sections including general characteristics, design characteristics, conceptual characteristics, and other observations.

General characteristics

Publication date and country of origin

Publication dates of the included studies ranged from 2001 to 2019. There was an increasing trend of ES studies specific to health services delivery over that time period (figure 2). Of the 96 studies, 42 (44%) were published since 2016. Studies originated from three countries (Canada, USA, and Australia), with most (n=65) from Canada (68%), and 27 (28%) from the USA.

Figure 2 Here

Population, healthcare setting and health conditions

Populations under inquiry ranged from newborn to older adults. The healthcare setting for the studies spanned the continuum of care. Most studies (n=55) were situated in multiple settings (57%). Nine studies were situated in acute care (9%), seven were in primary health care (7%), and five studies were in Regional Cancer Specialty Clinics (5%). Other settings are shown in figure 3. (see supplementary files 2 and 3 for detail on specific studies).

Figure 3 Here

Close to half of the studies (n=44) focused on a particular chronic disease (46%), nine studies focused on chronic disease in general (9%), and eight focused on infections or infectious disease (8%). Other foci are shown in figure 4. Of those studies with a disease focus, the most common conditions were cancer appearing in 17 studies, mental health in five studies, heart disease and stroke in five studies, and diabetes in four studies. About 31% of studies (30/96) were not focused on any specific condition.

Figure 4 Here

Health care domains

The studies centered on various health care domains of the healthcare environment. The most common health domain was the clinical/treatment services environment which was included in 75 studies (78%), followed by the regulatory environment which was included in 31 studies (32%) and 20 studies included the

technological environment (21%). Other foci that appeared in the studies are listed in descending order of frequency in figure 5.

Figure 5 Here

Purpose of the ESs

ESs were conducted for a wide range of purposes. The purposes reported in the studies are summarized in table 2 in descending order of frequency. Seventy-nine studies included the most common purpose which was to examine the current state of programs, services, or policies (82%). The second most commonly cited purpose included in 56 studies was to identify patient/community /organization needs, strengths, challenges, barriers, and service gaps (58%).

Table 2 Summary of the purpose(s) of the environmental scans in the included studies

Purpose of the ES(s)	Studies (%, n)
Examine the current state of programs, services or policies	82% (79)
Identify and/or assess patient/community/organization needs, strengths, challenges, barriers and service gaps	58% (56)
Identify and/or assess tools for patient care, or inform development of tools/ education materials/patient-decision aids	23% (22)
Understand the use or experience of a phenomenon or service	22% (21)
Inform program planning, design and/or improvement	21% (20)
Inform recommendations for policy and practice	21% (20)
Identify best practices or innovative practices	15% (14)
Inform/guide quality improvement and/or patient safety initiatives	14% (13)
Inform aspects of practice or policy development or change.	10% (10)
Assess or inform models of care	10% (10)
Assess or inform clinical practice guidelines	9% (9)
Inform the development of planning or evaluation frameworks	8% (8)
Inform improvements in the transition of care	6% (6)
Inform future research or research program	5% (5)
Inform standardization of services, processes, structure/organization and delivery	3% (3)
Understand factors influencing health behaviours	2% (2)
Assess or inform other types of guidelines and standards such as for use of technology	1% (1)

Note: Percentages do not add to 100 because there may be more than one purpose for an environmental scan.

Design characteristics

Data collection approach and methods

Of the 96 studies, 57 included qualitative methods (59%), 31 were mixed-methods (32%), and 8 were quantitative approaches (8%). Fifty-seven studies used more than one data collection method (59%). Data collection methods are shown in figure 6 (see supplementary files 4 and 5 for specific study details). The most common data collection methods were literature review which was employed in 66 studies (69%); followed by key informants or semi-structured interviews in 50 studies (52%). Thirty-three studies included surveys (34%). Researchers also used other types of person contact to collect data such as community advisory groups and expert panels.

Figure 6 Here

Scanning mode and sources

Of the 96 studies, almost half (49%) of the researchers used a combination of passive and active data collection methods (n=47). Twenty-six studies applied searching mode only (i.e., active) (27%), and 21 studies (22%) applied conditioned viewing only (i.e. passive).

Personal sources and impersonal sources of information were used to a similar extent. Of the 96 studies, 73 (76%) included personal sources of information and 69 studies (72%) included impersonal sources.

Twenty-five studies of the 96 studies used personal sources only (26%), and 21 studies used impersonal sources only (22%).

In terms of impersonal data sources, over half of the studies (n=54) reported using the internet/web (56%), followed by 35 studies that drew data from academic databases

(36%), and 20 studies reported using reports or other documents (21%). Other impersonal sources are shown in figure 7.

Figure 7 Here

Data source modes are shown in figure 8. External sources were more common than internal sources. Overall, 83 studies included external sources (86%), and 36 studies included internal sources (38%). External impersonal sources featured in 65 of the 96 studies (68%) of the studies. External personal sources were used in 62 studies (65%).

External sources represented both the general and task environments. In 31% (30/96) of the studies, researchers collected data from sources external to the health sector i.e. other government departments, education officials, community members, patients, professional associations, and private businesses.[51,56,77,85,86,89,92–94,102,103,106,108,110,114–116,119,124,126–128,130,133,144,146,159,160,163,170]

Thirty-one studies (32%) included internal personal sources and 17 studies included internal impersonal sources (18%) such as internal databases or reports. Eight studies included all four data source modes (8%).

Figure 8 Here

Limitations

Approximately 65% (62/96) of the studies included a discussion of study limitations. The most common limitations were those related to the search strategy, sampling, design, data collection methods, and response rate.

Conceptual characteristics

Rationale for ES

Of the 96 articles included in the review, three (3%) included a rationale for selecting an ES as a methodological approach.[90,110,175] Environmental scans were noted to be valuable tools to raise awareness, plan for the future, or provide information to support evidence-based policies.[101,131] They were perceived to be a flexible and adaptable tool to enable rapid collection of the required environmental information and for providing a snapshot of current work.[90,175]

Terminology and definition of ES

Of the 96 included articles, 15% (14/96) included a definition of ES (1 in the grey literature and 13 in the peer-reviewed studies).[51,56,77,87,90,99,101,110,118,127,129,131,136,170] These definitions are provided in supplementary file 6. Of the 14 studies that included a definition, seven (50%) cited the work of Graham et al. (2008)[54] four studies (29%) referenced or cited the definition by Choo (2001)[2] four studies (29%) cited the work of Rowel et al., (2005)[51] and one study cited the American Society of Association Executives [ASAE] definition.[176]

Many of the definitions for ESs included reference to an evaluation of the environmental factors that affect an organization (e.g., programs, policies, and physical features). Some definitions described ESs as a "tool" for: (1) conducting needs assessments; (2) identifying, collecting, gathering, organizing, and retrieving information on environmental factors for planning and program design; (3) identifying barriers and service gaps; and; [4] reviewing the current state of evidence on a specific area of

focus.[51,56,90,110,129,136] An ES is further described as an effective, systematic, comprehensive, flexible, and rapid strategy to collect, summarize, and inform the development of approaches to health service delivery.[51,56,90,131,136]

Definitions tended to be future oriented, focusing on identifying emerging issues or opportunities and informing future planning.[2,77,90,110,127,129] Some of the definitions specified the external environment, [118] and others made reference to both the internal and external environments,[131] and two definitions included reference to data collection methods.[127,136]

A range of terms were used within the definitions to describe an ES. The most common term used was "tool" (43%) (6/14)[51,56,90,110,129,136], including a "mixed-methods tool"[90] and a "needs assessment tool".[136] Other terms were "an objective review" or "review" (14%) (2/14) [87,99]; "method" or "research method" (14%) (2/14)[77,131]; "cross-sectional survey" (7%) (1/14)[101]; and "integral process" (7%) (1/14). [170] One study referred to an ES as a "rapid environmental scan" but did not provide a definition. [159]

Guiding frameworks or models for ES

Of the 96 studies reviewed, 17 (18%) were conducted by CADTH researchers using their specific organizational process for conducting ESs. Of the remaining 79 studies, five studies (6%) (5/79) reported being were guided by a specific ES model or framework. These included four peer-reviewed articles [51,56,99,116] and one grey literature article.[144] Of these five studies, two [51,116] were guided by Choo's conceptual model, [2] and one [56] was guided by both the Choo [2] and the ASAE frameworks.[176] The ASAE framework outlines four characteristics of environmental

scans.[176] A fourth study [144] was guided by the Wilburn et al. model.[52] The fifth study implemented a "built" environmental scan which assesses the environmental factors that influence an organization (e.g. programs, policies, and physical features).[99] The scan was based on a school-based evaluation model to evaluate cancer centers for physical activity and sedentary behaviour information and infrastructure.[99] In addition, two studies[140,170] reported being guided by scoping review methods, and one study applied the Social Ecological Model to inform the development of the interview guide for the ES.[93]

Several other ES studies included conceptual models that were not specific to ES but were used to guide analysis and reporting of results. [92,121,124,151,159,170,174,175] For example, Young et al. employed the INTEGRATE-HTA Context and Implementation of Complex Interventions (CICI) framework and applied the information gathered from the ES to guide the identification of themes related to enablers and barriers associated with the implementation of internet-delivered cognitive behavioral therapy (iCBT) in Canada.[174]

Other observations

In most studies, the ES was the focus of the entire study employing one or more data collection methods. In other studies the ES was only one of the methodological components.[86,89,103–105,107,120,132,144,148,149,172,175] In some studies, ESs were conducted in addition to a systematic review [91,125,148,149,172] or a scoping review. [56,124,144] For example, Naumann charted ES data according to classifications that emerged from the scoping review component of their study.[56] Several studies reported that the ES component of a study was used to validate information gathered

from other methods used in those same studies such as interviews, focus groups, surveys and a scoping review.[56,100,103] Four studies emphasized that the ES was useful to engage stakeholders in the program planning process.[51,56,85,170] Finally, one study conducted an ES to develop the content areas for a survey as part of a systems analysis on services and gaps in services for individuals with acquired brain injury.[120]

DISCUSSION

Over the past decade ESs have been used to gather evidence to inform health services program and policy development, yet little was known about how ESs were designed and operationalized in the health services delivery literature. Our objective in this scoping review was to describe the scope and nature of ESs within the health services delivery literature including the characteristics of these studies and how they are conceptualized, designed and implemented.

Previous research suggested that ES is a useful tool for supporting health planning, program and policy development.[6,51,54,55] The findings from this scoping review provide evidence to support these observations. This scoping review indicates that ES were conducted to gather evidence and inform decision-making on complex policy and health service delivery issues in a range of settings and across the continuum of care. The scoping review has shown that ESs can involve an examination of trends, issues, policies, practices, services, tools and resources, guidelines and standards, structures, strategies, technologies and other innovations, and/or patient/provider experiences related to a particular health services delivery issue. This review also elucidates that ESs are commonly conducted for an array of purposes including to: describe the current landscape of programs, policies, or services; identify needs and service or policy gaps;

identify barriers and facilitators to accessing services; assess or inform the design of programs, tools, or models of care; inform service and planning priorities, and planning frameworks; inform and/or assess adherence to clinical guidelines or other types of guidelines; inform the development of standards of care or other services; develop recommendations to improve service quality; enhance patient education and support services; and identify best practices, policies, strategies, innovative tools and technologies to improve and transform the quality, safety and efficiency of care.

Nevertheless, despite the use and potential utility of ESs to inform practice, policy and planning in health services delivery, this scoping review has also identified significant research gaps. First, the findings of this review illustrated inconsistencies in terminology and definitions used to describe ES within the health services delivery literature. Within the 96 studies included in this review, wide variations of terms were used to describe ES, and other inconsistencies in terminology became apparent when this scoping review was being designed. For example, in previous research some researchers referred to data source as "scanning mode" while others referred to scanning mode as a component of a conceptual model.[1,2,19,21,177] In addition, researchers interpreted the term 'passive' data collection in various ways, which can add to the confusion connected to conducting an ES.[56,116,135]

Similar inconsistencies were noted among the definitions of ES found within the health services delivery literature. A limited number of studies cited or provided a formal definition but where a definition was available, the content and emphasis in the definitions varied.

Given these findings, we suggest greater clarity in definition and terminology surrounding the ES could help provide structure and consistency for stakeholders who wish to undertake an ES, and help to advance ES as a methodological approach in health services delivery research. Based on the findings of the 96 primary studies in this scoping review and building on previous research and definitions,[2,51,52,54,87,131,178] we propose following working definition for environmental scan within the health services delivery context (Box 1):

Box 1 Working definition of environmental scan

Within the health services delivery context, an environmental scan is a type of inquiry that involves the systematic collection and analysis of information from internal and/or external environments to increase understanding of particular health services issues, inform future direction(s), and/or adapt to changing environments.

Stakeholders use evidence generated through an environmental scan to examine and/or inform decision-making related to:

- service needs, priorities, and trends;
- current practices, programs, and policies;
- policy and program planning, design and development;
- organizational resources;
- practice standards and guidelines;
- quality improvement initiatives;

- client/patient/provider experiences;
- patient support initiatives and tools (e.g., assessment and/or educational tools and resources; patient decision-aids);
- physical space/structure; and
- system transformation through the identification of best practice strategies, new models of care, and emerging technologies and innovations.

Secondly, this scoping review found a notable lack of formal guidance to support healthcare stakeholders in their attempts to design and conduct ESs within a health services delivery context. These gaps were evident in several of the included studies in this review as well as in existing literature.[51,52,55,56,129,144]. Of the studies not conducted by CADTH, five studies included in this scoping review referenced a specific ES guiding framework or model specific to the implementation of an ES,[51,56,99,116,144] and most frameworks were developed within business or education contexts. Choo's (2001) conceptual model [2] was most often cited. [51,56,116] Only one study[144] used a framework developed within the health services context.[52] In addition, two studies reported being guided by scoping review methods to guide the implementation of the ES.[140,170] Given the lack of frameworks developed within the health services delivery context, exploring the development of a guiding framework for conducting an ES specifically in this context could make an important contribution to future research and practice.

Oher characteristics

ESs focused on health services delivery have grown in use over the past decade, as noted in other studies.[54,56] Most studies included in this scoping review were published in North America (96%). The reason for this is unclear. It is possible that alternate terms were used to describe these types of studies in other countries or that studies may have been missed.

Consistent with previous research,[6,54] this scoping review described the range of methods used in ES studies depending on the objectives of the study. Personal and impersonal sources of information were used to a similar extent. Research from other sectors indicated that the most common and preferred sources of information tend to be personal sources.[1,5,19,20,22,24] Although it was beyond the scope of this review to evaluate preferred data collection sources of ESs conducted within a health services delivery context, several studies suggested personal sources may be particularly important to support or validate information collected from other methods in the study.[56,110,175] In addition, personal sources may also be important to gather new and relevant data that may be missed if a researcher relied exclusively on electronic or other sources of impersonal information.[110,175] Although it is not clear there is whether internal or external sources are preferred in other sectors, [5,19] this scoping review suggests that external sources of information were used to a greater extent than internal sources in the health services delivery context.

Finally, consistent with previous studies [52,54,55] several studies described ES as a useful means to increase stakeholder engagement. In recent years, a concerted emphasis has been placed on engaging the public and patients in health services delivery

and in health research.[179,180] Active engagement of stakeholders can inform policy and planning, improve health service delivery[179] and lead to research that is more relevant to stakeholders.[180]

Strengths and limitations

There are several limitations to this scoping review study. Articles included from grey literature databases were limited to those that appeared within the first 10 pages (or first 100 hits). Although this purposeful strategy was employed to balance comprehensiveness with search feasibility, relevant studies may have been missed. To enhance inclusiveness, broad search terms with no specific publication date limitations were used to identify the grey and peer-reviewed academic literature. The included studies were not assessed for methodological quality. This is in keeping with the primary purpose of a scoping review to identify and map available evidence. With the goal to describe studies that specifically incorporated "environmental scan", this scoping review may have excluded studies that used other terms to refer to approaches similar to ES such as 'jurisdictional scans' and 'situational analysis'. The strengths of this study include but are not limited to the following. A data dictionary was developed to promote consistency among researchers undertaking data extraction. Researchers met regularly to review the data extraction process and results, and to resolve discrepancies. Data was categorized according to the terminology used by the authors in the individual included studies. Finally, this study reviewed a topic not previously examined and followed established methods for conducting scoping reviews.

Future research and directions

This research has implications for researchers and other stakeholders who are designing and implementing environmental scans to gather evidence to inform a particular health issue. This scoping review provides insight into how ES are designed and implemented, and proposes a working definition. More research is needed to further build on this definition and explore the development of potential frameworks that could help guide research and practice. Our future work will involve a further review of the literature and consultation with experts (e.g. researchers, policy-makers, practitioners, and other stakeholders) to further refine the definition presented, and potentially establish a consensus definition of an "environmental scan" within a health services delivery context. We will also explore the development of a methodological framework that may be of assistance to stakeholders in designing and conducting environmental scans.

CONCLUSION

This scoping review addressed a knowledge gap by providing insights into the characteristics of an ES and how they are described, conceptualized, designed and implemented as reported in both the peer-reviewed and grey health services delivery literature. ES is type of inquiry that is commonly used within the health services delivery literature to generate evidence to inform decision-making on complex policy and health service delivery issues in a range of settings and across the continuum of care. The evidence generated by an ES is used for multiple purposes.

Despite these benefits, this scoping review also identified significant research gaps including inconsistencies in terminology and definitions used to describe ES within the health services delivery literature and a notable lack of formal guidance that could

help to support healthcare stakeholders in their attempts to design and conduct ESs within this context. We suggest consistency in terminology and definition would contribute to the advancement of the ES and have proposed a working definition for ES within the health services delivery context.

