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Résumé de l'article

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Methods – This was a prospective case study using descriptive analysis of the JAC usage statistics of journal articles from January 2009 to September 2013.

Results – JAC enables ministry employees to access approximately 12,000 journals with full-text articles. JAC usage statistics for the 2011-2012 calendar years demonstrate a steady level of activity in terms of searches, with monthly averages of 5,129. In 2009-2013, a total of 4,759 journal titles were accessed including 1,675 journals with full-text. Usage statistics demonstrate that the actual consumption was over 12,790 full-text downloaded articles or approximately 2,700 articles annually.

Conclusion – JAC's steady level of activities, revealed by the study, reflects continuous demand for JAC services and products. It testifies that access to online journal databases has become part of routine government knowledge management processes. MOHLTC's broad area of responsibilities with dynamically changing priorities translates into the diverse information needs of its employees and a large set of required journals. Usage statistics indicate that MOHLTC information needs cannot be mapped to a reasonably compact set of "core" journals with a subsequent subscription to those.

Evidence Based Library and Information Practice

Research Article

Informing Evidence Based Decisions: Usage Statistics for Online Journal Databases

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Abstract

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Introduction

Use of research results in medical evidence based decision-making and healthcare evidence-informed policy advice has been recognized as essential to improve health outcomes (Field, Gauld & Lawrence, 2012; Lomas & Brown, 2009; Sosnowy, Weiss, Maylahn, Pirani & Katagiri, 2013). Despite agreement on the importance of the issue and general consensus on the approaches, implementation of evidence based decision-making processes leaves much room for improvement. Several barriers have been identified by researchers, including: lack of access and limited awareness of research results (Wallace, Nwosu and Clarke, 2012); lack of practical use of systematic reviews (Wallace et al., 2012); lack of organizational culture or supports (e.g. behaviour of supervisors, front-line staff and other professionals in the organization) (Rapp et al., 2010); lack of time (Solomons & Spross, 2011); ambiguous and conflicting research (Madhavji, Araujo, Kim & Buschang, 2011; Ubbink et al., 2011) or research having methodological inadequacies (O'Connor & Pettigrew, 2009); lack of skills, training or tools to acquire, assess, synthesize, disseminate and apply research evidence to inform policy related to health systems (Ubbink, Guyatt & Vermeulen, 2013); lack of applicability/relevance of research (Humphries, Stafinski, Mumtaz & Menon, 2014); lack of standard knowledge translation strategies and processes effective in multiple contexts (Humphries et al., 2014); lack of timely research outputs (Oliver, Innvar, Lorenc, Woodman & Thomas, 2014; van der Arend, 2014); and lack of interaction and collaboration between researchers and policymakers (Oliver et al., 2014; Wooding, Hanney, Pollitt, Grant & Buxton, 2014).

A significant challenge for health system practitioners (both in a clinical setting and in public service) in implementing research evidence is inadequate access to information, which results in doctors or analysts being unaware of the research (Brownson et al., 2014; Oliver et al., 2014; Ubbink et al., 2013; Ubbink et al., 2011; Wallace et al., 2012). Various types of information are required for producing high-quality evidence based policy advice, including journals, books, research reports, professional/trade magazines, etc. Academic journals and professional magazines are the largest component of the potentially applicable information. Arguably, almost all new research is published in journals. That makes access to journals a key pre-requisite for evidence based policy advice.

In Canada, there are thirteen provinces and territories responsible for implementing evidence based health policies and services for the benefit of their populations. The Ministry of Health and Long-Term Care (MOHLTC) of Ontario, is one of the provincial ministries.

MOHLTC "is working to establish a patient-focused, results-driven, integrated and sustainable publicly funded health system" (MOHLTC, 2017a). MOHLTC's mandate includes (but is not limited to): "establishing overall strategic direction and provincial priorities for the health system; developing legislation, regulations, standards, policies, and directives to support those strategic directions; monitoring and reporting on the performance of the health system and the health of Ontarians; planning for and establishing funding models and levels of funding for the health care system;" etc. (MOHLTC, 2017a). From an organizational point of view, MOHLTC is a large and complex public corporation

(MOHLTC, 2017b). The ministry has several locations in Toronto, Ontario and local units in major provincial cities. Among the types of documentation produced by the ministry are: draft legislations and regulations, briefing notes, reports, program reviews and evaluations, recommendations, guidelines, etc. (MOHLTC, 2015).

The ministry, within the framework of the government of Ontario, makes decisions or provides advice on a wide spectrum of issues by setting agendas, implementing and evaluating solutions and promoting improvements in the health system. The ministry oversees a health budget of more than C$50 billion per year. The following may serve as examples of types of evidence based decisions made by the ministry on an on-going basis: budget-related planning and control; allocation of public resources to the local health integrated networks; performance management of the health system and its elements; economic evaluation and health technology assessment of new medical interventions, drugs and systems; health system capacity planning, etc. Specific examples of the ministry's evidence based decision-making can be found in Lomas and Brown (2009) and Khan et al. (2014). In 2015, the government of Ontario established a Centre of Excellence for Evidence-Based Decision Making to enhance the capability of all ministries in making informed decisions.

MOHLTC takes specific measures to encourage evidence based policy-making to improve the healthcare system. These measures include, in particular, development and implementation of the policies and procedures of using research evidence, providing financial support to universities in generating new evidence and conducting knowledge transfer, and building and operating information systems to facilitate access to online journals, e.g. the Journal Access Centre (JAC).

