

# Technology as the Key to Women's Empowerment: A Scoping Review

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## Research article

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## Abstract

Background: The achievement of gender equity and equality has been a long-time goal of many international entities. The main indicator for the goal of women's empowerment, as part of the Sustainable Development Goals (SDGs), has been to enable the use of technology by increasing the current access for women and girls across the globe. While information and communication technologies (ICTs) were initially thought to be neutral in terms of access and opportunity, emerging trends now indicate that the use of technology within society has significant social implications, specifically related to gender as a determinant of health. Methods: Using the Arksey and O'Malley methodology for scoping reviews, the following question was answered: What is the impact of information and communication technology (ICT) on the level of women's empowerment worldwide? The primary objective of this scoping review was to identify the extent, range, and scope of evidence involving the impact and influence of ICTs on women's empowerment. A total of 51 articles were analyzed using the scoping review framework. Results: The major themes that emerged from this review included: (a) the means in which ICTs have assisted in building the capacity and tools of women, (b) the manner in which ICTs have been used as an intervention in supporting empowerment; and (c) the approach in which ICTs can act as potential barriers and facilitators to women's attainment of agency. Conclusions: The evidence from this scoping review supports the innovative use of current and emerging technologies within health care to connect with, engage, and empower women both within the acute and community settings. The extant evidence explores how ICT has played a role in the promotion and support of women's empowerment as well as supporting the development of health care policies and relevant programs.

## Background

The achievement of gender equity and equality has underpinned many development initiatives and philosophies of many international entities. The transition from the Millennium Development Goals to the Sustainable Development Goals (SDGs) in 2015 saw the emergence of Target 5 which articulates the imperative to "Achieve gender equality and empower all women and girls" (p. 20).<sup>1</sup> One of the main indicators supporting achievement of the goal of empowerment is "enhancing the use of enabling technology by increasing the proportion of women and girls who have access" (p. 20).<sup>1</sup> Information and communication technologies (ICTs) have made communication and networking a possibility between and among people on a global scale. While ICTs were initially thought to be neutral in terms of access and opportunity, emerging trends have increasingly shown that the uptake and use of technology within society have significant social and gender implications.

Women across the globe are more likely to experience the social determinants of health less favourably than their male counterparts. Gender, as a social determinant of health, is influenced by the "gendered" norms of the roles, personality traits, attitudes, relative power, and influence that society ascribes to gender.<sup>2-3</sup> The standardization of measurements for what constitutes the poverty line, calculation of income, scales that adjust for differences, and metrics for composition of households are inconsistent at best and lacking at worst. Women carry the bulk of responsibility for raising children and meeting household obligations, which, globally, contribute to this continued disadvantage.<sup>4-6</sup> Due to a lack of affordable and quality daycare, women are over-represented in the part-time work force, and often remain within the low-income bracket.<sup>4-7</sup> In addition, data from an International Telecommunication Union (ITU) survey indicated that women have less access to technology overall, and, as a result, their usage is less than their male counterparts.<sup>8</sup>

A recent Status of Women Canada report indicated that lone female parents, unattached women aged 45–64, recent female immigrants, off-reserve Aboriginal women, and women with disabilities are all considered to be at-risk groups likely to experience persistent low-income.<sup>9</sup> This finding is echoed across many countries in which women are dependent on their spouses for economic resources.<sup>10</sup> Furthermore, as women are more likely to engage in unpaid labor, women often cannot readily access household funds.<sup>10</sup> Cultural norms and power differentials reinforce this inequitable division of economic resources which continues to perpetuate the gender gap.

Information and communication technologies have made communication and networking a possibility between and among people on a global scale. Since their inception, ICTs have generally been viewed as gender neutral, impacting both men and women equally and without social implications.<sup>11-14</sup> Since the 1970s, ICTs have been understood to have significant social implications as the access to, and experience of, technologies are directly related to power relations within communities, nations, and organizations.<sup>15-17</sup> Individuals with the most knowledge, capital, and status in society tend to adopt and utilize technological innovation quicker than those who are less educated and less wealthy.<sup>18-19</sup> Information and communication technologies can provide a plethora of opportunities for women by enhancing their entrepreneurship, economic gain, education, as well as health and safety.<sup>20-22</sup>

Hence, this research explored the breadth of existing evidence on the use of ICTs and their global impacts on women's empowerment. As such, the objectives of this research were: to identify the extent, range, and scope of the published and grey literature on ICTs and women's empowerment; to identify the links or connections made within the evidence regarding how ICTs are being used to address women's

empowerment; and to explore the gaps in knowledge and research on this topic from a nursing lens, at the individual, community, and global levels.