Finally, health systems operate in a complex, dynamic environment, responding constantly to current or emerging issues, and unpredictable events that can impact service quality and efficiency. Evidence gathered through ES can support decision-making and help healthcare organizations to respond and adapt to challenges and build on potential opportunities.

Funding. This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Contributors. All authors contributed to this research including the preparation and editing of the manuscript. Team members contributed to the screening and analysis of results (PC, TK, RHL, DAN, RA, SD, AL). PC developed the initial draft of the manuscript, and after several iterations with significant input from the research team, all team members (PC, TK, RHL, DAN, RA, SD, AL, WJM,) approved the final manuscript that was submitted for publishing.

Acknowledgements. We wish to also thank Christine Fahim, PhD, Scientist, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Ontario for reviewing our initial draft manuscript and providing helpful feedback.

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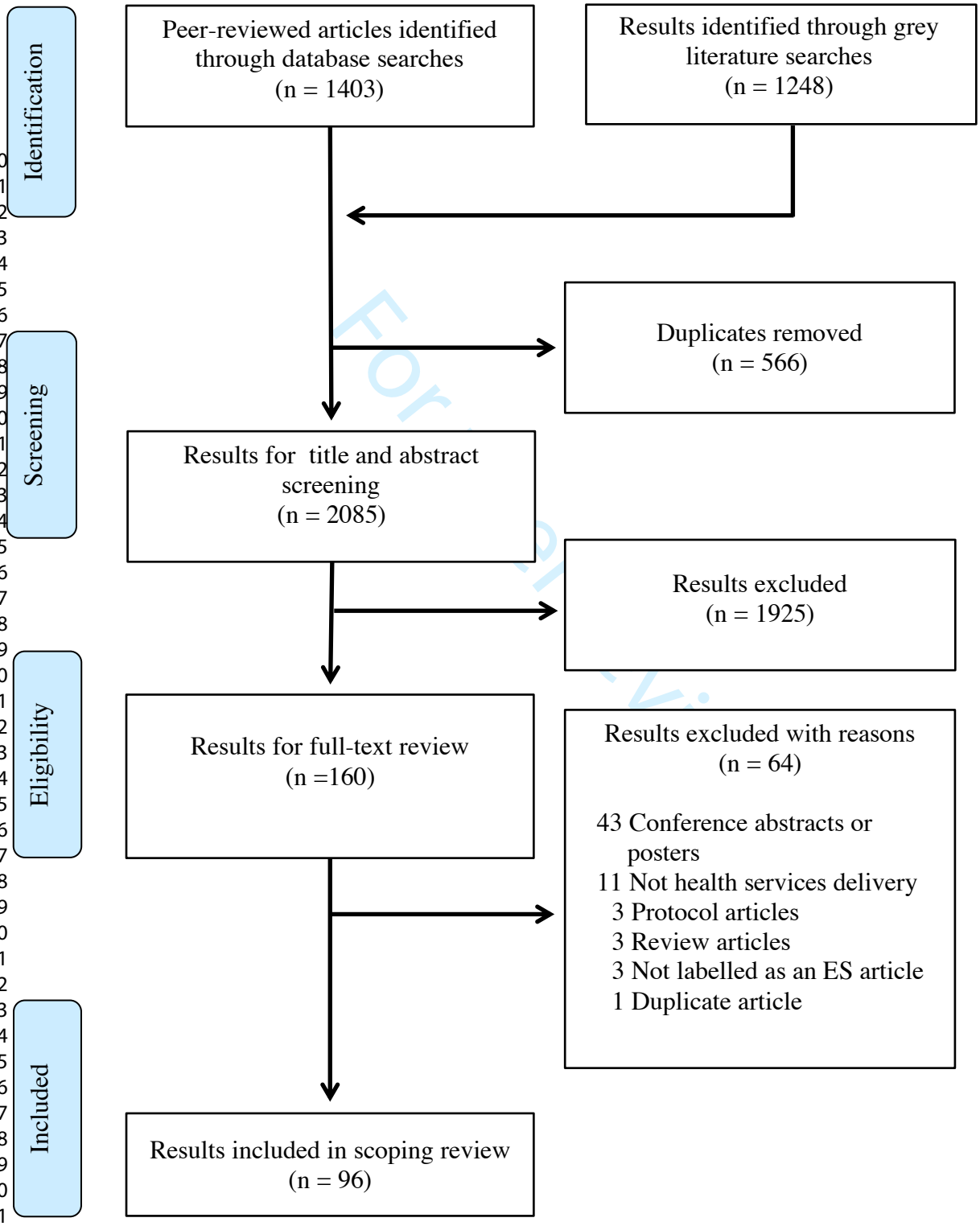

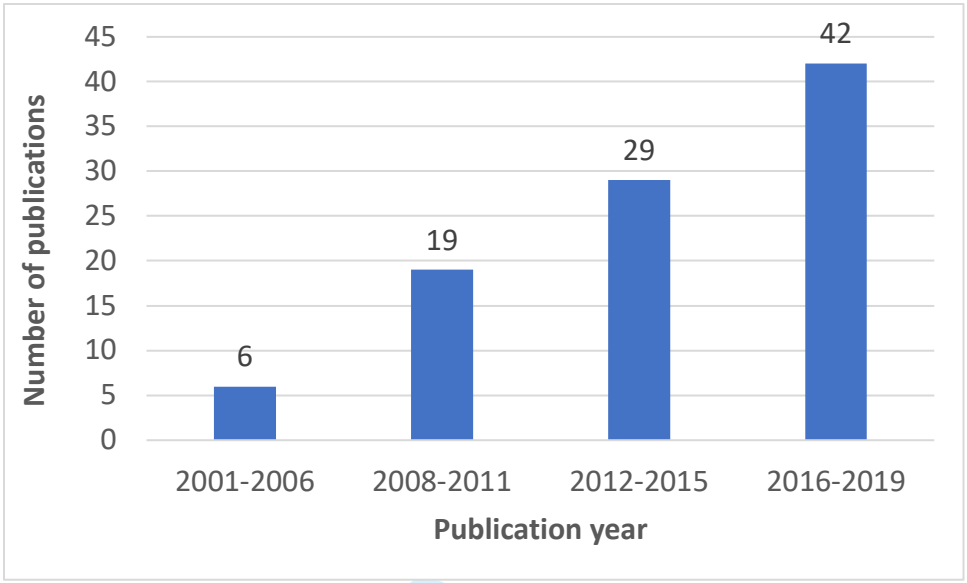

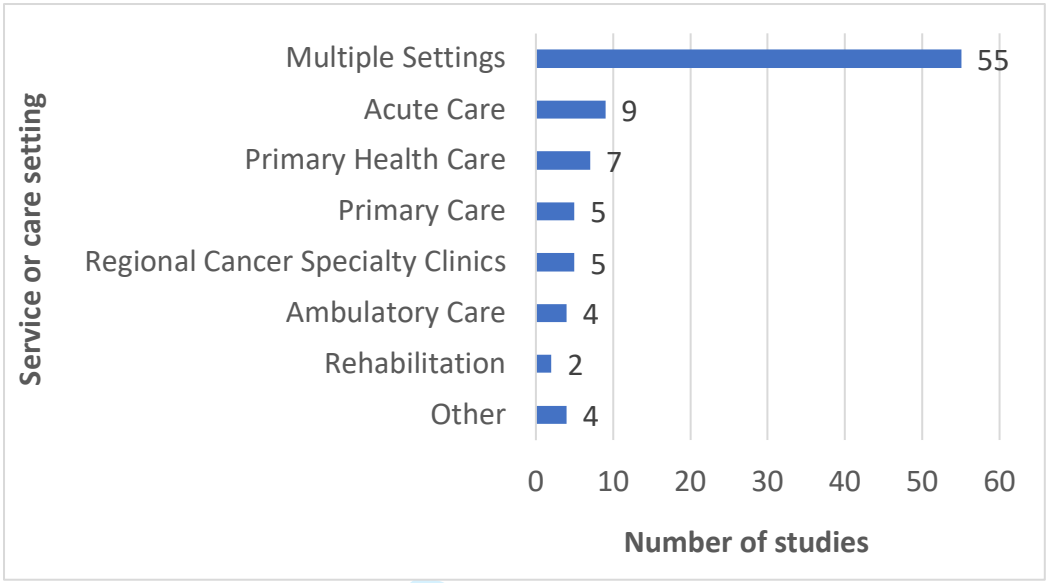

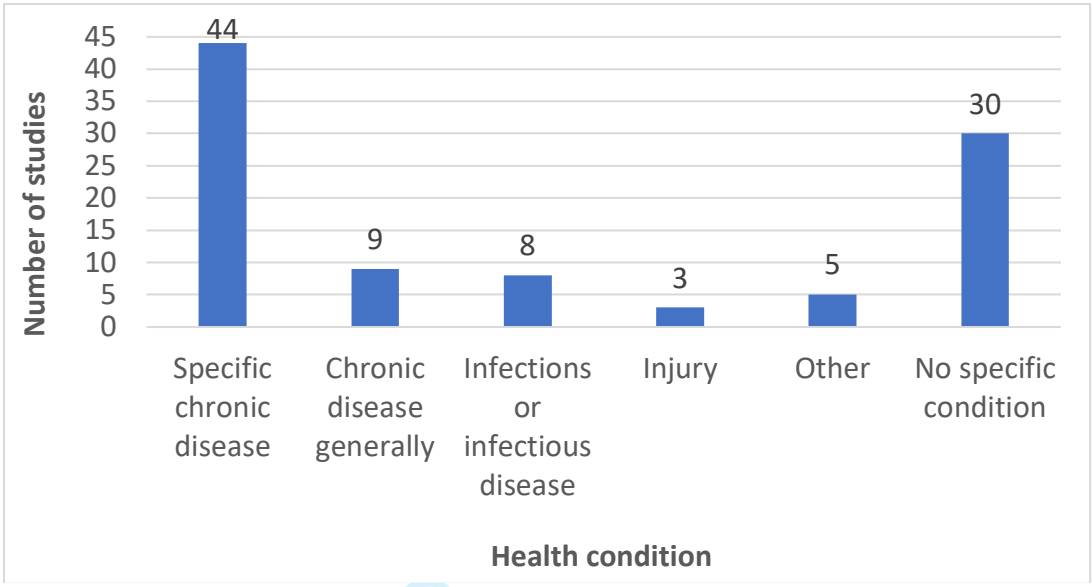

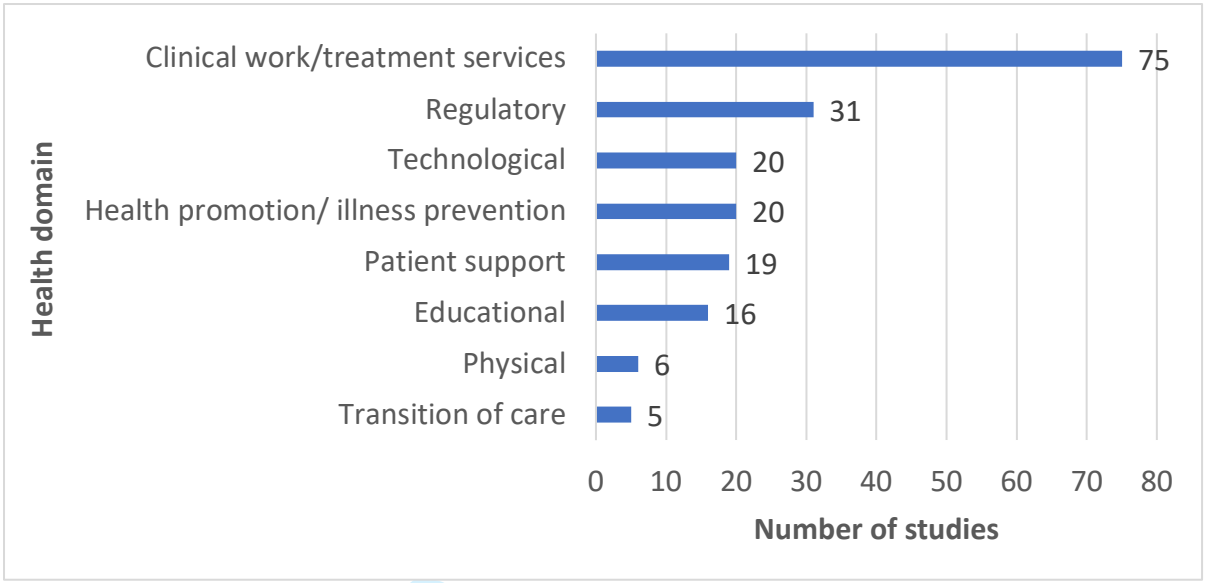

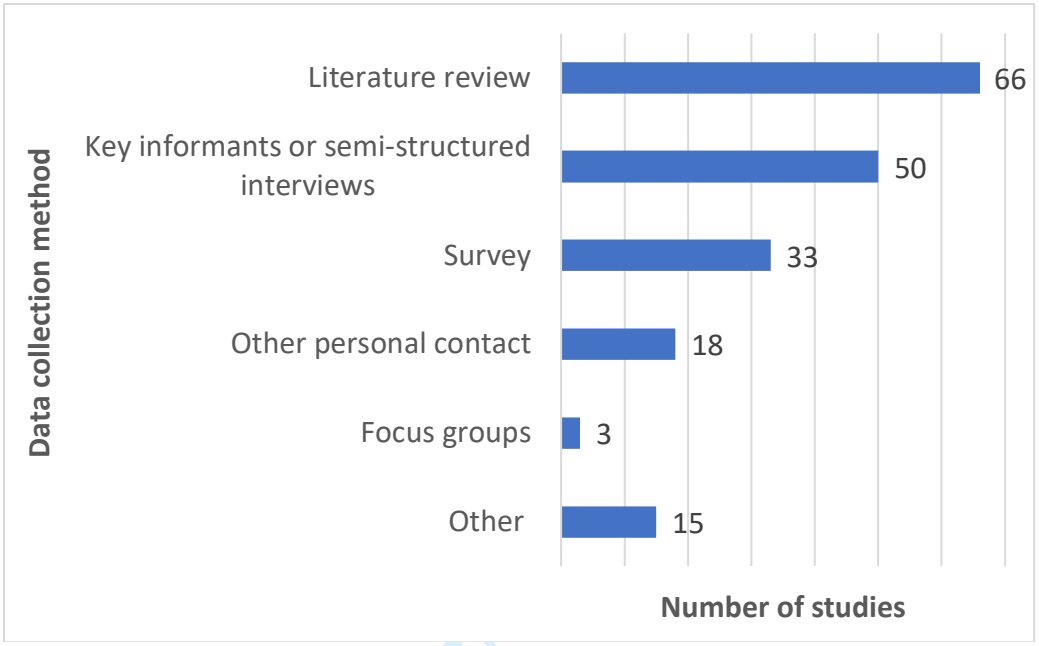

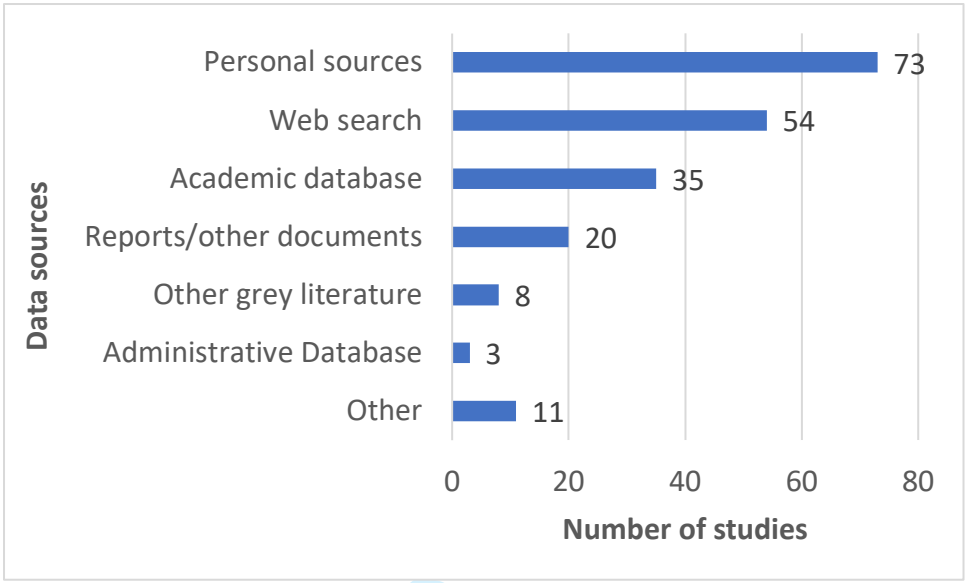

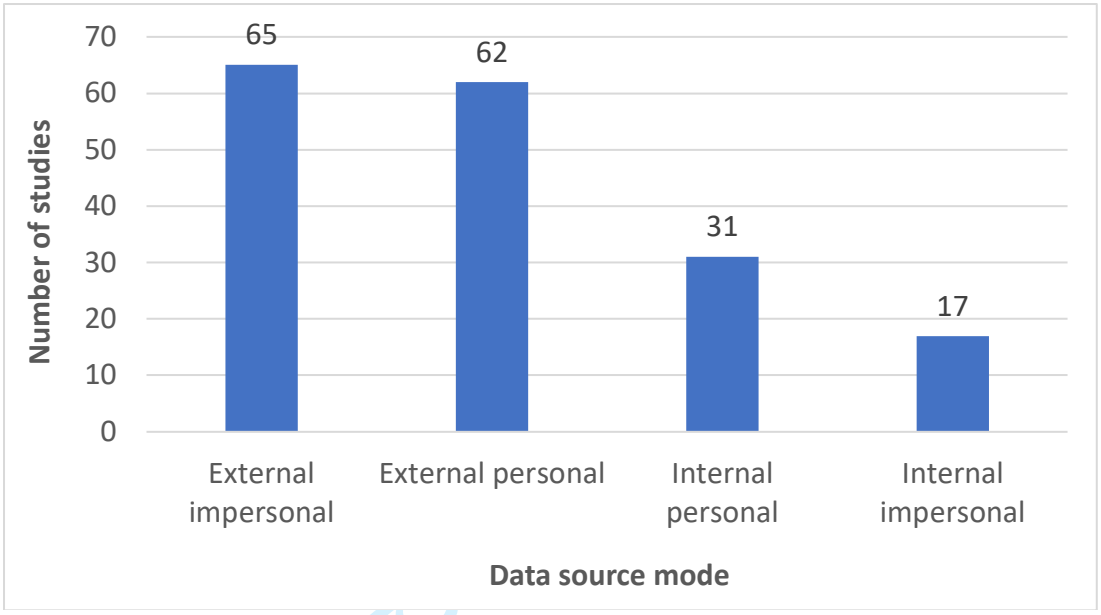

Supplementary File 1

Search Strategy for Medline

1	environment* scan$4.ti,ab,kf.
2	exp "Delivery of Health Care"/
3	exp Health Services/ and (administer* or delegat* or deliver* or distribut* or provide or providing or provision).ti,ab.
4	((care or healthcare) adj4 (accessib* or availab* or disparit* or equit* or equalit* or inaccessib* or inequalit*)).ti,ab,kf.
5	((care or healthcare) adj4 (administer* or delegat* or deliver* or distribut* or provide or providing or provision)).ti,ab,kf.
6	((care or healthcare) adj reform*).ti,ab,kf.
7	case management.ti,ab,kf.
8	(e health or e mental health or ehealth or m health or mhealth or mobile health or telehealth or telemedicine).ti,ab,kf.
9	(health care adj4 (accessib* or availab* or disparit* or equit* or equalit* or inaccessib* or inequalit*)).ti,ab,kf.
10	(health care adj4 (administer* or delegat* or deliver* or distribut* or provide or providing or provision)).ti,ab,kf.
11	(health adj2 reform*).ti,ab,kf.
12	managed care.ti,ab,kf.
13	practice pattern*.ti,ab,kf.