JAC is made available to all MOHLTC employees – several thousand people. Obviously, actual use varies across the departments. For example, research, analytics, policy development, program evaluation and economic assessment units are known to be regular users of JAC. The departments with primarily operational functions, such as financial management, corporate supply chain, and information technology, use JAC with less regularity. Informal surveys of staff conducted in 2011-2012 show that several hundred employees use JAC weekly or daily and consider their JAC skills as advanced.

Prior to JAC, access to journals was organized through subscriptions by individual ministry departments. Subscriptions were not coordinated. Overall, employees had access to several dozen printed journals.

Objectives

The primary objective of the study was to examine online journal databases usage statistics for a provincial ministry of health in the context of evidence based decision-making. In addition, the study highlights implementation of the Journal Access Centre that is housed and powered by the Ontario Ministry of Health and Long-term Care to inform health systems' policy making.

The research questions guiding this study were:

- What are the usage statistics of searches that reflect user demand for online journals?
- What are the usage statistics of downloaded full-text articles that characterize the desired output of the journal access solution and reflect consumption of information?
- What are the usage statistics of the journal titles accessed by JAC users?
- Can information needs of MOHLTC users be satisfied by subscription to a core set of "most important" journals?

Intent

The study has been undertaken with intent to use the results and recommendations of the research to:

- inform ministry program evaluation and performance management processes;
- provide input into economic cost-effectiveness models to optimize JAC journal acquisition;
- inform ministry senior management decisions on JAC funding.

Management decisions that were taken based on the recommendations of this study are not discussed.

Out of scope

This study is the first step in assessing JAC's outputs. To assess value to the users and organization, the outcomes of higher-level processes of analyzing retrieved information and making evidence based decisions need to be examined. Research questions at these phases would include: What are users doing with the articles they got from JAC?; Are retrieved articles pertinent and of high quality?; How do users analyze information?; How do they integrate evidence?; What is the process of making evidence based decisions in the organization? etc. All these research questions, although related to the topic of this study, are out of scope of this research.

The study examines usage statistics at the institutional level. Analyses at lower levels, e.g. departmental or individual, are out of scope. Similarly, usage statistics are examined at the journal title level; article-level considerations are out of scope.

Methods

This study had a prospective case study design with descriptive analysis of JAC usage statistics for two datasets. Dataset 1 contains JAC user statistics on the numbers of searches and downloaded full-text articles for the period from January 1st 2011 to December 31st 2012 (i.e. two full years of historical data). The following considerations were taken into account while selecting the period of historical data. Firstly, trends in current research practice. Similar or shorter periods of data collection to analyze usage patterns are quite common in academic studies, e.g.: a recent CIBER research report found that two years of journal usage data is sufficient to provide insight into a journal's usage patterns (CIBER Research Limited, 2011), two-year periods were used in the studies of Wical and Vandenbark (2015), and Chew, Stemper, Lilyard and Schoenborn (2013). Secondly, availability of data. A reasonable effort has been made to collect all pertinent available COUNTER-compliant data (COUNTER, n.d.). Thirdly, alignment of the data collection period with the objective of the study and research questions. This was the first study to examine online journal access for a Canadian ministry of health. The focus was primarily on capturing and interpreting the current state of usage – not on analyzing changes in trends (as there was no prior knowledge), which would have required multiple years of observation periods. Analysis of the usage data allowed the objective of the study to be achieved.

It has been acknowledged that information needs and hence usage patterns of the online resources at a ministry of health are different from those in public health organizations (e.g. Barr-Walker, 2017; Ford & Korjonen, 2012), health care providers (e.g., Younger, 2010) or of academic researchers (e.g., Haglund & Olsson, 2008; Niu et al. 2010). Information needs of the policy makers are commonly characterized by: firstly, a broad spectrum of the subject field which spreads beyond health care and includes economics, education, housing, etc. (e.g., Brownson, Royer, Ewing & McBride, 2006); secondly, a wide range of information sources which are not limited to academic journals and include grey literature and professional

magazines with inputs on politics, values and opinions (e.g., Ritter 2009); thirdly, a preference towards simple, uncomplicated information, for example evidence summaries (e.g., Petkovic et al., 2016; Ritter 2009; Tricco et al., 2016); and finally, a dynamically changing environment and necessity to make rapid decisions which require availability of tools with timely access to information (e.g., Oliver et al., 2014), making systems like JAC indispensable.

A descriptive analysis of the usage of journal articles was conducted through the JAC access tool from January 2009 to September 2013 (Dataset 2). Journal usage statistics for MOHLTC users were downloaded from the EBSCOhost administrative reporting site (EBSCOhost, n.d.). Journal usage is characterized by the following indicators: i) number of searches, ii) number of full-text articles accessed in PDF or HTML format, iii) number of abstracts accessed, and iv) number of turnaways (access denied). These indicators were selected based on the recommendations of the internationally recognized standard: COUNTER-2008, Counting Online Usage of NeTworked Electronic Resources (COUNTER, n.d.). Definitions of the indicators and related terms are available from COUNTER (n.d.). Numbers of searches characterize overall intensity of use of the JAC and demand for this service. Number of full-text articles characterizes the desired output of the solution and can be linked to the consumption of information provided by the service.