## Methods

This research used a scoping review, which is methodologically similar to a systematic review, to provide a rigorous knowledge synthesis.<sup>23-24</sup> For the purpose of this study, the scoping review framework used was described by Arksey and O'Malley<sup>25</sup> as a five-step process with an optional sixth step. These steps include: (a) identifying the research question, as the starting point and as the launching point to guide the search strategy; (b) identifying relevant studies, which involved the development of a comprehensive search strategy to ensure accurate and complete results; (c) selecting studies, which involved developing a-priori inclusion and exclusion criteria that were revised throughout the review, as familiarity with the evidence increased; (d) charting the data, which involved charting and sorting key material from the results into themes and trends; (e) collating, summarizing, and reporting the results, which involved presenting the results as a visual and/or narrative; and finally, (f) consulting with relevant stakeholders, which is contingent upon feasibility as well as time and resource considerations. For the purposes of this research, the sixth step was not performed.

### Review Protocol, Team, and Expertise

To ensure transparency, rigour, reproducibility, and consistency, a-priori protocols were developed for the inclusion criteria, search protocols, and data characterization utility form. These are available upon request. The scoping review was conducted by a team of individuals with multi-disciplinary capability in nursing, knowledge synthesis methodologies, and ICTs. In addition, a University librarian was consulted throughout the search term selection process to ensure completeness and accuracy of search terms contributing to a comprehensive and complete search strategy.

### Review Question & Scope

Using a scoping review methodology, the following question for this research was addressed: What is the impact of ICTs on the level of women's empowerment worldwide?

### Search Strategy

To ensure identification of relevant and suitable publications, a search strategy was developed a-priori to retrieve evidence from a variety of sources. As per Arksey and O'Malley<sup>25</sup>, the following avenues were reviewed as part of the search strategy: searching relevant electronic databases, reviewing reference lists of pertinent articles to identify additional sources, and manually searching key journals.

To ensure the search was comprehensive, the following databases, available via the University of Saskatchewan library, were searched on November 30, 2016 and updated on January 1, 2018: Scopus, Embase, ABI Inform, Soc Index, Sociological Abstracts, Gender Studies, Springer Link, PsychInfo, Science Direct, and Academic Search Complete. The COCHRANE Library was also searched for any relevant trials in the trial registry. Limits placed on the search included: English only, no book reviews, publication dated 2012-2017, and the protocol was pretested in Scopus and Soc Index using select key words including "women" and "empowerment" and "technology." An illustration of the search term strategy can be found in Table 1.

Table 1: Search Term Strategy

Women Search Terms	ICT Search Terms	Empowerment Search Terms
*searched with OR	"AND" *searched with OR	" AND" *searched with OR
Wom?n	Technolog*	Empower*
Female*	Information technolog*	Disempower*
Girl*	"information communications technolog*"	Barrier*
Maternal	"ICTs"	Enable*
	"social media"	Self concept
	mobile	Self efficacy
	handheld	Capacit*
	telehealth	Emancipat*
	computer	
	Smartphone	
	Digital	
	Internet	
	Telecommunication*	
	"world wide web"	
	Laptop	
	ICT4D	
	"web-based"	
	Iphone	
	Ipad	

Legend: \* at end of word = truncation, any number of letters (e.g. capacit\* will find capacity or capacities); ? at end of beginning of word is used to represent one or more other characters in a search term (e.g. wom?n will find women or woman).

**Limits included:** 2012-2017, English language, no books/book reviews

Search terms were drawn from the research question and expanded upon based on a cursory search of two databases. To determine the range and breadth of key terms, an initial limited search of two databases was conducted yielding several papers. These papers were then analyzed for similar keywords, definitions, analogies, and index terms that were relevant synonyms to the initial search words.<sup>26-27</sup> These additional terms were added to a master list that informed the final search strategy.

The ability of the electronic database search to identify all relevant primary research was verified by hand searching the reference lists of eight key peer reviewed articles and nine key electronic journals that were flagged through the initial test search as well as the main search. The journals were chosen based on their relevance to the research question as well as their scholarly nature. The initial three identified journals were: *Community Informatics*, *Gender and Development*, and *Journal of Women in Culture and Society*. Subsequent journals were identified and selected for a hand-search once the initial search was completed. These were: *Gender, Technology & Development*, *Computers in Human Behaviour*, *American Journal of Health Behaviour*, *American Journal of Public Health*, and *Women's Health Issues*. These journals were then evaluated for additional research potentially not identified via the database search.