14 prescribing pattern*.ti,ab,kf.

15 ((program* or service*) adj4 (accessib* or availab* or disparit* or equit* or equalit* or inaccessib* or inequalit*)).ti,ab,kf.

16 ((program* or service*) adj4 (administer* or delegat* or deliver* or distribut* or provide or providing or provision)).ti,ab,kf.

17 or/2-16

18 1 and 17

Supplementary file 2

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Abrahamyan et al. (2015) (83)	CA	To identify all community-based multidisciplinary wound care teams in Ontario and describe their service models.	Mixed methods	Multiple
Ahmad et al. (2015) (84)	CA	To develop recommendations and initiatives to improve quality of oral chemotherapy delivery in Ontario.	Qualitative	Regional Cancer Specialty Clinics/ Centres (provincial)
Baezconde-Garbanati et al. (2017) (85)	US	To assess needs, resources, and understanding attitudes toward HPV vaccination.	Qualitative	Multiple
Bak et al. (2013) (86)	CA	To describe available evidence on the effects of radiation on ambulatory infusion pumps used to deliver chemotherapy, heighten awareness of this issue within the clinical community, provide considerations for minimizing possible negative effects on patient care, and encourage the monitoring of infusion devices after exposure to radiation/electromagnetic interference.	Qualitative	Regional cancer specialty clinics/ centres (provincial)

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Bakhru et al. (2015) (87)	US	To evaluate the current level of diffusion of early mobilization practice and examine environmental factors that may influence its practice in U.S. intensive care units	Quantitative	Acute care
Ball et al. (2011) (88)	CA	To conduct the first national ES of pediatric weight management and reflect on their role in the overall management of pediatric obesity	Quantitative	Multiple
Battye & McTaggart (2003) (89)	AU	To develop a model of allied health services delivery using the principles of primary healthcare to meet the needs of 11 culturally diverse (indigenous, non-indigenous, mixed) communities in rural Australia.	Mixed methods	Primary health care
Bednar et al. (2018) (90)	US	To inform the design of a quality improvement project to increase rates of adherence to national guidelines for cancer genetic counseling and genetic testing at three unique oncology care settings.	Mixed methods	Acute care
Brouwers et al. (2009) (91)	CA	To describe how cancer diagnostic services should be organized, structured, and evaluated in Ontario	Qualitative	Regional cancer specialty clinics/ centres (provincial)

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Carter et al. (2017) (92)	CA	To identify and describe health and social system navigation activities in a large urban Canadian community	Mixed methods	Multiple
Cartmell et al. (2018) (93)	US	To identify contextually appropriate strategies for improving HPV vaccination uptake in South Carolina by conducting an ES of the barriers, facilitators, and strategies needed for improving HPV vaccination	Qualitative	Multiple
Chang et al. (2017) (94)	CA	To conduct an environmental scan of a rural primary care clinic to assess the feasibility of implementing an e-communications system between patients and clinic staff.	Mixed methods	Primary care
Davies et al. (2008) (95)	CA	To document the process of best practice guideline implementation by topic, to describe facilitators and barriers to implementation and to determine the impact of indicators related to process and patient outcomes.	Qualitative	Multiple
DeGroff et al. (2014) (96)	US	To describe key considerations in designing a patient navigation intervention model.	Qualitative	Multiple
Delparte et al. (2014) (97)	CA	To develop a customizable patient and family education resource for people with spinal cord injury	Qualitative	Rehabilitation

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Finnigan-Fox et al. (2017) (98)	US	To identify available patient decision aids relating information about hospice care and compare that information with the informational needs expressed by real-world health care consumers	Qualitative	Palliative care
Fong et al. (2018) (99)	CA	To evaluate cancer centres for physical activity and sedentary behaviour information and infrastructure, and to evaluate the quality of the information accessible to breast cancer survivors in cancer centres	Mixed methods	Regional cancer specialty clinics/ centres (provincial)
Frost et al. (2016) (100)	US	To better understand the experience of sickle cell disease patients, their caregivers, and providers during care transitions to determine whether and how their needs could be met through health information technology	Qualitative	Multiple
Glurich et al. (2017) (101)	US	To update the current status and progress in advancing establishment of models for integrated oral-dental healthcare delivery for patients with, or at risk for, diabetes.	Qualitative	Primary care

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Goldwater et al. (2014) (102)	US	To gain a larger understanding of the experience of Community Health Centres in the acquisition, implementation and utilization of open source EHR to achieve meaningful use and to serve their patient populations	Qualitative	Multiple
Gustafson et al. (2008) (103)	CA	To conduct a needs assessment of injection drug use in St. John's, NL and to identify the barriers to health and health services for people injecting drugs in the city	Mixed methods	Primary health care
Hauck et al. (2008) (104)	AU	To develop a framework for community mental health clinicians to improve the reproductive health outcomes for women with serious mental illness.	Qualitative	Multiple
Hogan et al. (2014) (105)	US	To evaluate the effects that technology-assisted access to clinical information may have on stakeholder experiences, processes of care and health outcomes.	Qualitative	Veterans Affairs
Hogenbirk et al. (2006) (106)	CA	To examine the current status of telehealth in Canada with respect to standards, guidelines, policies or procedures	Mixed methods	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Jeon et al. (2012) (107)	CA	To establish a set of guidelines for developing ambulatory chemotherapy preprinted orders in Canada.	Qualitative	Ambulatory care
Joschko et al. (2018) (108)	CA	To examine different eConsult services available worldwide and compare the strategies, barriers, and successes of their implementation in different health care contexts	Qualitative	Multiple
Kobe et al. (2020) (109)	US	To systematically survey and interpret relevant self-management education programs to identify opportunities for their development specific to adolescent and young adult survivors of childhood cancer	Qualitative	Primary health care
Leiva Portocarrero et al. (2015) (110)	CA	To identify publicly available DAs focusing on prenatal screening/diagnosis for Down syndrome that provide effective support for decision making	Qualitative	Not clear or not specifically reported
Liddy et al. (2015) (111)	CA	To identify current eConsultation and eReferral systems in Canada and to gain insight into the design and implementation process of existing systems.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Liddy & Mill (2014) (112)	CA	To identify existing policies, strategies and frameworks that support self-management initiatives for chronic disease in Canada.	Qualitative	Health administration/Health policy system level
Luke et al. (2018) (113)	CA	To provide other organizations with useful information when implementing paediatric navigation programs and to inform the implementation of a navigation care centre in New Brunswick for children with complex health conditions.	Qualitative	Multiple
Mansell et al. (2017) (114)	CA	To characterize pharmacists' expanded scope of practice as it relates to providing services to Canadians with diabetes	Qualitative	Multiple
McDonald & Acri (2018) (115)	US	To examine agency-level barriers to treatment among a poverty-impacted sample of women with depressive symptoms, as well as any supports that agencies have implemented to engage consumers into services.	Qualitative	Multiple
Mew et al. (2017) (116)	CA	To understand emergency response systems, services, and training in remote Nishnawbe Aski Nation First Nation communities.	Qualitative	Emergency services or response system

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Mitchell et al. (2018) (117)	US	To document the results of an ES of the literature, resources, and policies relevant to nursing professionals and their role in preventing alcohol-exposed pregnancies and fetal alcohol spectrum disorders	Qualitative	Multiple
Moore et al. (2015) (118)	CA	To determine the prevalence and characteristics of physical activity services offered by Famly Health Teams in Ontario.	Qualitative	Primary care
Morton et al. (2010) (119)	CA	To provide advice on organisational and technical aspects of the delivery of brachytherapy services in Ontario, Canada.	Qualitative	Regional cancer specialty clinics/ centres (provincial)
Munce et al. (2014) (120)	CA	To conduct a systems analysis on community and health services for individuals with acquired brain injury in the province of Ontario, Canada	Mixed methods	Multiple
Naumann et al. (2013) (56)	CA	To explore, summarize, and map out current services for fetal alcohol syndrome disorder in order to present a comprehensive review of service accessibility in Eastern Ontario.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
O'Mahony & Clark (2018) (121)	CA	To increase understanding of immigrant women's reproductive mental health care services within rural settings and to inform the implementation of a cross regional research program.	Mixed methods	Multiple
Ocampo et al. (2017) (122)	CA	To understand the current practices and perceptions with respect to ward closure for hospital acquired infectious disease outbreaks in acute care hospital settings across Canada.	Mixed methods	Acute care
Patel et al. (2014) (123)	CA	To characterize anal cancer screening practices in jurisdictions around the world with the aims of providing clinical and operational guidance for clinicians, describing the current practice and providing information from other jurisdictions for health care policy makers.	Quantitative	Not clear or not specifically reported
Porterfield et al. (2012) (124)	US	To develop a framework for interventions that utilize linkages between clinical practices and community organizations for the delivery of preventive services, and to identify and characterize these efforts.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Poulin et al. (2014) (125)	CA	To determine the current preoperative skin antisepsis in Alberta, reviewed key publications and existing guidelines,	Mixed methods	Acute care
Reitmanova & Gustafson (2009) (126)	CA	To identify the range of existing mental health care services in St. John's, NL with particular attention to those targeting visible minority immigrants.	Qualitative	Multiple
Richard et al. (2016) (127)	AU	To identify, implement and trial best practice interventions to improve access to PHC for vulnerable populations.	Mixed methods	Primary health care
Rosa Fortin et al. (2014) (128)	CA	To identify programs for managing obesity in adults and evaluate the degree to which programs adhere to recommendations	Quantitative	Multiple
Rowel et al. (2005) (51)	US	To conduct the needs-assessment phase of a project to increase cancer screening among African Americans in Baltimore, MD.	Mixed methods	Multiple
Scime & Burke (2018) (129)	CA	To determine, via key informant interviews, the types and frequencies of postnatal breastfeeding resources available to mothers of infants in Canadian NICUs.	Qualitative	Acute care

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Shahid et al. (2008) (77)	AU	To map activities in service provision in Indigenous cancer control with a view to sharing lessons learned.	Qualitative	Multiple
Silva et al. (2012) (130)	US	To conduct an ES of telemedicine-based stroke programs in the US and to identify success factors and barriers to the development or sustainability of telestroke programs	Mixed methods	Multiple
Tark et al. (2019) (131)	US	To identify state variations in Physician Orders for Life-Sustaining Treatment forms and determine if variations are associated with program maturity status.	Quantitative	Multiple
Vandenberg et al. (2009) (132)	CA	To provide a practical framework to guide standardized delivery of evidence-based systemic treatment in hospitals outside regional cancer centres, with special consideration for geographically dispersed regions.	Qualitative	Ambulatory care
Whitton et al. (2009) (133)	CA	To develop the organisational standards for the delivery of intensity-modulated radiation therapy.	Qualitative	Acute care

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Wijeysundera et al. (2012) (134)	CA	To understand the current availability, intensity, and complexity of services offered in specialized heart failure clinics in Ontario.	Mixed Methods	Ambulatory care
Wittal (2018) (135)	CA	To gain a broader understanding of survivorship care, highlight any trends, and report disparities in care during the transition from the oncology to the community setting.	Qualitative	Multiple
Wittich et al. (2018) (136)	CA	To identify screening tools, technologies and strategies vision and hearing care specialists recommend to front-line healthcare professionals for the screening of older adults in long-term care homes who have dementia.	Qualitative	Multiple
Wolff et al. (2018) (137)	US	To determine the availability of information about and features of shared access functionality to the patient portal.	Qualitative	Multiple
Wurz et al. (2019) (138)	CA	To identify physical activity programs for children diagnosed with cancer and summarize program characteristics.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Data Collection*	*Healthcare Setting(s)*
Yergens et al. (2014) (139)	CA	To better understand the status of medical assessment units in Canada and examine the adoption and characteristics of these units.	Quantitative	Acute care

Supplementary file 3

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Archer et al. (2010) (140)	CA	To describe the design, functionality, implementations, applications, outcomes, and the perceived and real benefits of ePersonal Health Records that have been used thus far, with a particular emphasis on North America.	Qualitative	Not clear or not specifically reported
Association of Maternal & Child Health Programs (2011) (141)	US	To provide insight into approaches that state Title V programs are taking to address the growing incidence of autism spectrum disorder and other developmental disabilities (ASD/DD)	Qualitative	Multiple
Bandali (2014) (142)	CA	To understand current breastfeeding services within Alberta Health Services acute care and community facilities.	Mixed methods	Multiple
Bella et al. (2005) (143)	US	To promote the development of new models of care for consumers with multiple chronic conditions who are served by Medicaid or are dually eligible for Medicaid and Medicare.	Mixed methods	Multiple
Blackman (2018) (144)	CA	To compile inventor of existing Chronic Disease and Injury Prevention (CDIP) programming that is culturally appropriate to the indigenous population.	Qualitative	Primary health care

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Boonyasai et al. (2014) (145)	US	To conduct an environmental scan of the literature on Emergency Department (ED) discharge procedures to describe existing processes, along with their strengths, weaknesses, omissions, barriers, and facilitators.	Qualitative	Acute care
Campos & Manning (2006) (146)	CA	To identify service priorities in Brandon and Winnipeg for immigrants and refugees infected with, affected by, or at risk for HIV.	Qualitative	Multiple
Cowling & Dolcine (2017) (147)	CA	To identify and analyze evidence and information regarding how Point of Care Testing (POCT) is implemented and managed in jurisdictions across Canada	Mixed methods	Multiple
Deshpande, Khola, Lorca et al. (2008a) 148)	CA	To provide a critical evaluation of the available data on the use of clinical applications of asynchronous telehealth.	Qualitative	Multiple
Deshpande, Khola, Mckibbon et al. (2008b) (149)	CA	To provide a critical evaluation of the available data on the use of telehealth for acute stroke patients	Qualitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Dietitians of Canada (2018) (150)	CA	To describe the current dietetic workforce and the role of dietitians as interprofessional health team members in Canadian provinces and territories.	Qualitative	Primary health care
Forsberg et al. (2014) (151)	US	To summarize current preventive service utilization patterns and barriers, documented cost and health outcomes associated with prevention, and activities and efforts designed to improve preventive service rates and outcomes.	Qualitative	Not clear or not specifically reported
Garland (2015) (152)	CA	To identify and summarize information about independent ambulatory cancer care centres in Canada, including services and interventions provided to cancer patients outside traditional acute care settings.	Mixed methods	Ambulatory care
Great Plains Quality Innovation Network (2016) (153)	US	To collect information regarding current status of medication safety efforts to detect and prevent Adverse Drug Events (ADE) within the Great Plains Quality Innovation Network (QIN).	Quantitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Health Tech Solutions (2018) (154)	US	To develop an accurate "As-Is" understanding of the Health Information Technology (HIT) landscape within the State of Alaska.	Mixed Methods	Multiple
Hochman et al. (2017) (155)	US	To examine what is currently known about reducing readmissions from the primary care perspective by analyzing the findings of 42 peer-reviewed articles and 30 items from the gray literature.	Qualitative	Primary care
Loorand-Stiver (2012a) (156)	CA	To provide an overview of existing falls prevention strategies targeting adults (18 years and older) in outpatient or community-based mental health and/or addiction programs in Canada.	Qualitative	Multiple
Loorand-Stiver (2012b) (157)	CA	To gather information from long-term ventilation (LTV) programs in British Columbia, Alberta, Manitoba, Ontario, and Newfoundland and Labrador regarding the transitioning of medically stable LTVD patients out of critical care units into alternate levels of care.	Qualitative	Acute care