It should be noted that at the time of data collection, EBSCO adhered to COUNTER Release 3. Since then, the COUNTER project has published an updated version of its Code of Practice – Release 4. Certain terminology and types of usage reports have been changed. There is no direct correspondence between all types of reports in Release 3 and Release 4. With some approximation, we can indicate that the data for performance measures used in the paper can be found in the following current COUNTER reports: the number of searches – in the Database Report 1 (DB1); number of abstracts – in the Record Views of DB1; number of full text downloads – in the Journal Report 1 (JR1); and number of turnaways (access denied) – in Database Report 2 (DR2).

Journal Access Centre Implementation

To support evidence based decisions, MOHLTC of Ontario, Canada, built the Journal Access

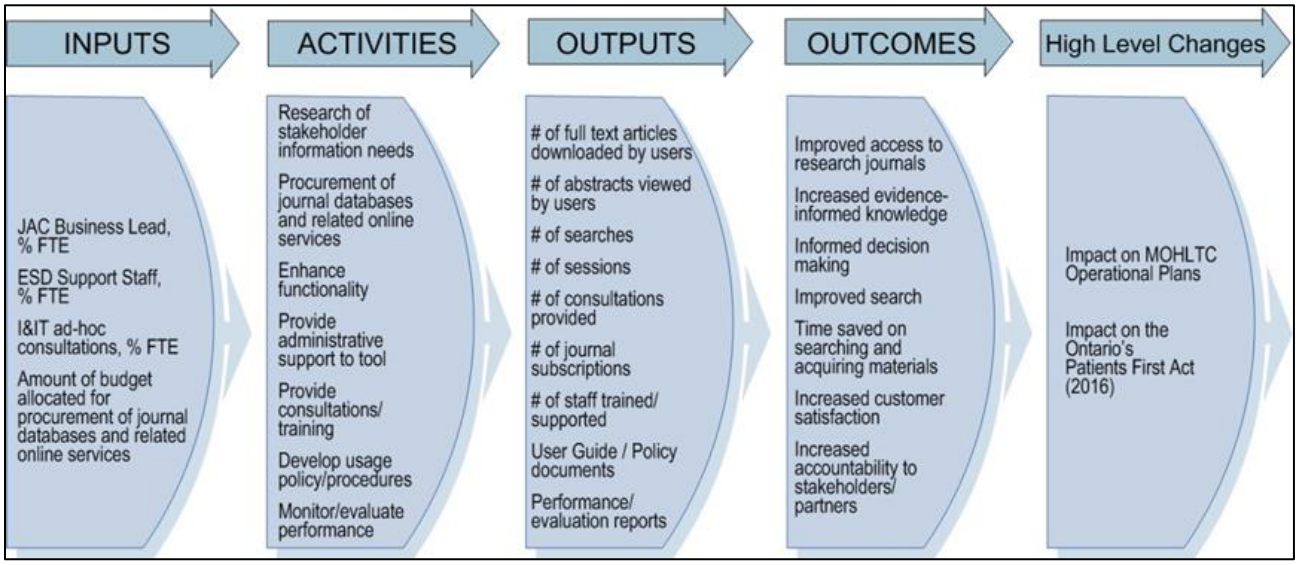

Figure 1
JAC logic model.

Centre (JAC). JAC - an online access tool supported by journal content selection, acquisition and consultation services – has been in operation with the MOHLTC since 2008, making the ministry one of the Canadian healthcare pioneers of online access to academic journals. It was conceived and developed to facilitate online access to journals and serve as an enabling factor for enhanced evidence-informed policymaking. JAC's logic model is presented in Figure 1.

A systems view of JAC is presented in Figure 2. MOHLTC acquire access to journals based on the annual subscriptions procured from various vendors including journal aggregators and individual publishers. The content is discussed and suggested for acquisition by the JAC Content Selection Advisory Network – a permanent working group with representation from each of the ministry's divisions.

Mostly, access to content is acquired by journal databases, which represent collections of journal titles focused on a certain subject area. Examples could be such well-known databases as MEDLINE, CINAHL from EBSCO (EBSCO Information Services, n.d.) or Academic OneFile, Academic OneFile from GALE CENGAGE Learning (Gale Cengage Learning, n.d.). Commonly, each database contains from a few hundred to several thousand journals. Some journals and databases are acquired individually, e.g., The Cochrane Library, Longwoods, etc. The total ministry subscription covers over 17,000 journal titles with over 9.0 million articles. These numbers include archives of prior years. Journals cover such topics as health, medicine, social science, business, policy, economics, finance, management, risk management, etc.

Usually, a database contains journals with different levels of access. Some journals are provided with complete full-text article coverage, others are available only at an abstract or indexing level. Some latest full-text journals have embargoes – delays in access from six months to three years. Most databases contain a mix of academic journals and professional non-peer-reviewed magazines. The types of content of several databases are illustrated in Table 1. The prime purpose of JAC is to provide access to the full-text articles because abstracts and bibliographic data for most journals are available on the Internet free of charge. Hence, the most valuable segment of a database constitutes full-text, current, non-embargoed journals. Despite the large number of journals and articles in the JAC repositories, occasionally a need arises for an article that is not available in full-text. In these cases, the Article on Demand Service manned by JAC's support staff orders materials and sends them to the JAC users.