Additional grey literature was identified by hand-searching the websites of the Association for Computing Machinery Digital Library Journals and Conference Proceedings, the UN Women, Status of Women Canada, the United Nations Development Programme, the International Center for the Research of Women, the Girls Action Foundation, the Information and Communications Technology Council, the International

Telecommunication Union, and the International Development Research Center for primary research reports, guidelines, situation reports, and referenced publications that were not already included.

### **Study Selection: Relevance screening and inclusion criteria**

Inclusion and exclusion criteria were developed a-priori to screen abstracts and titles of citations. Primary research articles were considered relevant if they included women's empowerment and/or information and communication technology concepts in the title or abstract of the publication. Synonyms for these concepts were created in consultation with the librarian to ensure a robust search strategy for maximum location and inclusion of studies. To ensure the feasibility of the search, specifically related to the number of possible results, the timeframe of 2012-2016 had been chosen, which was later expanded to December 31, 2017 as the review progressed. The results were also filtered to include English only content.

The remaining articles were then reviewed again by applying two additional levels of inclusion criteria. This set of inclusion criteria first focused on technology as an intervention in the study as well as women as active participants in the study, and secondly included how the social determinants of health were present in each study and supported the triad of concepts - women, empowerment, and ICTs.

### **Study Characteristics, Extraction, and Charting**

Each selected article was summarized in a customized data characterization utility form to guide data extraction. The goal of this step was to determine and chart factors to be extracted from each article to help answer the research question.<sup>24-25, 28</sup> The charting of data was an iterative and exploratory process in which the data charts were continuously updated to ensure completeness and accuracy.<sup>24, 28</sup> Examples of form characteristics included year of publication, country of study, implications for policy and practice, types of ICT interventions, demographics, empowerment (definition, as a design consideration, and measures), and social determinants of health (presence and description within in the study).

The data was then mapped using tabular and visual presentations of the main conceptual categories followed by a narrative summary describing how the results related to the research question and objectives.

### **Scoping review management and analysis**

Any and all potentially relevant citations identified throughout all stages were then imported into EndNote<sup>TM</sup>, a reference management software, where duplicates were removed by the program and then double checked, with manual removal by the masters candidate; the list of citations was then imported into a web-based electronic systematic review management platform, DistillerSR<sup>TM</sup>. The relevance screening up to the data extraction stages were conducted within this software. Two reviewers were used throughout the selection and analysis process to ensure consistency, adherence to the inclusion/exclusion criteria, relevance to the research question, as well as the categorization of data into themes and trends.

## **Results**

Of the 4481 abstracts and titles that were reviewed, initially 57 were considered potentially relevant. The full text was obtained, and relevant data was extracted and categorized to result in 45 full text articles in English. Due to the gap in the timeline as to when the review began, there was a need to complete re-run searches for each database up to January 1, 2018. A total of 573 articles were found and through the use of inclusion and exclusion criteria, all but six new articles were eliminated. The final total of articles included within the analysis was 51 (Figure 1).

### **Figure 1: PRISMA Flow for Screening Process**

Collation and comparison of demographics was difficult due to a lack of consistency in the reporting. However, all articles described the demographics of women who were the primary focus of the study. The demographic presentation within the majority of studies was perinatal/pregnant/post-partum populations, accounting for 21.5% (11/51) of all studies. The second most common demographic was women experiencing disease specific issues (17.6% [9/51]). The standardization of groupings is important as it may increase generalizable comparisons and data sharing across future research.

All studies considered the concept of empowerment in their study design; approximately 80% (41/51) of articles considered empowerment as a primary outcome of the study. However, only about 20% (10/51) of the studies that utilized a measurement of empowerment followed this measurement through their study design and potential outcomes.

In the included studies, the concept of empowerment was used incongruously with terms like self-concept, self-esteem, and self-worth, sometimes by the same author in the same study, which future challenged achievement of a uniform definition for the purposes of this research. Less than one quarter (12/51) of the studies used the term “empower(ment)” in their definition of the concept of interest. These studies defined empowerment as a process but with different foci: as individuals having choice or control over their decisions<sup>29-36</sup>, as being multi-dimensional and influencing a variety of areas.<sup>32, 35, 37-38</sup> or with a focus on building individuals’ capacities, including internal and external resources.<sup>37-40</sup>

The remaining studies described empowerment in a more indirect way, never including the term “empower” or “disempower.” Instead, the term empowerment was described synonymous terms, for instance, over half (28/51) described the concept of empowerment as the process of enabling a sense of self-efficacy or self-worth in the ability to overcome barriers to resources, as well as the barriers to decision-making control.<sup>41-68</sup> One fifth (11/51) described empowerment as the process enabling a sense of self-efficacy or self-worth in the ability to overcome barriers to control over resources.<sup>69-79</sup>

### ICT Interventions to Support Women’s Capacity and Tools

The articles described a range of supportive ICT interventions. The frequency of specific interventions within the 51 articles can be found in Figure 2. The categorization of ICT interventions is illustrated in Table 2.