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Mason & Ford (2017) (158)	CA	To Identify and summarize information regarding the feeding and swallowing assessment services provided to pediatric populations in Canada.	Mixed methods	Multiple
McGrath et al. (2017) (159)	CA	To explore how e-mental health is integrated within health systems and/or health policy nationwide.	Qualitative	Multiple
MedStar Health Research Institute et al. (2017) (170)	US	To identify: 1) studies on methods to engage patients and families in their care in primary care settings and the impact of these methods on patient safety; 2) existing interventions and associated tools to improve safety; 3) gaps between existing tools and those that need to be developed; 4) examples of primary care practices that have engaged patients and families in care with improvements in patient safety.	Mixed methods	Multiple
Moran et al. (2017) (160)	US	To review on implementation of medication-assisted treatment (MAT) for opioid use disorder (OUD) in rural primary care settings.	Qualitative	Primary care

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Morrison (2009) (161)	CA	To provide information regarding the seasonal and H1N1 vaccination programs currently offered in Canadian jurisdictions.	Qualitative	Not clear or not specifically reported
Morrison & Dowler (2011) (162)	CA	To provide a general overview of newborn screening in Canada, including resources used and the retention period for samples.	Qualitative	Multiple
Murzin & Furlotte (2013) (163)	CA	To outline the results of a national survey of programs and services which address the needs of older people living with HIV (PLWHIV) in Canada.	Mixed methods	Multiple
Ndegwa (2010) (164)	CA	To provide information regarding support services provided by cardiac rehabilitation programs across Canada.	Qualitative	Rehabilitation
Ndegwa (2011) (165)	CA	To provide a general overview of regional health authority and other local level frameworks, initiatives, programs, and/or strategies developed to support healthy aging.	Qualitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Ndegwa et al. (2018) (166)	CA	To provide information about available services, factors affecting access, and funding practices related to nonpharmacological therapies for chronic non-cancer pain in Canada.	Mixed methods	Multiple
Paccagnan et al (2017) (167)	CA	To inform further development and population of the Bone and Joint Health Strategic Clinical Network (BJNSCN) Model of Care for Osteoarthritis Management (OA Model) by identifying programs and education tools in Alberta, Canada, and internationally for the management of hip and/or knee OA symptoms	Mixed methods	Multiple
Seal et al. (2018) (168)	CA	To gather jurisdictional perspectives on ankyloglossia diagnosis and treatment in Canada.	Mixed methods	Multiple
Smith (2001) (169)	CA	To examine resources and policies relating to access and equity in all Health Units and Community Health Centers in Ontario	Quantitative	Primary health care
Topfer & Spry (2019) (171)	CA	To understand current resources and practices for sepsis detection in rural and remote settings.	Mixed methods	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Tran et al. (2008) (172)	CA	To evaluate the clinical benefit and to review the cost effectiveness of home telehealth versus usual care or no care for the management of diabetes, heart failure, and chronic obstructive pulmonary disease (COPD).	Qualitative	Multiple
Wells et al. (2019) (173)	CA	To gain direct stakeholder perspectives on the current context surrounding opioid addiction programs (including both opioid OADs and other non-pharmacological programming) and care setting transitions.	Mixed methods	Multiple
Young et al. (2018) (174)	CA	To identify existing or developing internet-delivered Cognitive Behaviour Therapy (iCBT) programs for treating patients with major depressive disorder (MDD) and anxiety disorders, to describe the relevant facilitators and barriers to implementation of these programs, and to explore the range of strategies that have been used to establish iCBT programs across Canadian jurisdictions.	Mixed methods	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Data Collection	Healthcare Setting(s)
Yurick & Allatt (2016) (175)	CA	To understand current state, functions, and components of comprehensive cancer-related supportive care in Canada, USA, UK, and New Zealand	Mixed methods	Multiple

Supplementary file 4

Environmental scan methods, data sources, and scanning mode characteristics studies from the peer-reviewed academic databases*

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Abrahamyan et al. 2015 (83)		X			X	X	X						X					X
Ahmad 2015 (84)			X				X						X					X
Baezconde-Garbanati et al. 2017 (85)	X		X		X		X			X			X		X	X	X	X
Bak et al. 2013 (86)	X										X					X	X	
Bakhru et al. 2015 (87)		X					X								X			X
Ball et al. 2011 (88)		X			X	X	X								X			X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Battye et al. 2003 (89)			X	X	X	X	X	X	X			X	X	X	X		X	X
Bednar et al. 2018 (90)	X	X	X		X		X		X	X	X		X	X	X	X	X	X
Brouwers et al. 2009 (91)	X		X				X				X		X		X	X	X	X
Carter et al. 2017 (92)		X					X								X			X
Cartmell et al. 2018 (93)		X	X		X		X						X		X			X
Chang et al. 2017 (94)		X	X				X						X		X			X
Davies et al. 2008 (95)			X			X	X		X				X	X				X
DeGroff et al. 2014 (96)	X		X				X		X		X	X			X	X	X	X
Delparte et al. 2014 (97)	X									X	X	X		X		X	X	

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Finnigan-Fox et al. 2017 (98)	X		X				X			X	X		X		X	X	X	X
Fong et al. 2018 (99)	X					X						X		X			X	X
Frost et al. 2016 (100)	X									X	X					X	X	
Glurich et al. 2017 (101)	X								X	X	X	X				X	X	
Goldwater et al. 2014 (102)	X		X			X	X		X	X	X	X			X	X	X	X
Gustafson et al. 2008 (103)	** NSI -	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
Hauck et al. 2008 (104)	- NSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hogan et al. 2014 (105)	X									X	X					X	X	

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Hogenbirk et al. 2006 (106)	X	X	X				X			X					X	X	X	X
Jeon et al. 2012 (107)	X										X					X	X	
Joschko et al. 2018 (108)	X		X				X			X	X				X	X	X	X
Kobe et al. 2019 (109)	X									X	X					X	X	
Leiva Portocarrero et al. 2015 (110)	X		X			X	X				X	X			X	X	X	X
Liddy et al. 2015 (111)	X		X				X			X	X				X	X	X	X
Liddy & Mill, 2014 (112)	X		X				X				X				X	X	X	X
Luke et al. 2018 (113)	X		X				X			X	X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Mansell et al. 2017 (114)	X		X				X				X				X	X	X	X
McDonald & Acri, 2018 (115)	X	X					X				X				X	X	X	X
Mew et al. 2017 (116)	X		X		X		X		X	X	X		X	X	X	X	X	X
Mitchell et al. 2017 (117)	X				X	X	X		X	X	X	X			X	X	X	
Moore et al. 2015 (118)			X				X						X					X
Morton et al. 2010 (119)	X										X					X	X	
Munce et al. 2010 (120)	X									X	X					X	X	
Naumann et al. 2013 (56)	X		X		X	X	X		X	X	X	X	X	X	X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Ocampo et al. 2017 (122)		X					X								X			X
O'Mahony & Clark, 2018 (121)	X	X	X				X		X		X		X	X		X	X	X
Patel et al. 2014 (123)		X					X								X			X
Porterfield et al. 2012 (124)	X										X					X	X	
Poulin et al. 2014 (125)		X					X						X					X
Reitmanova & Gustafson 2009 (126)	X										X	X		X		X	X	
Richard et al. 2016 (127)		X					X								X			X
Rosa Fortin et al. 2014 (128)		X			X		X								X			X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Rowel et al. 2008 (51)	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Scime & Burke 2018 (129)			X				X								X			X
Shahid et al. 2008 (77)			X		X		X						X					X
Silva et al. 2012 (130)	X	X	X		X		X				X	X			X	X	X	X
Tark et al. 2019 (131)	X										X					X	X	
Vandenberg et al. 2009 (132)	X										X			X		X	X	
Whitton e al. 2009 (133)	X								X		X			X		X	X	
Wijeysundera et al. 2012 (134)			X				X						X					X

Authors/ Year	Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Wittal 2018 (135)	X		X				X		X	X	X	X	X	X	X	X	X	X
Wittich et al. 2018 (136)			X				X								X			X
Wolff et al. 2018 (137)	X										X					X	X	
Wurz et al. 2019 (138)	X		X		X		X			X	X		X		X	X	X	X
Yergens et al. 2014 (139)		X					X						X		X			X

* The data collection methods, data sources, data source mode, and scanning mode refer only to the environmental scanning component of the study. ** NSI=Not clear or not specifically reported

Supplementary file 5

Environmental scan methods, data sources, and scanning mode characteristics studies from grey literature*

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Archer et al. 2010 (140)	X									X						X	X	
Association of Maternal and Child Health Programs (AMCHP) 2011 (141)						X		X								X	X	
Bandali 2014 (142)	X	X	X				X		X				X	X			X	X
Bella et al. 2005 (143)	X	X	X		X	X	X		X	** NSI	NSI		X	X	X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Blackman 2018 (144)	X		X				X				X				X	X	X	X
Boonyasai et al. 2014 (145)	X		X			X	X		X	X		X			X	X	X	X
Campos & Manning 2006 (146)	X		X	X			X		X				X	X	X	X	X	X
Cowling & Dolcine 2017 (147)	X	X	X				X			X	X				X	X	X	X
Deshpande, Khoja, Lorca, et al. 2008a (148)	X				X		X			X	X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Deshpande, Khola, McKibbon et al. 2008b (149)	X				X		X			X	X				X	X	X	X
Dietitians of Canada 2018 (150)	X		X				X		X		X				X	X	X	X
Forsberg et al. 2014 (151)	X									X	X					X	X	
Garland 2015 (152)	X	X					X			X	X				X	X	X	X
Great Plains Quality innovation Network 2016 (153)		X					X						X					X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Health Tech Solutions 2018 (154)		X					X						X		X			X
Hochman 2017 (155)	X									X	X					X	X	
Loorand-Stiver 2012a (156)			X				X								X			X
Loorand-Stiver 2012b (157)	X		X				X			NSI	NSI				X	X	X	X
Mason & Ford 2017 (158)	X	X			X		X			X	X				X	X	X	X
McGrath et al. 2017 (159)	X		X				X				X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Medstar et al. 2017 (170)	X	X	X			X	X		X	X	X	X	X		X	X	X	X
Moran et al. 2017 (160)	X									X	X					X	X	
Morrison 2009 (161)	X		X				X			NSI	NSI				X	X	X	X
Morrison & Dowler 2011 (162)	X		X				X			NSI	NSI				X	X	X	X
Murzin & Furlotte 2013 (163)		X					X						X		X			X
Ndegwa, 2010 (164)	X		X				X			NSI	NSI				X	X	X	X
Ndegwa 2011 (165)	X		X				X				X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant interviews	Focus group	Personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Ndegwa et al. 2018 (166)	X	X	X				X			X	X				X	X	X	X
Paccagnan et al. 2017 (167)	X	X				X	X			X	X		X	X	X	X	X	X
Seal et al 2018 (168)	X	X	X				X			X	X				X	X	X	X
Smith 2001 (169)		X					X						X					X
Topfer & Spry 2019 (171)	X	X	X				X			X	X				X	X	X	X
Tran et al. 2008 (172)	X		X				X		X		X				X	X	X	X
Wells et al. 2019 (173)	X	X					X			X	X				X	X	X	X

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant interviews	Focus group	Personal contact	Other	Personal sources	Administrative Databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Young et al. 2018 (174)		X					X								X			X
Yurick et al. 2016 (175)			X				X						X		X			X

* The data collection methods, data sources, data source mode, and scanning mode refer only to the environmental scanning component of the study. **NSI = not clear or not specifically reported

Supplementary file 6
Definitions of Environmental Scan

Author	Definition
Bakhru et al, 2015 [87]	"An environmental scan is defined as a review of current structures, processes and outcomes of care, and barriers to the new process understood in the context of the ecosystem (in this case, the ICU)" p. [87] p. 2361
Bednar et al., 2018 [90]	"An ES is a mixed-methods tool used in business, government, and public health to collect information, identify risks and opportunities, tailor strategic plans, or design programs in a flexible, rapid, comprehensive, low-cost manner". [51,54,183] p. 1483
Fong et al., 2018 [99]	"A built environmental scan is an objective review of the environmental factors that influence an organization; those factors can include programs, policies, and physical features (for example, the availability of visible, safe, and clean stairs for walking) within an organization" [51] p. e366
Glurich et al., 2017 [101]	"Ad hoc environmental scans are cross sectional surveys undertaken at unspecified frequency, for the purpose of reviewing the current relevant evidence base across a range of sources in an attempt to ascertain the current state of the art surrounding the specific topic under focus. Such scans are conducted to collect information that may inform future planning of various vested stakeholders". [101] p. 22
Leiva Portocarrero et al., 2015 [110]	"Environmental scans were developed as tools for retrieving and organizing data from a wide variety of fields in order to identify contexts and shifts in planning for the future. They can include internal (memos, notes from meetings with stakeholders, etc) as well as external sources (e.g. newly available technologies)" [54]
Medstar et al., 2017 [170]	"An environmental scan is an integral process for identifying, retrieving, and organizing information to enable health decision making and has been used to foster knowledge translation in primary care." [54,181] p. 2

Moore et al., 2015 [118]	"An environmental scan has been defined as the acquisition and use of information about events, trends and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action". [2] p. 303
Naumann et al., 2013 [56]	"In comparison, environmental scans are emerging as an effective tool to collect evidence pertaining to healthcare service delivery gaps…Originating within the business context as a valuable method for retrieving and organizing needs assessment data, the environmental scan methodology has been growing in use and complexity, recently emerging as a popular method of effectively determining the health care needs of communities." [54,55] p. 32, 35
Richard et al., 2016 [127]	"Environmental scanning is a research approach that uses wide-scope screening methods to identify the new, the unexpected and the emerging interventions, issues and challenges in health" [54]
Rowel et al., 2005 [51]	"The environmental scan is a tool that can be utilized to collect data to design health programs uniquely tailored to the needs of communities." [51] p. 527 "Environmental scanning is the acquisition and use of information about events, trends and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action." p. 529 [2] and " environmental scanning as "a systematic and continuous effort to search for important cues about how the world is changing and how these changes are likely to affect your organization." [176] p.529
Scime et al., 2018 [129]	"Despite origins in a business context a tool for gathering information to enable strategic action p. 203 [2,54] … Specifically, environmental scans are suitable for the identification and synthesis of evidence about existing resources, organizational processes, barriers and facilitators to action, and/or knowledge and practice gaps pertaining to the topic under study. [51] p. 203
Shahid et al., 2008 [77]	"(ES)...is used to identify emerging issues within the broader economic and political environment. [184] It is similar to situational analysis in which a review is undertaken of health strategies and policies, institutional support systems with the aim of strengthening health reform and health systems. Morrison argues that environmental scanning is a method that enables decision makers both the understand the external

	environment and the interconnections of its various sectors and to translate this understanding into an institution 's planning and decision-making processes." [182] "…The advantage of environmental scanning for organizational leaders is that knowing the internal and external environment in which the organization operates is helpful in planning their future course of action." [2] p. 57
Tark et al., 2019 [131]	"Environmental scanning is a research method in which publicly available information is gathered systematically and is used to evaluate both internal and external environments of organizations, organizational practices, and health programs. It produces important insights on current trends and occurrences based on existing resources and can assist with the development of evidence-based policies in future practices" [131] p. 1033.
Wittich et al., 2018 [136]	"In healthcare research, the environmental scan is often employed as a needs-assessment tool for the purposes of improving and developing the efficiency of health service programs and evidence-based policies. In using this approach, environmental or contextual factors are evaluated by reviewing existing data or actively collecting new data in the form of surveys or interviews, including a diversity of views and information, to determine the benefits, needs and efficiencies of practices within that environment. [51,54] p. 2-3.

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	2
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	7-8
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	9-11
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	9
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	12-13
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	11-12
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	13
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	11-12
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	13-14
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	13-14
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Click here to enter text.

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	15
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	15
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	16-25
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Click here to enter text.
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	16-25
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	16-25
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	25-30
Limitations	20	Discuss the limitations of the scoping review process.	4
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	30-31
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	31

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

BMJ Open

Use of environmental scans in health services delivery research: a scoping review

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2021-050284.R1
Article Type:	Original research
Date Submitted by the Author:	05-Aug-2021
Complete List of Authors:	Charlton, Patricia; University of Prince Edward Island, Adjunct Faculty, Faculty of Nursing Kean, Terri; University of Prince Edward Island, Faculty of Nursing Liu, Rebecca; University of Toronto, Women's College Hospital Institute for Health System Solutions and Virtual Care, Dalla Lana School of Public Health Nagel, Daniel; University of Manitoba Faculty of Health Sciences, College of Nursing Azar, R; Mount Allison University, Psychobiology of Stress and Health Lab, Psychology Department Doucet, Shelley; University of New Brunswick, Department of Nursing and Health Sciences Luke, Alison; University of New Brunswick, Department of Nursing and Health Sciences, Centre for Research in Integrated Care Montelpare, William; University of Prince Edward Island, Department of Applied Human Sciences, Faculty of Science
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Health services research
Keywords:	PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Manuscript Title

Use of environmental scans in health services delivery research: a scoping review

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Word count: 4279 not including Abstract, Funding, Contributors, Competing Interests, Ethics Approval, Data Availability Statement, Acknowledgements

August 4, 2021

Use of environmental scans in health services delivery research:

A scoping review

ABSTRACT

Objective

To examine the extent and nature of evidence on the use of the environmental scan (ES) in the health services delivery literature.

Design Scoping review

Methods This scoping review followed the five-stage scoping review methodology outlined by Khalil et al. A Peer Review of Electronic Search Strategies (PRESS) was completed. Seven electronic databases and the grey literature were searched. Pairs of researchers independently performed two levels of screening and the data extraction. Data were analyzed using qualitative content and thematic analysis.