The technological backbone of the solution is a cloud-based application, search engine, which allows MOHLTC users to access journal databases offered by EBSCO through the ministry's intranet. The service is provided through the EBSCO Integrated Search function. End users need only a web browser to access online journals. The EBSCO search engine provides integrated coverage of the databases both owned by EBSCO and bought from different providers – so end users can conduct a one-click search through all subscribed content. In addition, the EBSCO search is integrated with Google Scholar search, i.e. when a ministry user is conducting a search in Google Scholar he/she gets reminders if an article, presented in Google Scholar search results, is available in the ministry's EBSCO subscriptions, and can click on the link to be immediately transferred to a full-text article in EBSCO repositories. The service also provides automatic e-mail notifications of new content at an article level, which may be very specific to meet individual information needs. The service is available 24x7 with short periods of maintenance scheduled during weekends. The service has proved to be highly reliable: just one three-hour incident of service disruption has been observed in more than four years.

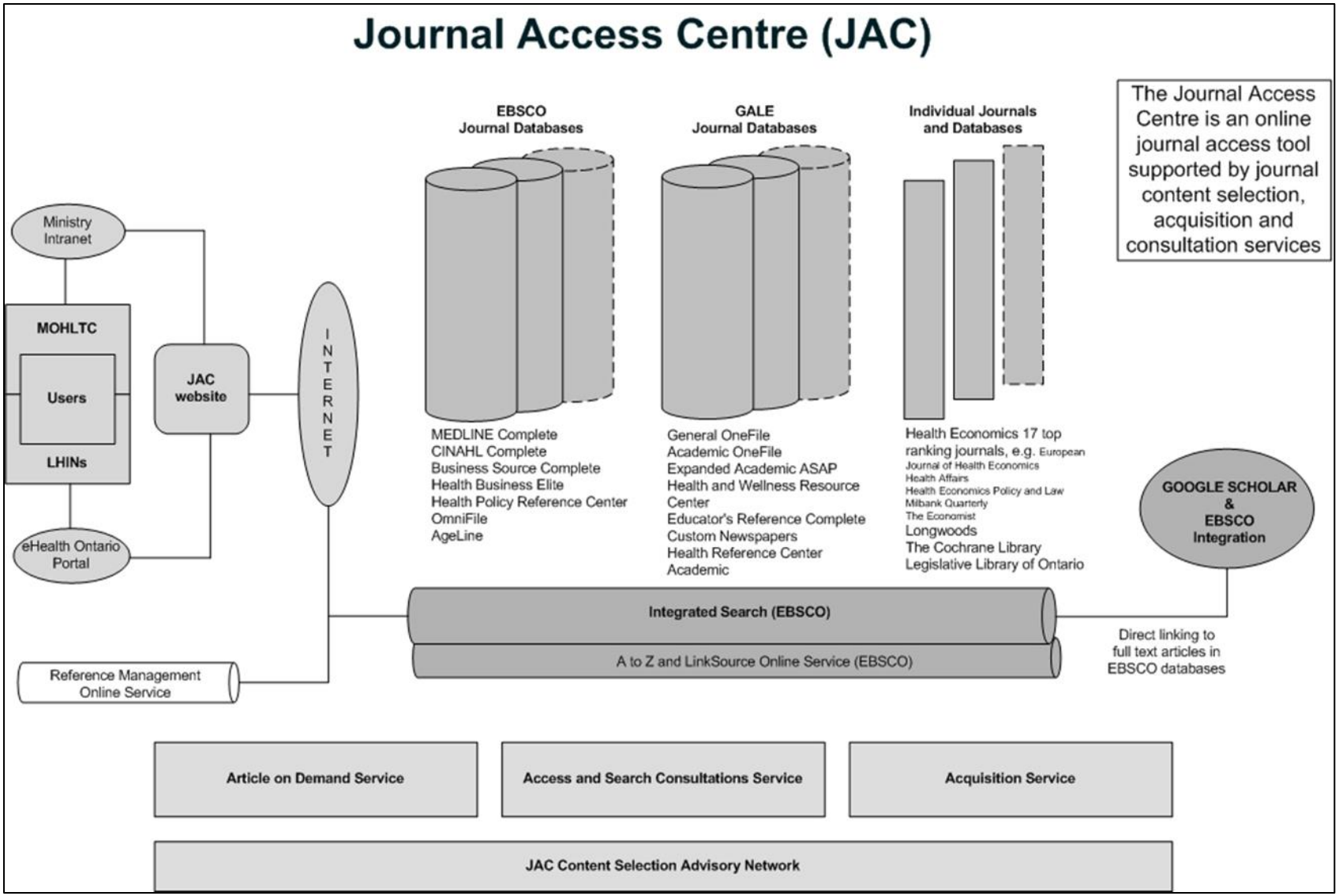

Figure 2
JAC structure.

Table 1
Types of Database Content[a]

Database	MEDLINE Complete	CINAHL Complete	Business Source Complete	Health Business Elite	Health Policy Reference Center	OmniFile Full Text	AgeLine	TOTAL
Total Number of Journals in the Database	2,184	5,453	5,023	714	472	3,125	209	**17,180**
Abstracts Only	0	3,825	1,191	64	37	0	209	**5,326**
Full-Text	2,184	1,628	3,832	650	435	3,125	0	**11,854**
Stopped Full-Text	357	537	1,139	414	149	982	0	**3,578**
Current Full-Text	1,827	1,091	2,693	236	286	2,143	0	**8,276**
Embargoed Current Full-Text	1,183	277	638	67	81	274	0	**2,520**
Non-Embargoed Current Full-Text	644	814	2,055	169	205	1,869	0	**5,756**
Non-Embargoed Current Full-Text Peer-Reviewed	608	587	943	140	143	1,184	0	**3,605**
Non-Embargoed Current Full-Text Magazines, Trade Publications	36	227	1,112	29	62	685	0	**2,151**

[a]Some databases have overlapping content (journal titles). The number of unique journal titles in the system is less than shown in the table.