**Table 2: ICT Categorizations**

ICT Categorization	Description
Outreach	Supporting women where they are at in the community, in terms of their social position, to enhance positive health behaviours with technological assistance, as well as overall enhanced accessibility to ICTs.
Education	Supportive ICT interventions that delivered various health information, through smartphones or other web-based devices
Lifestyle	Supportive ICT interventions that focused on behavioural outcomes related to general lifestyle areas, using web-based devices. Commonly, these interventions provided some form of external support for women to improve their overall way of being healthy.
Health Challenges	Focusing on the use of web-based devices to support specific health challenges. These health challenges were largely focused on ways to enhance maintenance of women’s health, in a variety of ways. The health challenges specified are concentrated on those that affect females versus males.
Prevention	Focused on preventing specific health challenges using web-based devices. This section focused largely on preventing health challenges that are specific to women’s issues.
Perceptions of Barriers	Focused on the perceptions of barriers to ICTs that assist women in advancing in their understanding and use of ICTs

**Figure 2 ICT Interventions to Support Women’s Capacities and Tools**

### Achieving Empowerment

Many articles (12/51) described a range of barriers to using supportive ICTs to empower women. These barriers included community (economic, literacy/usability, other) <sup>30, 56, 58, 67</sup> and individual (economic, information access, connection with others) <sup>37, 40, 52-53, 55, 57, 59, 60</sup> perceptions. Similarly, over half of the articles (26/51) described facilitating factors in using supportive ICTs to empower women. These facilitators were subdivided as community (literacy/usability, access, socioeconomic, self-efficacy) <sup>29-30, 35-36, 49, 63, 66, 67, 71</sup> and individual (self-efficacy, socioeconomic, knowledge access, social support) <sup>32, 37-39, 43, 45-46, 50, 54, 57, 60, 62, 67, 72, 75, 76, 78</sup> perceptions.

Many articles (24/51) also described positive outcomes of using supportive ICTs to empower women. These included community <sup>32, 34-36, 40, 41, 45, 48, 56, 60, 75</sup> and individual <sup>29, 31, 46-47, 51, 54, 59, 61, 64, 68, 73, 79, 77</sup> perspectives, such as increased sense of self-efficacy, health promotion, and improved knowledge access as well as enhanced socioeconomic status.

### **Attaining Agency**

The impacts of supportive ICT outcomes on the level of women's empowerment in attaining agency were describe in 20 of the 51 articles <sup>31, 40-43, 47, 49, 52, 55, 62, 64, 65, 67-68, 70, 73-74, 76, 78-79</sup>. These impacts reflected potential facilitators for future research and programs, as well as described obstacles. The evidence informed potential research strategies on the pathway to agency. A consideration of the importance of generational preference and knowing improved uptake and use of ICTs. Low income and minority women often lacked funds, transportation, and time to travel for health information, so delivering content via digital messaging was key. Another key consideration is developing and implementing ICTs in tandem with government policies that support women to take action in improving their day-to-day lives. Further to addressing the determinants of health, ICTs have the potential to be used as tool for knowledge translation and evaluation to address attitudes, barriers, and facilitators in developing behavioural changing interventions. Key to this being operationalized is the development of a standardized tool for measuring the level of empowerment experienced by women, which was lacking within the evidence.

## **Dicussion**

Concepts inherent within the topic of empowerment and ICT were accessibility, affordability, and capability. Most participants across all 51 studies were Caucasian, employed, making between \$40,000 and 90,000 per annum, and had at least some secondary education. Furthermore, exclusion criteria eliminated women not already owning a mobile device, computer, or tablet. This finding reflects a biased view in terms of the population demographics of participants in research studies that aim to advance empowerment. Missing from these studies were the perspectives and participation of women who cannot currently access, afford, and/or purchase an ICT device as well as effectively and fully utilize it to support their empowerment. Women, who do not have access to or who cannot afford ICTs, are disempowered due to a lack of voice and participation within the information society. Exclusion of these women from the research limits measuring the true impact of ICTs on empowerment and generalizability of results. Continued research regarding empowerment involving more advantaged cohorts of women does not address the inherent issues of oppression of women within society and, in fact, further disempowers those under-represented groups.