Results Ninety-six studies were included in the scoping review. Researchers conducted environmental scans for many purposes, the most common being to examine current state of programs, services, or policies. Recommendations were informed by ESs in 20% of the studies. Most common data collection methods were literature review (70%), key informant or semi-structured interviews (50%), and surveys (34%). Almost half (49%) of the studies used a combination of passive (collecting existing information) and active (creating new information) approaches to data collection. Person sources of data (e.g., health care stakeholders, community representatives) and non-person sources of data (e.g., electronic databases, the web, and other documents) were drawn upon to a similar extent. The thematic analysis of the definitions yielded several themes including instrument of discovery, knowledge synthesis, forward-looking, and

decision-making. Research gaps identified included absence of a standard definition, inconsistencies in terminology, and lack of guiding frameworks in the health services delivery context.

Conclusion ESs were conducted to gather evidence and inform decision-making on a range of policy and health services delivery issues across the continuum of care. Consistency in terminology, a consensus definition, and more guidance on ES design may help provide structure for researchers and other stakeholders, and ultimately advance ES as a methodological approach. A working definition of ES in health services delivery context is presented.

Key Words: environmental scan, health care, health services delivery, scoping review, protocol, research design

Strengths and limitations

Strengths

- This scoping review addresses an important knowledge gap - the use of environmental scans in the health services delivery literature - and includes a comprehensive analysis of the peer-reviewed and grey literature.
- The study followed established and systematic methods for conducting scoping reviews.

Limitations

- For the grey literature search, limits were placed on the number of platforms searched and articles selected per platform. Some relevant studies may have been missed; however, our comprehensive search strategy helped mitigate this limitation.
- Only English-language studies were considered for this scoping review.
- The included studies were not assessed for methodological quality.

Use of environmental scans in health services delivery research: A scoping review

INTRODUCTION

Environmental scanning, a process designed to gather information to inform and direct organizational change, is deeply rooted in the business sector.[1] Leaders in other sectors over the past several decades have come to understand the need to acquire, organize, evaluate, and mobilize different kinds of knowledge to inform decision-making processes, anticipate and interpret trends, adapt organizational behaviour, energize organizational growth, mitigate institutional risk, and develop strategies in response to rapidly changing environments. [2-8]

Scanning characteristics

Environmental scanning can range from formal to informal activity and is influenced by individual, contextual, and organizational factors.[1,9-13] Formal scanning is systematic, continuous, proactive, prospective, and coordinated, and is undertaken to inform decision-making on circulating trends, threats, or issues.[1,5,14,15] Environmental scanning may also be conducted on a less formal, irregular, and reactive basis often triggered by a crisis or specific issue.[11,14-17] Regardless of the approach, environmental scanning forms a primary means of organizational learning.[1,2]

Environmental scanning is integral to strategic planning and involves an analysis of an organization's external and internal environments.[2,13,18-21] The external environment includes elements outside the boundaries of an organization (e.g., political, technological, political/legal, socio-cultural environments and/or information from customers, suppliers, strategic partners, etc.).[19,22,23] The internal environment may include elements of an organization e.g., structure, budget, workforce capacity, and/or leadership).[23-27]

Information is drawn from person sources (e.g., staff, community, experts) and/or non-person sources (e.g., databases, documents, the Web).[5,6,28,29] Person and non-person sources may be internal (accessible within the boundaries of an organization) or external (accessible beyond the boundaries of an organization).[4,5,28] The selection of data sources may be influenced by accessibility to information, quality of information, and environmental uncertainty (constant change within an environment).[10,11,24,30,31]

Environmental Scans and Health Services Delivery

While environmental scanning is conducted by healthcare organizations as part of strategic planning [32-36], an *environmental scan* (ES) is frequently reported in health literature as a methodological approach to examine a specific health issue. For example, environmental scans have been used to: explore patient safety education and health care provider training programs [37,38]; create quality indicators for health services (e.g., fall prevention and adult critical care) [39,40]; inform the design of cancer prevention programs [29,41] and; explore the availability of health information resources.[42] Several studies have noted the utility of ESs for assessing community needs and for program and policy development.[28,29,41,43]

Despite the potential of ESs to inform policy and practice, consensus on a working definition does not appear to exist [29,41,44] and practical guidance to design and/or implement ESs is lacking in the literature. [41,45] Guiding frameworks or models exist in the business and other sectors [2,5,14,16,46-48], yet ES frameworks specific to health services delivery are comparatively limited.[28,29,41,43,44] To build on previous research and address the knowledge gaps noted above, this scoping review provides a synthesis of evidence about the nature and extent of the use of ES in the health services delivery literature. To our knowledge, this is the

first scoping review on this topic. Research and evaluation of ESs may enhance the approach to ES and its utility to support decision-making in health policy and practice. [29,41.44]

METHODS

This scoping review followed the five-stage methodology outlined by Khalil et al. (2016) that builds on previous scoping review methodologies of Arksey and O'Malley, Levac et al., and the Joanna Briggs Institute.[49-55] The PRISMA Extension for Scoping Reviews (PRISMA-ScR) reporting guidelines were also followed.[51,56] The steps for the review are briefly presented here; however, a full description of the scoping review protocol can be found in Charlton, Doucet, Azar et al. (2019).[45]

Identifying the research questions

The research questions for this scoping review were:

1. How have ESs been conceptualized and operationalized by stakeholders in the health services delivery literature? (e.g., characteristics including existing definitions, ES purpose, healthcare issues, settings, data collection approaches, methods, data sources, scanning modes)
2. What limitations, if any, were described in the included studies that use ESs in the context of health services delivery?

Identifying relevant studies

A three-step search strategy was developed by an experienced librarian (LB) with the research team and peer reviewed (KM) based on the Peer Review of Electronic Search Strategies (PRESS) guidelines.[57,58]. Seven electronic databases were searched: CINAHL, MEDLINE, PsycINFO, ERIC, Embase, Canadian Business & Current Affairs (CBCA), and Academic Search Premier (see supplementary file 1 for an example of the search strategy for Medline).

Relevant grey literature was identified through searches of Google Scholar, the New York Academy of Medicine Library Online Catalog[59] and *Grey Matters*, a resource developed by the Canadian Agency for Drugs and Technologies in Health (CADTH) [60] for searching health-related grey literature, using the search term "environmental scan". A Google search was also conducted using the search terms "environmental scan and health services". To balance comprehensiveness with feasibility, the searches of Google, Google Scholar, and the NYAM, were limited to the first 10 pages (or first 100 hits). For CADTH's Grey Matters, the top 10 websites/databases deemed most relevant to the objectives of the study were selected to identify studies. Despite the limits placed on the grey literature search, this comprehensive search strategy appeared to yield hits that were representative of literature related to the topic of interest. The reference lists of peer-reviewed sources were also hand searched for relevant studies.

Selecting Studies

Articles considered for inclusion were specific to health services delivery, published in English, and reported on the use of an "environmental scan" as a methodological approach. No limitations were placed on publication date, population, health service, health care setting (e.g., primary care, acute care, etc.), health care discipline, or geographic location.

Two reviewers independently screened titles and abstracts (PC, KT) and full-text articles of the peer-reviewed literature (PC, TK) to assess for study eligibility. Pilot tests were conducted at the beginning of first level (titles and abstracts) and second level (full-text) screening to evaluate reviewer agreement and to ensure consistency. Similarly, for the grey literature, six team members worked in pairs to conduct both levels of screening (RHL, DAN, AL, TK, RA, and PC). Disagreements on study selection in the screening process were resolved through

discussion or, if necessary, by a third reviewer (PC, TK, WJM). A modified version of the PRISMA flowchart for this review is found in Figure 1.[56,61]

Charting the data

The team developed a standardized data extraction form to chart the data. Extracted data elements included author, country, publication year, publication type, purpose of the study, purpose of ES, health condition, health domain, setting, research approach, methods, data sources, data source mode, scanning mode, as well as other relevant information including existing definitions, guiding frameworks, and limitations.

Working definitions for the extracted data elements were developed to provide clarity and consistency among researchers during the data extraction process. For instance, *scanning mode* was recorded following two of the four levels of scanning described in the Choo model [1]- conditioned viewing and searching. In this model, viewing information (i.e., "looking at" information), is considered "passive" data collection, while searching (i.e., "looking for" information) is considered "active" data collection.[1] Similar to Naumann [44], we categorized scanning mode into two of the four scanning modes described by Choo[1] as these were deemed most relevant to this review. The term *scanning mode* has also been used to describe data sources (i.e. internal/external and personal/impersonal) in some studies [31]. Therefore, for clarity the term *data source mode* was chosen to refer to the environment from where the data source emerged (i.e., internal or external source) and the nature of the data source (i.e. person/non-person).

Four teams of paired reviewers (PC, TK, PC, RA, TK, AL, RHL, DAN) independently extracted data from both the peer-reviewed and grey literature. Pilot tests of data extraction were conducted to assess agreement and promote consistency between reviewers.[52,62] The team

identified initial categories for the data elements and additional relevant categories and sub-levels of categories were added as we became more familiar with the literature. Each pair of reviewers met regularly to review extraction results and to resolve any discrepancies through discussion.

Figure 1 here – PRISMA Flowchart

Collating results

Content and thematic analysis were used to analyze the extracted data [63,64] The content analysis included a descriptive analysis using frequency counts and percentages to describe study characteristics using SAS Edition 3.6. A manual thematic analysis was conducted to illustrate themes within the definitions of the reviewed studies. Data familiarization was achieved by reading and re-reading the included articles and the extracted definition-related data. Preliminary ideas were recorded and coded to reflect potential contribution to a theme. The initial themes were reviewed and refined until the final themes were determined.

All authors reviewed and discussed the preliminary findings. The data are presented in tabular form which includes a narrative and descriptive numerical summary of the studies' characteristics (supplementary files 2-5), environmental scan definitions and descriptions (supplementary file 6), and thematic analysis details (supplementary file 7). Knowledge gaps and implications for policy, practice, and research are highlighted.

Patient or public involvement

No patients or public involved in the design or implementation of the scoping review.

RESULTS

Ninety-six studies were included in this scoping review; 60 from peer-reviewed literature [29,44,65-122] and 36 from grey literature.[123-158] Findings suggest ESs were conducted for a

wide range of purposes, defined in various ways, and employed a variety of methods. Few studies were guided by a methodological framework for conducting an ES. A summary of study characteristics are presented here (see supplementary files 2-5 for further detail).

General characteristics

Publication date and country of origin

Studies originated from three countries including Canada (68%), USA (28%), and Australia (4%) with publication dates from 2001 to 2019 inclusive. Among the 96 studies reviewed, the rates of published studies that used ESs in a health services delivery context increased from about 6% (2001-2006) to 20% (2008-2011) to 30% (2012-2015) and to 44% (2016-2019).

Population, healthcare setting and health conditions

Populations under inquiry ranged from newborn to older adult and the healthcare setting spanned the continuum of healthcare services. Most studies (58%) were situated in multiple settings followed by acute care (9%), primary health care (11%), and Regional Cancer Specialty Clinics (5%). Several health settings appeared in 4% or less of the studies e.g., ambulatory care, rehabilitation, palliative care, Veterans Affairs, and emergency services. Of the 96 studies reviewed, 55% focused on chronic disease, 8% on infections or infectious disease, and 8% other conditions (e.g., end-of-life, injury); 31% did not focus on a particular health condition.

Purpose of the ESs

The stated purposes of the ESs varied across studies (see Table 1). The two most stated purposes were to a) examine the current state of programs, services, or policies (82%) and b) identify patient/community /organization needs, strengths, challenges, barriers, and service gaps (58%).

Table 1 Stated purpose(s) of the ES within reviewed studies

Purpose of the ES(s)	Studies %(n)
Examine the current state of programs, services or policies	82% (79)
Identify and/or assess patient/community/organization needs, strengths, challenges, barriers and service gaps	58% (56)
Identify and/or assess tools for patient care, or inform development of tools/ education materials/patient-decision aids	23% (22)
Understand the use or experience of a phenomenon or service	22% (21)
Inform program planning, design and/or improvement	20% (19)
Inform recommendations for policy and practice	20% (19)
Identify best practices or innovative practices	15% (14)
Inform/guide quality improvement and/or patient safety initiatives	14% (13)
Inform aspects of practice or policy development or change	10% (10)
Assess or inform models of care	10% (10)
Assess or inform clinical practice guidelines	9% (9)
Inform the development of planning or evaluation frameworks	8% (8)
Inform improvements in the transition of care	6% (6)

Inform future research or research program	6% (6)
Inform standardization of services, processes, structure/organization, and delivery	3% (3)
Understand factors influencing health behaviours	2% (2)
Assess or inform other types of guidelines and standards such as for use of technology	1% (1)

Note: Percentages do not add to 100 because there may be more than one purpose for an environmental scan.

In 20% of the studies the ES and other methods informed policy and/or practice recommendations. For example, the ES helped to inform recommendations to: improve HPV vaccination rates [68]; improve patient access to clinical information [88]; promote perinatal mental health and support among immigrant women [104]; develop institution-specific policies and procedures on the use of continuous infusion pumps during radiation treatment [69]; develop a model of care for osteoarthritis management [150]; and develop standards of care for cancer diagnostic assessment programs [74].

Data collection approach and methods used in the ES

The research designs included in ESs were: qualitative (57%), mixed (31%), and quantitative methods (11%). A variety of data collection methods were used; about 64% of the studies used more than one data collection method. Within the ES of the study, the most common data collection methods were literature review (i.e., peer-reviewed and grey literature) (70%) followed by key informant or semi-structured interviews (50%), surveys (34%), other types of personal contact such as community advisory groups and expert panels, (24%) and focus groups (3%).

Scanning mode and sources

About 27% of the studies relied solely on active data collection methods while 22% used passive data collection methods. Nearly half (49%) reported using a combination of passive and active data collection methods.

Over half (52%) of the studies used a combination of person and non-person sources, 24% used only person data sources and 24% used only non-person data sources. Non-person data sources included: the Web (57%), academic databases (35%), reports, documents or other grey literature (30%), administrative databases (3%), and other sources such as social media, list serves, and checklists (13%). Almost three-quarters of the studies (71%) included external data sources and 33% included internal sources.

Data source modes were classified into one of four categories: internal person sources, internal non-person sources, external person sources, and external non-person sources. Overall, about 68% of the studies included external non-person sources, 65% external person sources, 32% internal person sources, and 18% internal non-person sources. Eight percent of studies included all four data source modes.

Conceptual characteristics

ES definition and description

Less than one quarter (22%) of the studies provided a definition and/or a description of ES. Within the 21 studies that provided this information (18 peer-reviewed and 3 grey literature) twelve (57%) studies cited the work of Graham et al. [28], six studies (29%) referenced or cited the definition by Choo [2], and seven studies (33%) cited the work of Rowel et al. [29]. Graham et al. [28] and Rowel et al. [29] also cited Choo (2001) [2] as influential. (see supplementary file 6)

The thematic analysis of definition/description-related data yielded several key themes: instrument of discovery, forward-looking, knowledge synthesis, and decision-making (see codes and themes in supplementary file 7). Most of the studies (81%) classified ES as a distinct entity or mechanism (e.g., “a tool”, “a review”, “a method”) while others described the action or process of environmental scanning. [65,99,110,112,114] Nearly three quarters (71%) of the studies used language (e.g., “raise awareness of issues”, “develop insight”, “to identify emerging issues”) that suggested the acquisition of new knowledge was a function of an ES. Most of the studies (71%) used ES descriptors that were future-oriented (e.g., “may inform future planning”, “to enable strategic action”, “opportunities for improvement”). About half (48%) of the studies conveyed the importance of an ES in synthesizing information (e.g., “the identification and synthesis of evidence”, “publicly available information is gathered systematically and is used to evaluate", “to identify and collate a large body of information”). Many studies (43%) used terms within the definition/description-related data that suggested an ES could guide and support decision-making (e.g., “assist in health decision-making”, “to facilitate with strategic planning and decision-making”, “analyze information to guide the direction”). Finally, some definitions made reference to scanning the external environment [2,29,101], one included reference to both the internal and external environments [114], while others referred to internal and external sources.[44,65,93]

ES Terminology

Terms to describe an ES varied widely and were applied inconsistently across the literature. The most common term used was “tool” (43%) [29,44,68,73,93,96,112,119,127] including a “mixed-methods tool” [73] and a “needs assessment tool”.[119] Other terms used to describe an ES were “an objective review” [82], “review” [70], or “rapid review” [158]; “method” or “research

method" [65,114]; "research approach" [110], "cross-sectional survey" [84]; and "integral process". [153] An ES was further described as a systematic [29,114], flexible [73], and economical [73] approach for collecting information.

Guiding frameworks or models for ES

Of the 96 studies reviewed, 18% were conducted by CADTH researchers using organization-specific processes for conducting ESs. Of the remaining 79 studies, five studies (6%) reported being informed or guided by a specific ES model or framework (four peer-reviewed articles [29,44,82,99] and one grey literature article.[127]) Of these five studies, two [29,99] were guided by Choo's conceptual model [2], one [44] was guided by the Choo [2] and the American Society of Association Executives [ASAE] frameworks [159], one [127] was guided by the Wilburn et al. model.[41] The fifth study implemented a "built" environmental scan which assesses the environmental factors that influence an organization (e.g. programs, policies, and physical features) using a school-based evaluation model.[82] In addition, two studies[123,153] reported being guided by scoping review methods. Several reviewed studies included conceptual models that were not specific to ES but were used to guide analysis and reporting of results.[75,107,110,127,134,142,153,157,158]

Methodological and other observations

In most studies, the ES was the primary methodological approach. However, in 14% of studies, the ES represented one of multiple methodological approaches used within a study.[69,72,86-88,90,103,115,127,131,132,155,158] In some studies for example (8%), ESs were conducted in combination with a systematic review [74,108,131,132,155] or a scoping review. [44,107,127] Several studies reported the findings of ES component of a study was used to validate information gathered from other methods used in those same studies such as a scoping review,

interviews, focus groups, or surveys.[44,83,86]. In addition, there were inconsistencies in the interpretation of the terms 'passive' data collection.[44,99,118]

Finally, several studies emphasized that the ES was useful to engage stakeholders in the program planning process.[29,41,68,153] For example, Wilburn et al. [41] demonstrated the central role of engaging stakeholders in developing plans to increase HPV vaccination rates.