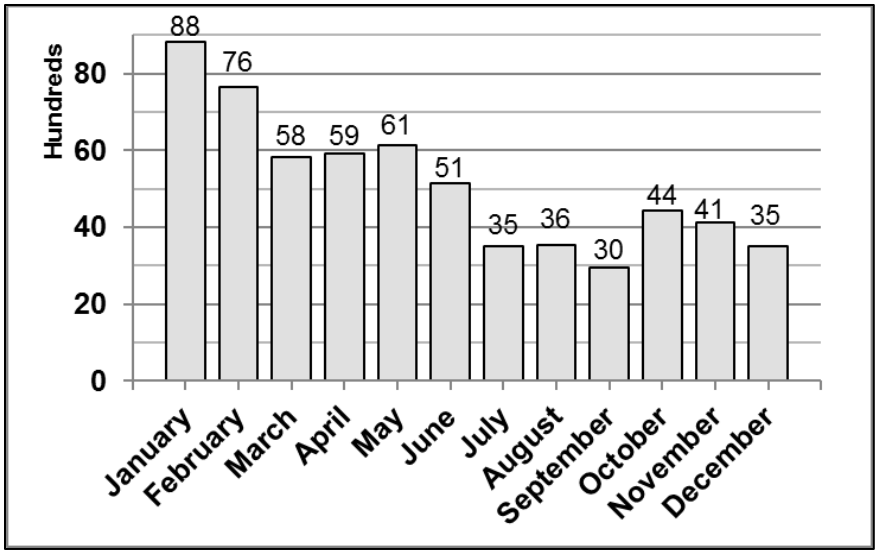

Figure 3
Number of searches (monthly average for 2011-2012).

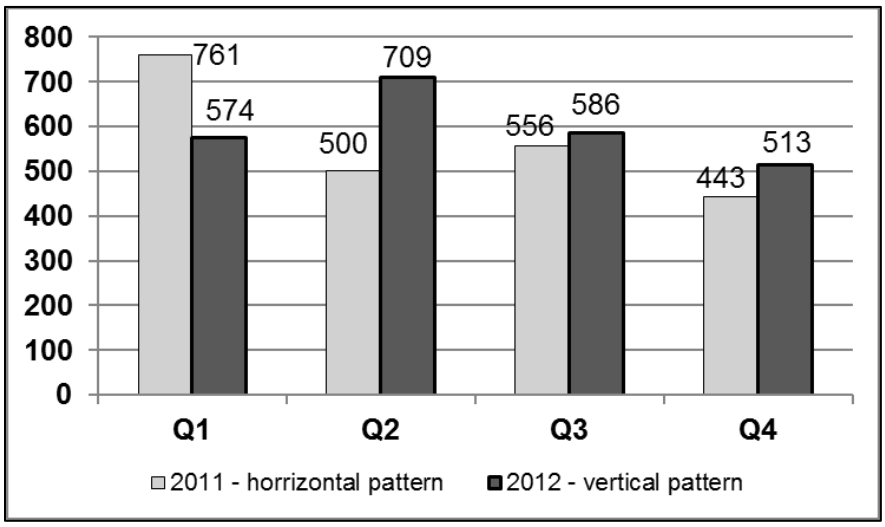

Figure 4
Number of downloaded full-text articles (quarterly in 2011and 2012).

Usage Statistics Results

This section presents the results for the number of searches from a report covering two full calendar years 2011-2012. Figures 3 and 4 show monthly average number of searches, and quarterly number of downloaded full-text articles respectively. Reported number of turnaways (access denied) is zero.

A report on the number of full-text articles and abstracts accessed by journal title for approximately 5000 journals is presented in Additional file (Appendix). This report covers the period from January 1, 2009 through September 30, 2013. A list of the most frequently used journals (top-50) is presented in Table 2.

Table 2
List of the Most Frequently Used Journals[a]

ISSN	Title	Full Text	Abstract	Category
00178012	*Harvard Business Review*	2208	734	NPR
00900036	*American Journal of Public Health*	303	129	PR
00284793	*New England Journal of Medicine*	270	189	PR, E3
08203946	*Canadian Medical Association Journal*	183	177	PR
00084263	*Canadian Journal of Public Health*	129	113	PR
15445208	*Health Affairs*	123	139	PR
00028614	*Journal of the American Geriatrics Society*	118	74	PR, E12
03092402	*Journal of Advanced Nursing*	118	40	PR, E12
01628968	*Inc.*	114	5	NPR
13558196	*Journal of Health Services Research and Policy*	112	64	PR, E12
1357633X	*Journal of Telemedicine and Telecare*	94	9	PR
07067437	*Canadian Journal of Psychiatry*	89	59	PR
01607480	*Modern Healthcare*	86	47	NPR
09269630	*Studies in Health Technology and Informatics*	69	49	PR, E12
10688838	*HandHN: Hospitals and Health Networks*	69	25	NPR
00034819	*Annals of Internal Medicine*	68	44	PR
11707690	*PharmacoEconomics*	67	31	PR, E6
01406736	*Lancet*	66	154	PR
0887378X	*Milbank Quarterly*	64	40	PR, E12
17561833	*BMJ: British Medical Journal*	63	115	PR, E3
10966218	*Journal of Palliative Medicine*	62	29	PR, E12
14726963	*BMC Health Services Research*	58	50	PR
13652702	*Journal of Clinical Nursing*	55	23	PR, E12
13869620	*Health Care Management Science*	54	33	PR, E12
09660410	*Health & Social Care in the Community*	53	21	PR, E12
13561294	*Journal of Evaluation in Clinical Practice*	53	19	PR, E12