Limitations of the reviewed studies

A discussion of limitations was included in about 65% of the studies. The most common limitations were those related to the search strategy, sampling, design, data collection methods, and response rate. Overall, similar limitations were noted across peer-reviewed and grey literature.

DISCUSSION

This scoping review provides insight into how ES are conceptualized, designed, and operationalized in the health services delivery literature, a topic that had not been extensively examined or well understood. ES were conducted to gather evidence and inform decision-making on complex policy and health service delivery issues in a range of settings across the continuum of healthcare services. However, significant conceptual and methodological gaps were also identified.

First, the findings of this review underscore inconsistencies in the terminology used to describe and define ESs in a health services delivery context. Terminology to define the ES as an entity varied (e.g., a needs assessment tool, method, review, process), and where a definition or description was provided, the content and emphasis also varied. Despite lack of clarity of terminology and/or definition, research using ES has continued. Data from this review indicates

the number of published ESs in health services delivery has increased from 6% (2001-2006) to 44% (2016-2019).

It is not unusual to find inconsistencies in terminology [160-162], and/or definitions [161] in widely used methodologies. The provision and use of clear and consistent ES-related terminology and/or definition may limit uncertainty among researchers when deciding whether to choose an ES for a research study. It may also improve reader understanding and experience (160,162], increase confidence and efficiency of researchers in implementing high quality studies [161,162], improve knowledge translation [161], advance ES as a methodological approach [29,161], and enhance the strength of ESs to support decision-making on policy and practice.

Among the studies that included an ES definition and/or description the works of three researchers were most cited [2,28,29], particularly the Choo model [2] which built on previous frameworks [163,164] and was developed in the business sector. Notably, these works were all published over a decade ago, signaling a need for new research and further work to develop a consensus on a formal definition of ES in the context of health services delivery. This conceptual gap was noted by Rowel et al [29] who stated "The lack of clear definition or methodology for ES could weaken its efficacy for public health practice if it were confused with other research tools or processes, such as a comprehensive needs assessment". p. 533

Given this conceptual gap, and based on the analysis of the 96 studies in this scoping review, discussions with our research team, and previous research and definitions [2,28,29,41,44,84,114,153,165] a working definition was developed as a preliminary step towards the potential development of a formal definition of ES within the context of health services delivery (Box 1). The descriptive characteristics of the ESs identified in this scoping

review and the four key themes identified through the thematic analysis (instrument of discovery; forward looking; knowledge synthesis; and decision-making) underpin the working definition. This definition is distinct to health service delivery because it provides specifics about the nature of the information, how it is gathered, and the environments from which information is gathered. It also states the purpose of ESs.

Box 1 Working definition of an environmental scan in the health services delivery context

> In the health services delivery context, an environmental scan is a type of inquiry that involves the collection and synthesis of existing information and/or the pursuit of new evidence to investigate specific policy and health services delivery issues to inform and optimize decision-making to shape future response.
>
> Drawing information from any source within the internal and/or external environments of an organization, an ES is often conducted to identify emerging issues, service gaps and priorities; inform program design, improve service quality and patient safety, inform future planning, and identify successful strategies and innovations to inform system transformation.

Second, our findings indicate a notable lack of formal guidance to support healthcare stakeholders in their attempts to design and conduct ESs within a health services delivery context. These methodological gaps were noted in several of the studies included in this review [29,44,112,127] as well as in other literature.[41,43] Studies noted the lack of specific methodology or guidelines for conducting ES [43,44,112,127]. Inconsistencies in methodology were also noted when designing this scoping review. In several existing studies, researchers

referred to data source as "scanning mode" [10,12,31] while others referred to scanning mode as a component of a conceptual model.[2,163,166]

Researchers at CADTH followed specific organization protocols to conduct ESs that then provided healthcare decision-makers with evidence to optimize the use of health technologies.[48] Of the non-CADTH studies reviewed, few referenced a specific ES guiding framework or model specific to the implementation of an ES.[29,44,82,99,127] Most frameworks were developed within business or education contexts; two ES studies reported being guided or informed by scoping review methods.[123,153] Existing models may prove helpful to guide the development of a conceptual model or framework for ES. For example, Wilburn et al. (2016) outlined a seven-step process for conducting an ES and maintained the process could be applied to other health issues and research.[41]

Given the lack of methodological guidance for ES within the health services delivery context, exploring the development of a guiding framework or a more standardized process for conducting an ES specific to this context could enhance the rigor of these studies and make an important contribution to future research and practice.

Finally, several previous studies [28,41,43] described ES as a useful means to increase stakeholder engagement. This aligns with the current efforts to engage stakeholders in health services delivery decision-making and in health research.[167,168] Enhancing the quality of ESs can be an effective approach to increasing stakeholder engagement to strengthen decision-making to improve patient safety and quality of care [153].

Limitations of the scoping review

Strengths and limitations

This scoping review examined a topic not previously examined and followed an established rigorous method for conducting scoping reviews. A data dictionary was developed to promote consistency in data extraction and researchers met regularly to discuss data extraction and the findings. Data was categorized according to the terminology as presented by the authors in the individual included studies. The limitations placed on the grey literature may have resulted in some relevant studies being missed. Broad search terms were used to mitigate this possible. The included studies were not assessed for methodological quality.

Future research and directions

The conceptual and methodological gaps identified in this scoping review raise important questions for future research and the advancement of ES within a health services delivery context.

1. Would a consensus definition, consistent terminology, and/or a model or framework provide the necessary guidance to support researchers and to advance the ES as a methodological approach used to support decision-making on policy and practice?

2. What types of guidance would a model or framework provide (e.g., type of information gathered, environments assessed (internal/external), methods, and/or types of sources)?

Our future work will involve a further review of the literature and consultation with experts (e.g. researchers, policy-makers, practitioners, and other stakeholders) to build on and refine the working definition presented in this paper to potentially establish a consensus definition of an "environmental scan" within a health services delivery context. We will also explore the

development of a conceptual model or framework that may be of assistance to stakeholders who design and conduct environmental scans.

Finally, the findings from this scoping review showed that in 20% of the studies the evidence generated from the ES was used to inform policy and practice recommendations on a range of issues. A potential topic for future research could examine how ESs ultimately informed decision-making.

The scoping review was purposely focused on the studies that specified use of an "environmental scan" to address a specific health service delivery issue. Further research may examine other analytic methods or techniques that include or are similar to ES such as those used in business and strategic planning (e.g SWOT, situational analysis).

CONCLUSION

This scoping review provided insights into the characteristics of an ES and how they are described, conceptualized, designed, and implemented as reported in the peer-reviewed and grey health services delivery literature. Significant conceptual and methodological gaps were identified. Consistent terminology and/or definition along with structured methodological guidance could support stakeholders in their attempts to design and implement ESs while contributing to the strength of ES to support policy and program development. We presented a preliminary working definition as a first step in exploring a conceptual definition in future work.

Health systems operate in a complex, dynamic environment, responding constantly to current or emerging issues, and unpredictable events that can impact service quality and efficiency. Evidence gathered through ESs can support decision-making and assist healthcare organizations to respond, adapt, and build on potential challenges and opportunities.

Funding. This study did not receive funding from any agency.

Contributors. All authors contributed to this research including the preparation and editing of the manuscript. Team members contributed to the screening and analysis of results (PC, TK, RHL, DAN, RA, SD, AL). PC developed the initial draft of the manuscript, and after several iterations with significant input from the research team, all team members (PC, TK, RHL, DAN, RA, SD, AL, WJM,) approved the final manuscript that was submitted for publishing.

Competing interests

None declared.

Ethics approval

This scoping review did not require ethics review.

Data Availability Statement

Most data relevant to this study are included in the article or uploaded as supplemental information. The study protocol and the data dictionary for the data elements in the scoping review are available upon request from the corresponding author.

Acknowledgements. We wish to acknowledge the contributions of the research librarians, LB, who developed the search strategy in consultation with the research team, and KM who conducted a peer review of the search strategy. We also thank Kate Thompson for her assistance in the initial article screening, and Christine Fahim, PhD, Scientist, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Ontario for reviewing our initial draft manuscript and providing helpful feedback.

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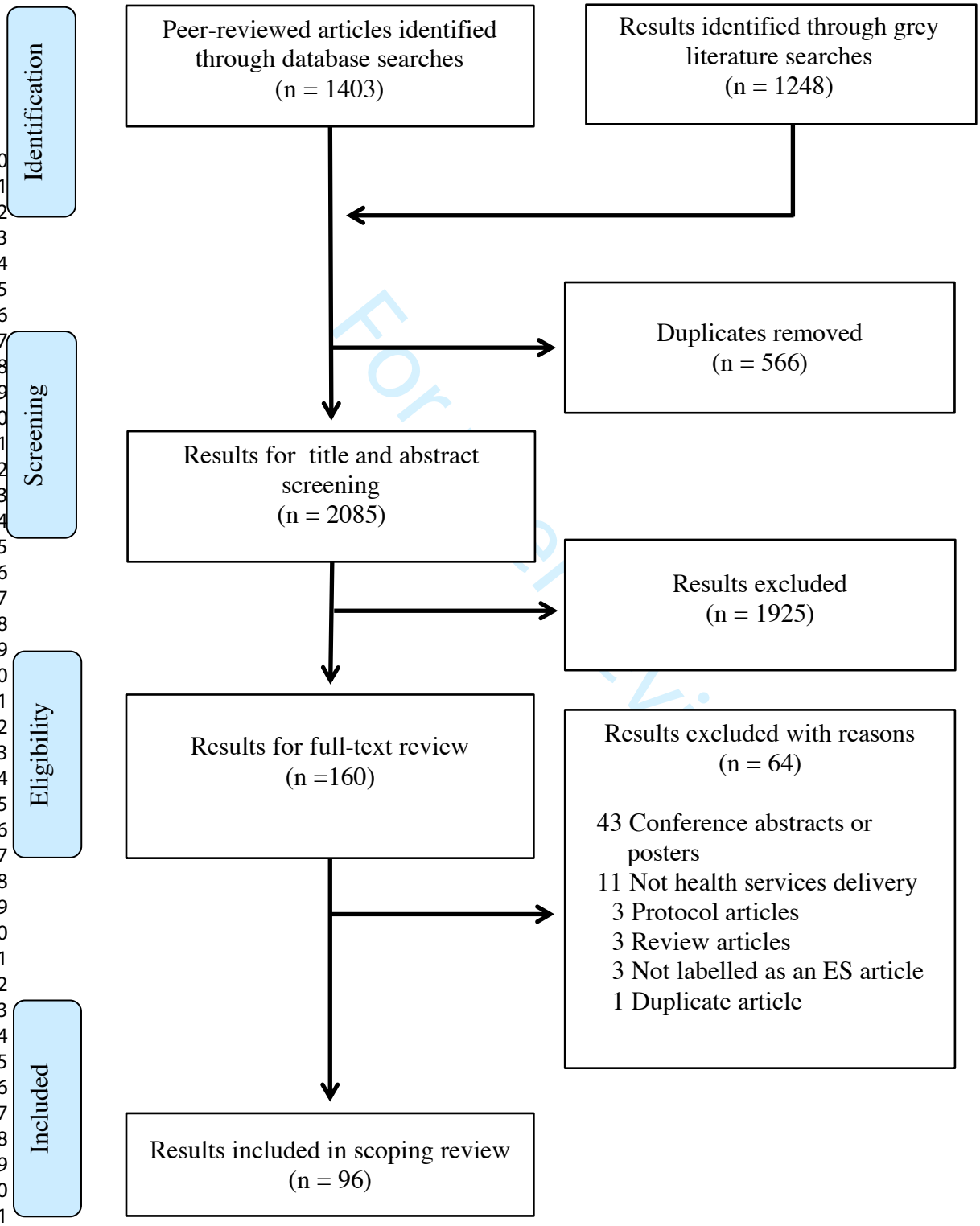
Identification
Peer-reviewed articles identified through database searches (n = 1403)
Results identified through grey literature searches (n = 1248)
Duplicates removed (n = 566)
Screening
Results for title and abstract screening (n = 2085)
Results excluded (n = 1925)
Eligibility
Results for full-text review (n =160)
Results excluded with reasons (n = 64)
43 Conference abstracts or posters
11 Not health services delivery
3 Protocol articles
3 Review articles
3 Not labelled as an ES article
1 Duplicate article
Included
Results included in scoping review (n = 96)

Supplementary File 1

Search Strategy for Medline

1	environment* scan$4.ti,ab,kf.
2	exp "Delivery of Health Care"/
3	exp Health Services/ and (administer* or delegat* or deliver* or distribut* or provide or providing or provision).ti,ab.
4	((care or healthcare) adj4 (accessib* or availab* or disparit* or equit* or equalit* or inaccessib* or inequalit*)).ti,ab,kf.
5	((care or healthcare) adj4 (administer* or delegat* or deliver* or distribut* or provide or providing or provision)).ti,ab,kf.
6	((care or healthcare) adj reform*).ti,ab,kf.
7	case management.ti,ab,kf.
8	(e health or e mental health or ehealth or m health or mhealth or mobile health or telehealth or telemedicine).ti,ab,kf.
9	(health care adj4 (accessib* or availab* or disparit* or equit* or equalit* or inaccessib* or inequalit*)).ti,ab,kf.
10	(health care adj4 (administer* or delegat* or deliver* or distribut* or provide or providing or provision)).ti,ab,kf.
11	(health adj2 reform*).ti,ab,kf.
12	managed care.ti,ab,kf.
13	practice pattern*.ti,ab,kf.

14 prescribing pattern*.ti,ab,kf.

15 ((program* or service*) adj4 (accessib* or availab* or disparit* or equit* or equalit* or inaccessib* or inequalit*)).ti,ab,kf.

16 ((program* or service*) adj4 (administer* or delegat* or deliver* or distribut* or provide or providing or provision)).ti,ab,kf.

17 or/2-16

18 1 and 17

Supplementary file 2

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Abrahamyan et al. (2015) (66)	CA	To identify all community-based multidisciplinary wound care teams in Ontario and describe their service models.	Mixed methods	Multiple
Ahmad et al. (2015) (67)	CA	To develop recommendations and initiatives to improve quality of oral chemotherapy delivery in Ontario.	Qualitative	Regional Cancer Specialty Clinics/ Centres (provincial)
Baezconde-Garbanati et al. (2017) (68)	US	To assess needs, resources, and understanding attitudes toward HPV vaccination.	Qualitative	Multiple
Bak et al. (2013) (69)	CA	To describe available evidence on the effects of radiation on ambulatory infusion pumps used to deliver chemotherapy, heighten awareness of this issue within the clinical community, provide considerations for minimizing possible negative effects on patient care, and encourage the monitoring of infusion devices after exposure to radiation/electromagnetic interference.	Qualitative	Regional cancer specialty clinics/ centres (provincial)

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Bakhru et al. (2015) (70)	US	To evaluate the current level of diffusion of early mobilization practice and examine environmental factors that may influence its practice in U.S. intensive care units	Quantitative	Acute care
Ball et al. (2011) (71)	CA	To conduct the first national ES of pediatric weight management and reflect on their role in the overall management of pediatric obesity	Quantitative	Multiple
Battye & McTaggart (2003) (72)	AU	To develop a model of allied health services delivery using the principles of primary healthcare to meet the needs of 11 culturally diverse (indigenous, non-indigenous, mixed) communities in rural Australia.	Mixed methods	Primary health care
Bednar et al. (2018) (73)	US	To inform the design of a quality improvement project to increase rates of adherence to national guidelines for cancer genetic counseling and genetic testing at three unique oncology care settings.	Mixed methods	Acute care
Brouwers et al. (2009) (74)	CA	To describe how cancer diagnostic services should be organized, structured, and evaluated in Ontario	Qualitative	Regional cancer specialty clinics/ centres (provincial)

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Carter et al. (2017) (75)	CA	To identify and describe health and social system navigation activities in a large urban Canadian community	Mixed methods	Multiple
Cartmell et al. (2018) (76)	US	To identify contextually appropriate strategies for improving HPV vaccination uptake in South Carolina by conducting an ES of the barriers, facilitators, and strategies needed for improving HPV vaccination	Qualitative	Multiple
Chang et al. (2017) (77)	CA	To conduct an environmental scan of a rural primary care clinic to assess the feasibility of implementing an e-communications system between patients and clinic staff.	Mixed methods	Primary care
Davies et al. (2008) (78)	CA	To document the process of best practice guideline implementation by topic, to describe facilitators and barriers to implementation and to determine the impact of indicators related to process and patient outcomes.	Mixed Methods	Multiple
DeGroff et al. (2014) (79)	US	To describe key considerations in designing a patient navigation intervention model.	Qualitative	Multiple
Delparte et al. (2014) (80)	CA	To develop a customizable patient and family education resource for people with spinal cord injury	Qualitative	Rehabilitation

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Finnigan-Fox et al. (2017) (81)	US	To identify available patient decision aids relating information about hospice care and compare that information with the informational needs expressed by real-world health care consumers	Qualitative	Palliative care
Fong et al. (2018) (82)	CA	To evaluate cancer centres for physical activity and sedentary behaviour information and infrastructure, and to evaluate the quality of the information accessible to breast cancer survivors in cancer centres	Mixed methods	Regional cancer specialty clinics/ centres (provincial)
Frost et al. (2016) (83)	US	To better understand the experience of sickle cell disease patients, their caregivers, and providers during care transitions to determine whether and how their needs could be met through health information technology	Qualitative	Multiple
Glurich et al. (2017) (84)	US	To update the current status and progress in advancing establishment of models for integrated oral-dental healthcare delivery for patients with, or at risk for, diabetes.	Qualitative	Primary care