01958631	*Health Care Financing Review*	53	15	PR
07350732	*Healthcare Financial Management*	51	40	PR
09652140	*Addiction*	51	13	PR, E12
00197939	*Industrial and Labor Relations Review*	50	21	PR
14712458	*BMC Public Health*	48	29	PR
10792082	*American Journal of Health-System Pharmacy*	48	18	PR
1477030X	*Palliative Medicine*	48	14	PR
07461739	*Nursing Economics*	46	20	PR
00333107	*Psychology Today*	46	8	NPR
03190781	*Toronto Star* (Toronto, Ontario)	43	32	NPR
00130613	*Economist*	42	24	NPR
1095158X	*Psychiatric Rehabilitation Journal*	42	24	PR, E12
87569728	*Project Management Journal*	41	39	PR, E12
03616878	*Journal of Health Politics, Policy and Law*	40	40	PR, E12
14756773	*Health Services Research*	40	34	PR
00413674	*Trustee*	40	31	NPR
00296570	*Nursing Standard*	40	25	PR
10903127	*Prehospital Emergency Care*	38	16	PR, E18
10786767	*Journal of Health Care Finance*	37	19	PR
08982759	*Physician Executive*	37	14	PR
00048674	*Australian and New Zealand Journal of Psychiatry*	36	16	PR
08835381	*Healthcare executive*	35	24	NPR
15414469	*International Journal of Health Services*	34	44	PR, E6
08949867	*Journal of Traumatic Stress* (Wiley)	34	23	PR, E12

[a]Abbreviations in Table 2: PR – peer-reviewed, NPR – non-peer-reviewed, E – embargoed with indication of the delay in months.

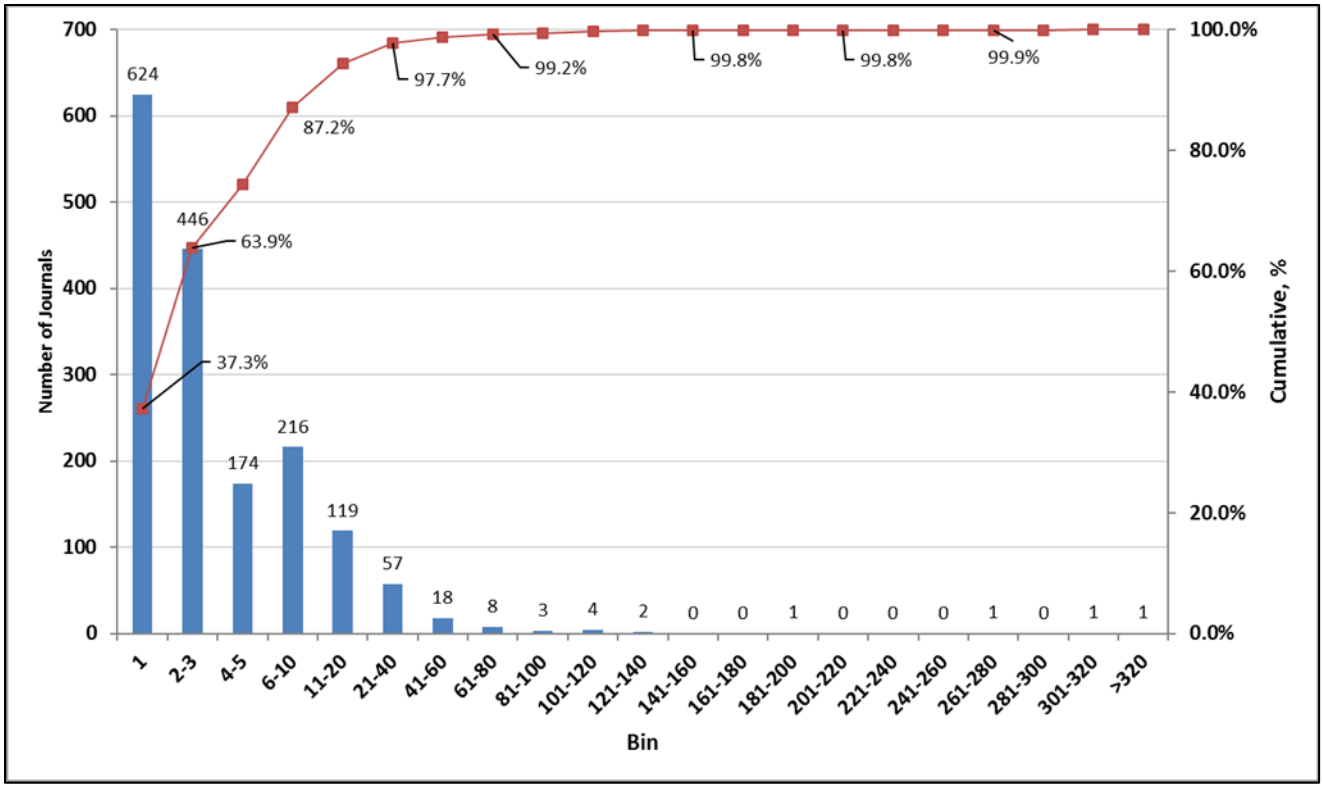

Figure 5
Distribution of the number of journals falling into journal groups with similar numbers of full-text downloads.