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Goldwater et al. (2014) (85)	US	To gain a larger understanding of the experience of Community Health Centres in the acquisition, implementation and utilization of open source EHR to achieve meaningful use and to serve their patient populations	Qualitative	Multiple
Gustafson et al. (2008) (86)	CA	To conduct a needs assessment of injection drug use in St. John's, NL and to identify the barriers to health and health services for people injecting drugs in the city	Mixed methods	Multiple
Hauck et al. (2008) (87)	AU	To develop a framework for community mental health clinicians to improve the reproductive health outcomes for women with serious mental illness.	Qualitative	Multiple
Hogan et al. (2014) (88)	US	To evaluate the effects that technology-assisted access to clinical information may have on stakeholder experiences, processes of care and health outcomes.	Qualitative	Veterans Affairs
Hogenbirk et al. (2006) (89)	CA	To examine the current status of telehealth in Canada with respect to standards, guidelines, policies or procedures	Mixed methods	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Jeon et al. (2012) (90)	CA	To establish a set of guidelines for developing ambulatory chemotherapy preprinted orders in Canada.	Qualitative	Ambulatory care
Joschko et al. (2018) (91)	CA	To examine different eConsult services available worldwide and compare the strategies, barriers, and successes of their implementation in different health care contexts	Qualitative	Multiple
Kobe et al. (2020) (92)	US	To systematically survey and interpret relevant self-management education programs to identify opportunities for their development specific to adolescent and young adult survivors of childhood cancer	Qualitative	Primary health care
Leiva Portocarrero et al. (2015) (93)	CA	To identify publicly available DAs focusing on prenatal screening/diagnosis for Down syndrome that provide effective support for decision making	Qualitative	Not clear or not specifically reported
Liddy et al. (2015) (94)	CA	To identify current eConsultation and eReferral systems in Canada and to gain insight into the design and implementation process of existing systems.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Liddy & Mill (2014) (95)	CA	To identify existing policies, strategies and frameworks that support self-management initiatives for chronic disease in Canada.	Qualitative	Health administration/Health policy system level
Luke et al. (2018) (96)	CA	To provide other organizations with useful information when implementing paediatric navigation programs and to inform the implementation of a navigation care centre in New Brunswick for children with complex health conditions.	Qualitative	Multiple
Mansell et al. (2017) (97)	CA	To characterize pharmacists' expanded scope of practice as it relates to providing services to Canadians with diabetes	Qualitative	Multiple
McDonald & Acri (2018) (98)	US	To examine agency-level barriers to treatment among a poverty-impacted sample of women with depressive symptoms, as well as any supports that agencies have implemented to engage consumers into services.	Quantitative	Multiple
Mew et al. (2017) (99)	CA	To understand emergency response systems, services, and training in remote Nishnawbe Aski Nation First Nation communities.	Qualitative	Emergency services or response system

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Mitchell et al. (2018) (11)	US	To document the results of an ES of the literature, resources, and policies relevant to nursing professionals and their role in preventing alcohol-exposed pregnancies and fetal alcohol spectrum disorders	Qualitative	Multiple
Moore et al. (2015) (101)	CA	To determine the prevalence and characteristics of physical activity services offered by Famly Health Teams in Ontario.	Qualitative	Primary care
Morton et al. (2010) (102)	CA	To provide advice on organisational and technical aspects of the delivery of brachytherapy services in Ontario, Canada.	Qualitative	Regional cancer specialty clinics/ centres (provincial)
Munce et al. (2014) (103)	CA	To conduct a systems analysis on community and health services for individuals with acquired brain injury in the province of Ontario, Canada	Mixed methods	Multiple
Naumann et al. (2013) (44)	CA	To explore, summarize, and map out current services for fetal alcohol syndrome disorder in order to present a comprehensive review of service accessibility in Eastern Ontario.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
O'Mahony & Clark (2018) (104)	CA	To increase understanding of immigrant women's reproductive mental health care services within rural settings and to inform the implementation of a cross regional research program.	Mixed methods	Multiple
Ocampo et al. (2017) (105)	CA	To understand the current practices and perceptions with respect to ward closure for hospital acquired infectious disease outbreaks in acute care hospital settings across Canada.	Mixed methods	Acute care
Patel et al. (2014) (106)	CA	To characterize anal cancer screening practices in jurisdictions around the world with the aims of providing clinical and operational guidance for clinicians, describing the current practice and providing information from other jurisdictions for health care policy makers.	Quantitative	Not clear or not specifically reported
Porterfield et al. (2012) (107)	US	To develop a framework for interventions that utilize linkages between clinical practices and community organizations for the delivery of preventive services, and to identify and characterize these efforts.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Poulin et al. (2014) (108)	CA	To determine the current preoperative skin antisepsis in Alberta, reviewed key publications and existing guidelines,	Mixed methods	Acute care
Reitmanova & Gustafson (2009) (109)	CA	To identify the range of existing mental health care services in St. John's, NL with particular attention to those targeting visible minority immigrants.	Qualitative	Multiple
Richard et al. (2016) (110)	AU	To identify, implement and trial best practice interventions to improve access to PHC for vulnerable populations.	Mixed methods	Primary health care
Rosa Fortin et al. (2014) (111)	CA	To identify programs for managing obesity in adults and evaluate the degree to which programs adhere to recommendations	Quantitative	Multiple
Rowel et al. (2005) (29)	US	To conduct the needs-assessment phase of a project to increase cancer screening among African Americans in Baltimore, MD.	Mixed methods	Multiple
Scime & Burke (2018) (112)	CA	To determine, via key informant interviews, the types and frequencies of postnatal breastfeeding resources available to mothers of infants in Canadian NICUs.	Mixed methods	Acute care

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Shahid et al. (2008) (65)	AU	To map activities in service provision in Indigenous cancer control with a view to sharing lessons learned.	Qualitative	Multiple
Silva et al. (2012) (113)	US	To conduct an ES of telemedicine-based stroke programs in the US and to identify success factors and barriers to the development or sustainability of telestroke programs	Mixed methods	Multiple
Tark et al. (2019) (114)	US	To identify state variations in Physician Orders for Life-Sustaining Treatment forms and determine if variations are associated with program maturity status.	Quantitative	Multiple
Vandenberg et al. (2009) (115)	CA	To provide a practical framework to guide standardized delivery of evidence-based systemic treatment in hospitals outside regional cancer centres, with special consideration for geographically dispersed regions.	Qualitative	Ambulatory care
Whitton et al. (2009) (116)	CA	To develop the organisational standards for the delivery of intensity-modulated radiation therapy.	Qualitative	Acute care

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Wijeysundera et al. (2012) (117)	CA	To understand the current availability, intensity, and complexity of services offered in specialized heart failure clinics in Ontario.	Mixed Methods	Ambulatory care
Wittal (2018) (118)	CA	To gain a broader understanding of survivorship care, highlight any trends, and report disparities in care during the transition from the oncology to the community setting.	Qualitative	Multiple
Wittich et al. (2018) (119)	CA	To identify screening tools, technologies and strategies vision and hearing care specialists recommend to front-line healthcare professionals for the screening of older adults in long-term care homes who have dementia.	Qualitative	Multiple
Wolff et al. (2018) (120)	US	To determine the availability of information about and features of shared access functionality to the patient portal.	Qualitative	Multiple
Wurz et al. (2019) (121)	CA	To identify physical activity programs for children diagnosed with cancer and summarize program characteristics.	Qualitative	Multiple

Selected characteristics of the peer-reviewed academic literature in the scoping review of environmental scans

Authors/ Year	*Country*	*Aim/Purpose of the Study*	*Design/Data Collection*	*Healthcare Setting(s)*
Yergens et al. (2014) (122)	CA	To better understand the status of medical assessment units in Canada and examine the adoption and characteristics of these units.	Quantitative	Acute care

Supplementary file 3

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Archer et al. (2010) (123)	CA	To describe the design, functionality, implementations, applications, outcomes, and the perceived and real benefits of ePersonal Health Records that have been used thus far, with a particular emphasis on North America.	Qualitative	Not clear or not specifically reported
Association of Maternal & Child Health Programs (2011) (124)	US	To provide insight into approaches that state Title V programs are taking to address the growing incidence of autism spectrum disorder and other developmental disabilities (ASD/DD)	Qualitative	Multiple
Bandali (2014) (125)	CA	To understand current breastfeeding services within Alberta Health Services acute care and community facilities.	Mixed methods	Multiple
Bella et al. (2005) (126)	US	To promote the development of new models of care for consumers with multiple chronic conditions who are served by Medicaid or are dually eligible for Medicaid and Medicare.	Mixed methods	Multiple
Blackman (2018) (127)	CA	To compile inventor of existing Chronic Disease and Injury Prevention (CDIP) programming that is culturally appropriate to the indigenous population.	Qualitative	Primary health care

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Boonyasai et al. (2014) (128)	US	To conduct an environmental scan of the literature on Emergency Department (ED) discharge procedures to describe existing processes, along with their strengths, weaknesses, omissions, barriers, and facilitators.	Qualitative	Acute care
Campos & Manning (2006) (129)	CA	To identify service priorities in Brandon and Winnipeg for immigrants and refugees infected with, affected by, or at risk for HIV.	Qualitative	Multiple
Cowling & Dolcine (2017) (130)	CA	To identify and analyze evidence and information regarding how Point of Care Testing (POCT) is implemented and managed in jurisdictions across Canada	Mixed methods	Multiple
Deshpande, Khola, Lorca et al. (2008a) (131)	CA	To provide a critical evaluation of the available data on the use of clinical applications of asynchronous telehealth.	Qualitative	Multiple
Deshpande, Khola, Mckibbon et al. (2008b) (132)	CA	To provide a critical evaluation of the available data on the use of telehealth for acute stroke patients	Qualitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Dietitians of Canada (2018) (133)	CA	To describe the current dietetic workforce and the role of dietitians as interprofessional health team members in Canadian provinces and territories.	Qualitative	Primary health care
Forsberg et al. (2014) (134)	US	To summarize current preventive service utilization patterns and barriers, documented cost and health outcomes associated with prevention, and activities and efforts designed to improve preventive service rates and outcomes.	Qualitative	Not clear or not specifically reported
Garland (2015) (135)	CA	To identify and summarize information about independent ambulatory cancer care centres in Canada, including services and interventions provided to cancer patients outside traditional acute care settings.	Qualitative	Ambulatory care
Great Plains Quality Innovation Network (2016) (136)	US	To collect information regarding current status of medication safety efforts to detect and prevent Adverse Drug Events (ADE) within the Great Plains Quality Innovation Network (QIN).	Quantitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Health Tech Solutions (2018) (137)	US	To develop an accurate "As-Is" understanding of the Health Information Technology (HIT) landscape within the State of Alaska.	Quantitative	Multiple
Hochman et al. (2017) (138)	US	To examine what is currently known about reducing readmissions from the primary care perspective by analyzing the findings of 42 peer-reviewed articles and 30 items from the gray literature.	Qualitative	Primary care
Loorand-Stiver (2012a) (139)	CA	To provide an overview of existing falls prevention strategies targeting adults (18 years and older) in outpatient or community-based mental health and/or addiction programs in Canada.	Qualitative	Multiple
Loorand-Stiver (2012b) (140)	CA	To gather information from long-term ventilation (LTV) programs in British Columbia, Alberta, Manitoba, Ontario, and Newfoundland and Labrador regarding the transitioning of medically stable LTVD patients out of critical care units into alternate levels of care.	Qualitative	Acute care

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Mason & Ford (2017) (141)	CA	To Identify and summarize information regarding the feeding and swallowing assessment services provided to pediatric populations in Canada.	Mixed methods	Multiple
McGrath et al. (2017) (142)	CA	To explore how e-mental health is integrated within health systems and/or health policy nationwide.	Qualitative	Multiple
MedStar Health Research Institute et al. (2017) (153)	US	To identify: 1) studies on methods to engage patients and families in their care in primary care settings and the impact of these methods on patient safety; 2) existing interventions and associated tools to improve safety; 3) gaps between existing tools and those that need to be developed; 4) examples of primary care practices that have engaged patients and families in care with improvements in patient safety.	Mixed methods	Multiple
Moran et al. (2017) (143)	US	To review on implementation of medication-assisted treatment (MAT) for opioid use disorder (OUD) in rural primary care settings.	Qualitative	Primary care

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Morrison (2009) (144)	CA	To provide information regarding the seasonal and H1N1 vaccination programs currently offered in Canadian jurisdictions.	Qualitative	Not clear or not specifically reported
Morrison & Dowler (2011) (145)	CA	To provide a general overview of newborn screening in Canada, including resources used and the retention period for samples.	Qualitative	Multiple
Murzin & Furlotte (2013) (146)	CA	To outline the results of a national survey of programs and services which address the needs of older people living with HIV (PLWHIV) in Canada.	Mixed methods	Multiple
Ndegwa (2010) (147)	CA	To provide information regarding support services provided by cardiac rehabilitation programs across Canada.	Qualitative	Rehabilitation
Ndegwa (2011) (148)	CA	To provide a general overview of regional health authority and other local level frameworks, initiatives, programs, and/or strategies developed to support healthy aging.	Qualitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Ndegwa et al. (2018) (149)	CA	To provide information about available services, factors affecting access, and funding practices related to nonpharmacological therapies for chronic non-cancer pain in Canada.	Mixed methods	Multiple
Paccagnan et al (2017) (150)	CA	To inform further development and population of the Bone and Joint Health Strategic Clinical Network (BJNSCN) Model of Care for Osteoarthritis Management (OA Model) by identifying programs and education tools in Alberta, Canada, and internationally for the management of hip and/or knee OA symptoms	Mixed methods	Multiple
Seal et al. (2018) (151)	CA	To gather jurisdictional perspectives on ankyloglossia diagnosis and treatment in Canada.	Mixed methods	Multiple
Smith (2001) (152)	CA	To examine resources and policies relating to access and equity in all Health Units and Community Health Centers in Ontario	Quantitative	Primary health care
Topfer & Spry (2019) (154)	CA	To understand current resources and practices for sepsis detection in rural and remote settings.	Mixed methods	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Tran et al. (2008) (155)	CA	To evaluate the clinical benefit and to review the cost effectiveness of home telehealth versus usual care or no care for the management of diabetes, heart failure, and chronic obstructive pulmonary disease (COPD).	Qualitative	Multiple
Wells et al. (2019) (156)	CA	To gain direct stakeholder perspectives on the current context surrounding opioid addiction programs (including both opioid OADs and other non-pharmacological programming) and care setting transitions.	Mixed methods	Multiple
Young et al. (2018) (157)	CA	To identify existing or developing internet-delivered Cognitive Behaviour Therapy (iCBT) programs for treating patients with major depressive disorder (MDD) and anxiety disorders, to describe the relevant facilitators and barriers to implementation of these programs, and to explore the range of strategies that have been used to establish iCBT programs across Canadian jurisdictions.	Quantitative	Multiple

Characteristics of the grey literature studies in the scoping review of environmental scans.

Authors/ Year	Country	Aim/Purpose of the Study	Design/Data Collection	Healthcare Setting(s)
Yurick & Allatt (2016) (158)	CA	To understand current state, functions, and components of comprehensive cancer-related supportive care in Canada, USA, UK, and New Zealand	Mixed methods	Multiple

Supplementary file 4

Environmental scan methods, data sources, and scanning mode characteristics studies from the peer-reviewed academic databases*

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Abrahamyan et al. 2015 (66)		X			X	X	X						X					X
Ahmad et al. 2015 (67)			X		X		X						X					X
Baezconde-Garbanati et al. 2017 (68)	X		X		X		X			X			X		X	X	X	X
Bak et al. 2013 (69)	X										X					X	X	
Bakhru et al. 2015 (70)		X					X								X			X
Ball et al. 2011 (71)		X			X	X	X								X			X

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Battye et al. 2003 (72)			X	X	X	X	X	X	X			X	X	X	X		X	X
Bednar et al. 2018 (73)	X	X	X		X		X		X	X	X		X	X	X	X	X	X
Brouwers et al. 2009 (74)	X		X				X				X		X		X	X	X	X
Carter et al. 2017 (75)		X					X								X			X
Cartmell et al. 2018 (76)		X	X		X		X						X		X			X
Chang et al. 2017 (77)		X	X				X						X		X			X
Davies et al. 2008 (78)					X	X	X		X				X	X				X
DeGroff et al. 2014 (79)	X		X				X		X		X	X			X	X	X	X
Delparte et al. 2014 (80)	X									X	X	X		X		X	X	

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Finnigan-Fox et al. 2017 (81)	X				X		X			X	X		X		X	X	X	X
Fong et al. 2018 (82)	X					X						X		X			X	X
Frost et al. 2016 (83)	X									X	X					X	X	
Glurich et al. 2017 (84)	X								X	X	X	X				X	X	
Goldwater et al. 2014 (85)	X		X			X	X		X	X	X	X			X	X	X	X
Gustafson et al. 2008 (86)	** NSI	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
Hauck et al. 2008 (87)	- NSI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hogan et al. 2014 (88)	X									X	X					X	X	

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Hogenbirk et al. 2006 (89)	X	X	X				X			X					X	X	X	X
Jeon et al. 2012 (90)	X										X					X	X	
Joschko et al. 2018 (91)	X		X				X			X	X				X	X	X	X
Kobe et al. 2019 (92)	X									NSI	NSI					X	X	
Leiva Portocarrero et al. 2015 (93)	X				X	X	X				X	X			X	X	X	X
Liddy et al. 2015 (94)	X		X				X			X	X				X	X	X	X
Liddy & Mill, 2014 (95)	X		X				X				X				X	X	X	X
Luke et al. 2018 (96)	X		X				X			X	X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Mansell et al. 2017 (97)	X		X				X				X				X	X	X	X
McDonald & Acri, 2018 (98)	X	X					X				X				X	X	X	X
Mew et al. 2017 (99)	X		X		X		X		X	X	X		X	X	X	X	X	X
Mitchell et al. 2017 (100)	X				X		X		X	X	X	X			X	X	X	
Moore et al. 2015 (101)			X				X						X					X
Morton et al. 2010 (102)	X										X					X	X	
Munce et al. 2010 (103)	X									X	X					X	X	
Naumann et al. 2013 (44)	X		X		X	X	X		X	X	X	X	X	X	X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Ocampo et al. 2017 (105)		X					X								X			X
O'Mahony & Clark, 2018 (104)	X	X	X				X		X		X		X	X		X	X	X
Patel et al. 2014 (106)		X					X								X			X
Porterfield et al. 2012 (107)	X										X					X	X	
Poulin et al. 2014 (108)		X					X						X					X
Reitmanova & Gustafson 2009 (109)	X										X	X		X		X	X	
Richard et al. 2016 (110)		X					X								X			X
Rosa Fortin et al. 2014 (111)		X			X		X								X			X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi-structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Rowel et al. 2008 (29)	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Scime & Burke 2018 (112)			X				X								X			X
Shahid et al. 2008 (65)			X		X		X						X					X
Silva et al. 2012 (113)	X	X	X		X		X				X	X			X	X	X	X
Tark et al. 2019 (114)	X										X					X	X	
Vandenberg et al. 2009 (115)	X								X		X			X		X	X	
Whitton e al. 2009 (116)	X								X		X			X		X	X	
Wijeysundera et al. 2012 (117)			X		X		X						X					X

Authors/ Year	Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi - structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Wittal 2018 (118)	X		X				X		X	X	X	X	X	X	X	X	X	X
Wittich et al. 2018 (119)			X				X								X			X
Wolff et al. 2018 (120)	X										X					X	X	
Wurz et al. 2019 (121)	X		X		X		X			X	X		X		X	X	X	X
Yergens et al. 2014 (122)		X					X						X		X			X

* The data collection methods, data sources, data source mode, and scanning mode refer only to the environmental scanning component of the study. ** NSI=Not clear or not specifically reported

Supplementary file 5

Environmental scan methods, data sources, and scanning mode characteristics studies from grey literature*

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Archer et al. 2010 (123)	X									X						X	X	
Association of Maternal and Child Health Programs (AMCHP) 2011 (124)						X		X								X	X	
Bandali 2014 (125)	X	X	X				X		X				X	X			X	X
Bella et al. 2005 (126)	X	X	X		X	X	X		X	** NSI	NSI		X	X	X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Blackman 2018 (127)	X		X				X				X				X	X	X	X
Boonyasai et al. 2014 (128)	X		X			X	X		X	X	X	X			X	X	X	X
Campos & Manning 2006 (129)	X		X	X			X		X				X	X	X	X	X	X
Cowling & Dolcine 2017 (130)	X	X	X				X			X	X				X	X	X	X
Deshpande, Khoja, Lorca, et al. 2008a (131)	X				X		X			X	X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Deshpande, Khola, McKibbon et al. 2008b (132)	X				X		X			X	X				X	X	X	X
Dietitians of Canada 2018 (133)	X		X				X		X		X				X	X	X	X
Forsberg et al. 2014 (134)	X									X	X					X	X	
Garland 2015 (135)	X	X					X			X	X				X	X	X	X
Great Plains Quality innovation Network 2016 (136)		X					X						X					X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Health Tech Solutions 2018 (137)		X					X						X		X			X
Hochman 2017 (138)	X									X	X					X	X	
Loorand-Stiver 2012a (139)			X				X								X			X
Loorand-Stiver 2012b (140)	X		X				X			NSI	NSI				X	X	X	X
Mason & Ford 2017 (141)	X	X			X		X			X	X				X	X	X	X
McGrath et al. 2017 (142)	X		X				X				X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Other personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Medstar et al. 2017 (153)	X	X	X			X	X		X	X	X	X	X		X	X	X	X
Moran et al. 2017 (143)	X									X	X					X	X	
Morrison 2009 (144)	X		X				X			NSI	NSI				X	X	X	X
Morrison & Dowler 2011 (145)	X		X				X			NSI	NSI				X	X	X	X
Murzin & Furlotte 2013 (146)		X					X						X		X			X
Ndegwa, 2010 (147)	X		X				X			NSI	NSI				X	X	X	X
Ndegwa 2011 (148)	X		X				X				X				X	X	X	X

Authors/ Year	Data Collection Methods						Data Sources						Data Source Mode				Scanning Mode	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Personal contact	Other	Personal sources	Administrative databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Ndegwa et al. 2018 (149)	X	X	X				X			X	X				X	X	X	X
Paccagnan et al. 2017 (150)	X	X				X	X			X	X		X	X	X	X	X	X
Seal et al 2018 (151)	X	X	X				X			X	X				X	X	X	X
Smith 2001 (152)		X					X						X					X
Topfer & Spry 2019 (154)	X	X	X				X			X	X				X	X	X	X
Tran et al. 2008 (155)	X		X				X		X		X				X	X	X	X
Wells et al. 2019 (156)	X	X					X			X	X				X	X	X	X

Authors/ Year	*Data Collection Methods*						*Data Sources*						*Data Source Mode*				*Scanning Mode*	
	Literature review	Survey	Key informant / semi structured interviews	Focus group	Personal contact	Other	Personal sources	Administrative Databases	Reports or internal docs	Academic database	Internet web search	Other	Internal personal	Internal impersonal	External personal	External impersonal	Conditioned viewing - Passive data collection	Searching - Active data collection
Young et al. 2018 (157)		X					X								X			X
Yurick et al. 2016 (158)	X		X				X				X		X		X			X

* The data collection methods, data sources, data source mode, and scanning mode refer only to the environmental scanning component of the study. **NSI = not clear or not specifically reported

Supplementary file 6
Definitions and descriptions of environmental scan

Author	Definition/Description
Baesconde-Garbanati et al., 2017 [1]	"Although environmental scans originated in the business sector, they have come to be used in public health to collect data that can be used to develop health programs and interventions tailored to the unique needs of specific communities [2] Environmental scans can help assess strengths, weaknesses, challenges, and opportunities for improvement. They may help to refute or confirm common perceptions within the community. The methodology for environmental scans vary depending on the needs of the organization or community. However, they often include multiple sources of internal and external data (e.g., literature review, surveys, interviews with key stakeholders, internal documents, focus groups, technology), various target populations, and program planning [3] Environmental scans can be a valuable tool to raise awareness of issues, plan for the future, develop interventions, assist in health decision-making, and provide information for the development of evidence- based policies" [3] p. 4931
Bakhru et al, 2015 [4]	"An environmental scan is defined as a review of current structures, processes and outcomes of care, and barriers to the new process understood in the context of the ecosystem (in this case, the ICU)" [4] p. 2361
Bednar et al., 2018 [5]	"An ES is a mixed-methods tool used in business, government, and public health to collect information, identify risks and opportunities, tailor strategic plans, or design programs in a flexible, rapid, comprehensive, low-cost manner" [2,3,6] p. 1483
Blackman, 2018 [7]	"There has been an increasing interest in environmental scans in public health practice, as they are now recognized as a valuable assessment and data collection tool by federal funding agencies and other health-related organizations. [8] Environmental scans originated in the business world as a tool for retrieving and organizing data to facilitate with strategic planning and decision-making.[3] Within the arena of public health, environmental scans have been used to collect, organize, and analyze information to guide the direction of new public health activity, raise awareness of health disparities, or initiate a project or funding opportunity [8]… As Rowel et al. [2] posited, the realities of the 21st century with regards to new technologies and diversity in sources of information have forced public health to

	reconsider traditional approaches to knowledge generation. It has been recognized that in a health environment that experiences challenges such as scarcity of resources, innovative approaches to public health research and practice is needed to maximize existing resources, ensure timely responses to health crises, and build on established knowledge. [2] Environmental scans incorporate nontraditional methods in searching for evidence that include exploring the Internet and directly contacting or surveying other programs, organizations, or experts. [9] An advantage to an environmental scan approach is the allowance for organizations to account for diverse types of knowledge, which includes codified from statistics, policy documents, or clinical reviews) and tacit knowledge (data from interviews or focus groups). [3] There are multiple strategies for information collection that include, but are not limited to, focus groups, in-depth interviews, surveys, literature assessments, chart reviews, personal communication, and policy analyses.[8] The goal of environmental scans is to use the information attained to design health programs that meet the needs of the target population. Intrinsically, they are designed to help the process of planning for the future by guiding health organizations and projects, thereby leading to evidence-based solutions for health care issues [3]… A noted limitation of environmental scans is the inconsistent approach to conducting them, resulting in ambiguity of the process. [3,8] pp. 9-11, 30
Fong et al., 2018 [10]	"A built environmental scan is an objective review of the environmental factors that influence an organization; those factors can include programs, policies, and physical features (for example, the availability of visible, safe, and clean stairs for walking) within an organization" [2] p. e366
Glurich et al., 2017 [11]	"Ad hoc environmental scans are cross sectional surveys undertaken at unspecified frequency, for the purpose of reviewing the current relevant evidence base across a range of sources in an attempt to ascertain the current state of the art surrounding the specific topic under focus. Such scans are conducted to collect information that may inform future planning of various vested stakeholders" [11] p. 22

Leiva Portocarrero et al., 2015 [12]	"Environmental scans were developed as tools for retrieving and organizing data from a wide variety of fields in order to identify contexts and shifts in planning for the future. They can include internal (memos, notes from meetings with stakeholders, etc) as well as external sources (e.g., newly available technologies)" [3] p. 3
Luke et al., 2018 [13]	"An environmental scan was used to generate a map of paediatric PN models of care in Canada. Originating in the business context, environmental scans are useful tools to develop insight into the utilization of health services [2,3]. Environmental scans allow for the assessment of trends, status, policy initiatives and strategies within a specific area [14,15] and have the advantage of identifying and avoiding potential problems and implementing useful solutions" [16] p. e47
Medstar et al., 2017 [17]	"An environmental scan is an integral process for identifying, retrieving, and organizing information to enable health decision making and has been used to foster knowledge translation in primary care." [3,18] p. 2
Mew et al., 2017 [19]	"We used an environmental scanning (ES) approach to consolidate information from community leaders, frontline practitioners, and publically available sources [3,20]. The first phase of our ES employed an active approach by gathering information from primary sources such as perspectives of First Nations health leaders and relevant stakeholders [3]. The second phase employed a passive approach by gathering information from secondary sources, such as publically available information, to supplement the results obtained from the active approach" [3] p. 3
Moore et al., 2015 [21]	"An environmental scan has been defined as the acquisition and use of information about events, trends and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action" [20] p. 303
Naumann et al., 2013 [22]	"In comparison, environmental scans are emerging as an effective tool to collect evidence pertaining to healthcare service delivery gaps…Originating within the business context as a valuable method for retrieving and organizing needs assessment data, the environmental scan methodology has been growing in use and complexity, recently emerging as a popular method of effectively determining the health care needs of communities. Similar to the scoping study, both external and internal sources of data are utilized during an environmental scan. External sources of data include corporate media and sources, government data, and academic literature; internal

	sources include the informal records and knowledge held by individuals or organizations, personal communications, minutes of meetings, memos, and other internal documents." [3,23] p. 32, 35
Porterfield et al., 2012 [24]	"An environmental scan examines unpublished literature and publicly available program information" [24] p. S164
Richard et al., 2016 [25]	"Environmental scanning is a research approach that uses wide-scope screening methods to identify the new, the unexpected and the emerging interventions, issues and challenges in health" [3] p. 2
Rowel et al., 2005 [2]	"The environmental scan is a tool that can be utilized to collect data to design health programs uniquely tailored to the needs of communities." [2] p. 527 "Environmental scanning is the acquisition and use of information about events, trends and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action." p. 529 [20] and "environmental scanning as "a systematic and continuous effort to search for important cues about how the world is changing and how these changes are likely to affect your organization." [26] p.529
Scime et al., 2018 [27]	"Despite origins in a business context a tool for gathering information to enable strategic action p. 203 [3,20] … Specifically, environmental scans are suitable for the identification and synthesis of evidence about existing resources, organizational processes, barriers and facilitators to action, and/or knowledge and practice gaps pertaining to the topic under study. [2] p. 203
Shahid et al., 2008 [28]	"Environmental scanning is a method most commonly used in business but is quite popular in the health care sector around the world [29,30,31], and is used to identify emerging issues within the broader economic and political environment. [32] It is similar to situational analysis in which a review is undertaken of health strategies and policies, institutional support systems with the aim of strengthening health reform and health systems. It differs from audits which generally evaluate performance and are aimed at ascertaining the validity and reliability of information as part of quality control processes. Morrison argues that environmental scanning is a method that enables decision makers both to understand the external environment and the interconnections of its various sectors and to translate this understanding into an institution 's planning and decision-making processes." [33] "…The advantage of environmental scanning for

	organizational leaders is that knowing the internal and external environment in which the organization operates is helpful in planning their future course of action." [20] p. 57
Tark et al., 2019 [34]	"Environmental scanning is a research method in which publicly available information is gathered systematically and is used to evaluate both internal and external environments of organizations, organizational practices, and health programs. It produces important insights on current trends and occurrences based on existing resources and can assist with the development of evidence-based policies in future practices" [34] p. 1033
Wittich et al., 2018 [35]	"In healthcare research, the environmental scan is often employed as a needs-assessment tool for the purposes of improving and developing the efficiency of health service programs and evidence-based policies. In using this approach, environmental or contextual factors are evaluated by reviewing existing data or actively collecting new data in the form of surveys or interviews, including a diversity of views and information, to determine the benefits, needs and efficiencies of practices within that environment" [2,3] p. 2-3
Wurz et al., 2019 [36]	"Environmental scans are one way to identify and collate a large body of information seeking to achieve such an aim. [20,37] Moreover, they are a useful way to inform strategic planning, provide evidence about the direction of a field, and raise awareness about gaps in program/service availability" [3,38] p. 1154
Yurick [39]	"Environmental scans are considered a rapid review of information. The information gathered is considered incomplete until validated, but gives a snapshot of current work, as well as the breadth of depth of information available" [39] p. 94

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Supplementary File 7
Thematic Analysis of ES Definitions

Theme	Definition	Sub-Theme	Studies % (n)	Examples
Instrument of discovery	A system for achieving a result	Mechanism	81% (17) [29, 44, 70, 65, 68, 73, 82, 84, 93, 96, 110, 112, 114, 119, 127, 153, 158]	"a review", "a mixed-method tool", "an objective review" "cross sectional surveys", "tools", "an integral process", "an effective tool", "a research approach", "a tool", "a method", "a research method", "a rapid review", "needs-assessment tool"
	The acquisition of new knowledge through the process of inquiry	Learning	71% (15) [29, 44, 65, 68, 70, 73, 82, 93, 96, 110, 114, 119, 121, 127, 153]	"to search for important cues about how the world is changing and how these changes are likely to affect your organization", "a popular method of effectively determining the health care needs of communities", " to identify emerging issues", "the new process understood in the context of the ecosystem", "identify risks and opportunities", "review of the environmental factors that influence an organization", "to identify contexts and shifts", "information about events, trends and relationships in an organization's external environment", "to identify the new, the unexpected and the emerging interventions, issues and challenges health", "produces important insights on current trends and occurrences", "to determine the benefits, needs and efficiencies of practices", "used to foster knowledge translation in primary care", "assess strengths, weaknesses, challenges, and opportunities for improvement", "raise awareness of issues", "develop insight"

Supplementary File 7
Thematic Analysis of FS Definitions

Forward-looking	Anticipating or making provision for the future; progressive		71% (15) [29, 65, 68, 70, 73, 82, 84, 93, 96, 110, 112, 114, 119, 121, 127]	"future course of action", "to identify emerging issues", "future course of action", "the new process", "identify risks and opportunities, tailor strategic plans, or design programs", "factors that influence an organization", "may inform future planning", "in planning for the future", "emerging", "to enable strategic action", "future practices", "improving and developing", "opportunities for improvement", "plan for the future, develop interventions", "avoiding potential problems and implementing useful solutions", "inform strategic planning, provide evidence about the direction of a field", "to guide the direction", " initiate a project or funding opportunity", "leading to evidence-based solutions"
Knowledge synthesis	An attempt to summarize all pertinent information on a specific topic or question		48% (10) [29, 84, 93, 96, 112, 114, 116, 121, 127, 153]	"data acquisition and use of information about events, trends and relationships", "current relevant evidence base across a range of sources ", "retrieving and organizing data from a wide variety of fields", "the identification and synthesis of evidence", "publicly available information is gathered systematically and is used to evaluate", "identifying, retrieving, and organizing information", "to consolidate information", "to consolidate information", "gathering information…to supplement the results", "generate a map", "to identify and collate a large body of information", "diverse types of knowledge"

Supplementary File 7
Thematic Analysis of ES Definitions

Decision-making	Making choices from two or more alternatives for the purpose of achieving a preferred outcome		43% (9) [29, 65, 68, 84, 93, 114, 119, 127, 153]	"inform future planning", "in planning for the future", "planning", "planning and decision-making processes", "to enable health decision making", "evaluate(d)", "to foster knowledge translation in primary care", "assist in health decision-making", "to facilitate with strategic planning and decision-making", "analyze information to guide the direction"