Based on the usage statistics, a histogram was developed. Figure 5 shows distribution of the number of journals falling into journal groups with similar numbers of full-text downloads. The horizontal axis is non-linear for better visual presentation.

Discussion

Figures 3 and 4 are interrelated and are built in a COUNTER-compliant way (searches, and downloads).

Figure 3 shows the number of searches per month. During 2011-2012, there were over 123,000 searches with monthly averages of 5,129. Smaller increments of time have been used to reveal usage patterns on a relatively short data period of Dataset 1. It should be noted that this was the first effort to collect data and analyze JAC usage. There was no prior information about the usage: whether the system had been used only from time to time (e.g. to support decision-making for an important health care policy or regulation) or whether it had been used at all.

It should be acknowledged that the charts are not exposing unexpected trends. Figures 3 and 4 can be interpreted along the following lines. The data provides evidence that December is a slowdown period in JAC use (minimum number of searches). This is quite understandable due to a number of statutory holidays and traditional vacation time. In January and February users increase JAC activity (usage numbers show a steep rise) to make up for a slow year-end and to retrieve information that they need in planning for the next fiscal period (April 1 is the starting date for the government of Ontario fiscal year). Usage during all other months of the year does not display large variations. JAC usage demonstrates a steady level of activity most of

the year, i.e. it has become part of routine government knowledge-management processes.

The number of full-text articles, either downloaded in PDF format or viewed on the computer screen in HTML, characterizes the desired output of the system. Figure 4 demonstrates the actual consumption of information in JAC databases: in 2011-2012, over 4,600 full-text articles were accessed. During the same period of time more than 5,800 abstracts were accessed. This indicator is secondary, keeping in mind that the main purpose of JAC is to provide access to full-text articles. However, the fact that the user accessed the abstract could be seen as an evidence of interest that the user had in the article but full-text may not have been available. If a journal, not available in full-text, has experienced multiple abstract viewing, it testifies that this journal should be considered for subscription in full-text version.

It was noted that some journals were accessed at abstract level extensively, but had zero full-text downloads. That may demonstrate that these journals publish pertinent articles but are not available with full-text. The ten journals that were most frequently accessed in this way (from 117 to 30 times) were: *JAMA – Journal of the American Medical Association, Healthcare Quarterly, Medical Care, Healthcare Papers, Health Policy, Vaccine, Journal of Palliative Care, Diabetes Educator*. MOHLTC may consider exploring subscription to these journals with full-text taking into account cost-efficiency (Botchkarev, 2013).

Usage statistics as numbers of full-text articles and abstracts of individual journals for the period from 2009 to 2013 are presented in Additional file (Appendix). Usage statistics for the top-50 most frequently used journals are shown in Table 2. This data shows that MOHLTC users accessed 12,790 full-text articles and 14,517 abstracts. A total of 4,759 journal titles were accessed including 1,675 journals with full-text. The *Harvard Business Review* is by far the most frequently used journal – it was used seven times more than the second-ranked journal: the *American Journal of Public Health*.

Table 2 demonstrates that the most frequently used journals include both peer-reviewed (82%) and non-peer-reviewed (18%) periodicals. Approximately 50% of the most frequently used peer-reviewed journals have embargoes from 3 to 18 months, predominantly 12 months.

The histogram presented in Figure 5 indicates spread of usage across multiple journal titles. Usage does not demonstrate a "core" set of journals There are only 10 journals with over 100 downloads each. The total number of downloads from these journals is 3,678. Similarly, there are only 30 journals that were accessed in full-text format 50 times or more. These journals contributed only 38% (4,953) of the accessed articles. Of the accessed journals, 54% (908 titles) were accessed with full-text only once or twice. This group contributed 1,192 articles (9%). This pattern of usage can be attributed to the following factors. First, there is an increasing amount of research being conducted that triggers a persistently growing number of publication outlets. Second, MOHLTC has a very broad area of responsibilities with dynamically changing priorities, which translates into the diverse information needs of its employees. A practical conclusion from the usage analysis is that MOHLTC information needs cannot be mapped to a reasonably compact set of "core" journals with a subsequent subscription to those. In this case, subscription economics necessitate the use of journal aggregators, e.g. EBSCO, Gale, etc., as the main source of journal access acquisition (Botchkarev, 2013).

Certain JAC user feedback is notable. This information has been collected in non-structured conversations with clients and is not supported by quantitative assessments. Despite availability and actual use of thousands of journals, there is a need to (i) expand access to more peer-reviewed journals, (ii) expand access to more journals with full-text articles, (iii) explore

opportunities to reduce embargoes. Some users expect immediate online access to the full-text articles of interest, requesting no abstract-only, no delays/embargoes content. If these expectations are not met, user satisfaction might decline rapidly.

The focus of this empirical study is on usage statistics in terms of number of downloads, etc., which represent the outputs of the JAC solution. There is no implication or judgement about the value that JAC collections provide to users. This study is the first step in assessing value to the users and organization. It needs to be emphasized that there is no rationale to judge the value of JAC collections through the rate of downloads per user (high or low – good or bad) because there is nothing to compare to either in MOHLTC or in other organizations (e.g. commonly accepted benchmarks do not exist). To assess value, we would need to consider the outcomes of higher-level processes.

The findings reported in this paper can be used in various government organizations to implement journal subscriptions strategies that will better meet ministry employees' information needs and contribute to cost-efficiency of operations.

Study Assumptions and Limitations

To the best of our knowledge, this is the first study to address usage statistics for online journal databases in a Canadian ministry of health. However, this study has certain limitations that should be made explicit.

Use of JAC implies that its collections are of interest for the MOHLTC employees. However, numbers of article downloads may not be equal to actual use or satisfaction – users may download an article and find it worthless for their task or they may be unhappy because they did not find specifics they needed.

JAC statistics used in this study have been downloaded from the EBSCO reporting site. This data is based on the automatic logs and is believed to be very accurate. However, the following should be noted.

Firstly, JAC is not an exclusive channel of information for MOHLTC users. Some users have access to online journals at local universities through their alumni connections. Others have access to journal repositories based on their memberships in professional associations. Certain departments used to have subscriptions to publications in their specific narrow fields. As a result, documented in the study number of downloads represents a lower border of actual downloads.

Secondly, JAC is using EBSCO integrated search services that allow access to the databases that are owned by EBSCO, and those of the third parties external to EBSCO. Search results presented to the user include both internal and external documents. When a person clicks on the link to an external database, he/she is transferred to the document in the external database. As soon as a person moves to an external database, EBSCO usually does not have information about what is happening there, and so cannot include activity in the report. That pertains especially to full-text documents. As a result, JAC statistics may be missing data on the use of full-text documents in external databases. An example of this situation could be statistics on the use of the Cochrane database shown in the Additional file (Appendix). JAC has a direct subscription to the Cochrane database with full-text documents, which makes it external to EBSCO. The usage statistics indicate zero downloads of Cochrane full-text documents. However, this is misleading as it has been verified through conversations with JAC users that the Cochrane database actually has been used.

Thirdly, in some cases, EBSCO usage reports are not perfect. There were a certain number of duplications of journal titles in the initial version of Additional file (Appendix). For example, (i) some titles were duplicated because of using

different online and print ISSNs (e.g., *Academic Emergency Medicine: Official Journal Of The Society For Academic Emergency Medicine*: Usage was attributed to one title. Another was deleted); (ii) some titles were duplicated because in one case the title had an ISSN and in another the ISSN was blank (e.g., *The Academy of Management Executive*: Usage was attributed to one title. Another was deleted); (iii) some titles were duplicated because of spelling mistakes (e.g., *American Journal of PublicHealth* vs *American Journal of Public Health*); (iv) different title abbreviations were used – most likely in different databases – (e.g., *BMC HEALTH SERVICES RESEARCH* vs *BMC Health Serv Res*); (v) Use of & instead of AND; (vi) using titles with or without the definite article; and (vi) just typos.

Fourthly, it was shown in annual customer surveys (not reported in the current paper), that JAC users were not satisfied when search results contained a large number of articles with abstracts only. It took additional time to look through several pages of search results to find articles with full text. In March 2012, according to the recommendation of the JAC Content Selection Advisory Network, the JAC default search was configured to present full-text articles only. If a researcher was willing to analyze additional abstracts-only articles, he/she could adjust the search configuration. That may have decreased the number of retrieved abstracts from the second half of 2012.

Conclusions

This is the first paper, to our knowledge, to examine usage statistics for online journal databases in a ministry of health.

The Ministry of Health and Long-Term Care built and has maintained the Journal Access Centre – an online access tool supported by journal content selection, acquisition and consultation services. As a key prerequisite for evidence based policy-making, JAC enables access to approximately 12,000 journals with full-text articles.

JAC usage statistics for the 2011 – 2012 calendar years demonstrate a steady level of activities in terms of searches with a monthly average of 5,129. JAC's steady level of activities, revealed by the study, reflects a continuous demand for the JAC services and products. It testifies that access to online journal databases has become part of routine government knowledge-management processes.

The number of downloaded full-text articles characterizes the desired output of the solution. JAC usage statistics demonstrate that the actual consumption in 2009-2013 was over 12,790 full-text articles or approximately 2,700 articles annually.

Usage statistics helped to identify a list of journals that were accessed at abstract level extensively (117 to 30 times), but had zero full-text downloads. That led to a practical recommendation to consider subscription to these journals with full-text, taking into account cost-efficiency.

JAC usage statistics for the period 2009-2013 provide evidence that a total of 4,759 journal titles were accessed including 1,675 journals with full-text. MOHLTC's broad area of responsibilities with dynamically changing priorities translates into the diverse information needs of its employees and a large set of required journals. Usage statistics indicate that MOHLTC information needs cannot be mapped to a reasonably compact set of "core" journals with a subsequent subscription to those. In this case, subscription economics necessitate the use of journal aggregators (e.g. EBSCO, Gale, etc.) as the main source of journal access acquisition.

Future efforts could be focused on studying: (i) usage statistics complemented with data beyond EBSCO reports and covering all sources of online academic journals available in JAC; (ii) usage statistics by individual EBSCO databases,

e.g. MEDLINE, CINAHL, etc., and category of journals, e.g. peer-reviewed, non-peer-reviewed, embargoed, etc.; iii) in-depth usage of information sources and patterns of behaviour at the level of individual article as compared to the journal title level in this paper; (iv) JAC users' information needs and preferences; (v) JAC's usability through the customer satisfaction survey; and (vi) development and examination of a model of a value creation chain which would integrate JAC outputs with outcomes of higher-level processes of analyzing retrieved information and making evidence based decisions.

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Appendix

Additional file: JAC Usage Statistics by Journal Title 2009-2013