Empowerment was defined within the evidence by both direct and indirect means. The defining was inconsistent and oblique with only 12 articles including a definition that included the word "empower" or some variant. <sup>29- 40</sup> From the outset of the review, search terms had to include words beyond simply "empower[ment]" as much of the initial searching revealed synonyms including self-efficacy, self-worth, self-concept, and/or capacity. Empowerment is a multi-dimensional and contextual concept that is internal by nature, varies in meaning, and reflects how women self-ascribe. This inconsistency yields a lack of consensus on how empowerment is understood which impacts on how research studies and interventions are structured and delivered to ensure maximum effectiveness and generalizability.

No measures of empowerment were specifically cited within any of the articles, beyond the measures of the behaviour being studied. Several studies included various measures of self-efficacy (i.e., childbirth<sup>74</sup>, physical activity <sup>54, 65, 69, 72, 78-79</sup> intimate partner violence<sup>70</sup>, caregiving<sup>73</sup>, barrier <sup>53-54</sup>, health<sup>76</sup>, and chronic disease management<sup>75</sup>). This lack of specific measures to empowerment reflects a barrier, not only in how strategies for empowerment are understood and implemented, but in how researchers will know whether empowerment has been achieved.

While none of the included studies indicated the broader negative outcomes related to the use of ICT, the literature supports that there is a flip side to using technology to empower women. For example, technological advances are disproportionately accompanied by female-directed cyber abuse. <sup>80-81</sup> Most frequently, cyber abuse included attempts to control a partner, <sup>82,-83</sup> stalking, harassment, extortion, and bullying. <sup>80, 84-85</sup> Women identified concerns with the ability of ICTs to assist their partner in tracking them using global position system (GPS) technology or whether social media settings were following their activity online. <sup>80, 86, 81</sup> This trend in cyber violence calls further attention to the gender inequities and inequalities for women, as well as the significance of gender norms in society.

Empowerment through the vector of ICT has the potential to cross multiple sectors, both private and public. The complexity of empowerment and ICTs, as they relate to the root issues of inequities, support the need for collaborative, multi-sectoral involvement. These partnerships consider the contextual factors that act as facilitators and barriers for women in all types of communities. Interagency partnerships are uniquely suited to develop campaigns or workshops aimed at enabling women to make better use of ICTs. These campaigns should include information on access to education, facilities for education regarding entrepreneurship, employment opportunities, and health and other government health resources. Governments, which partner with public and private telecommunication agencies, through subsidization, could provide discounted or refurbished devices for women who are deemed disadvantaged. Funding may also benefit those who experience difficulty in obtaining mobile devices as well as in accessing programs and workshops aimed at their use. For example, funding is needed to support the cost of transportation to and from workshops, low-cost devices, or the provision of Subscriber Identity Module (SIM) cards. Alternatively, governments should support and encourage private mobile operators through tax exemptions and other benefits to facilitate better mobile services and infrastructure in rural, remote, and urban areas. Providing accessible laptop sites within communities or in schools is another way to bridge the gap in access and use of ICT. These strategies help in improving the overall status of girls and women but also influence overall empowerment and development of the community.

The importance of knowledge regarding deficits in literacy, such as health and digital literacy, and the use of ICTs can inform policies that address gaps in delivery. Literacy skills are a key consideration when developing policies, programs, or other research strategies. As both literacy and digital literacy are at issue, especially among women of poor socio-economic status, policies must evolve which recognize that those with access do not necessarily have the capacity to utilize ICTs to their fullest extent. There are 750 million adults world-wide who lack the ability to read, two thirds of whom are women.<sup>87</sup> Policies and programs must be developed with this reality in mind; for example, providing adult literacy programs and policies that must include training for digital literacy. Policies created to address women's empowerment lead the way for programs that meet the needs of specific populations of women. Better informed programs provide a scaffolding of knowledge and skills to women are needed at the local and national levels to enable women to fully realize and utilize their ICTs. It would be beneficial for stakeholders to integrate literacy concerns into their program planning while embedding literacy support throughout all programs. Funding needs to be provided for libraries or other agencies to provide digital literacy programs or workshops that target women's health, focusing on specific barriers and how to address those using ICTs. The support of governments, both locally and nationally, in this endeavour potentiates improved information access, education, as well as opportunities for employment and entrepreneurship for and by women.

### Limitations

While scoping reviews examine the breadth of evidence available on a topic, they do not factor in the depth or quality of that evidence.<sup>23-25</sup> <sup>28</sup> Some authors have argued that scoping reviews should include an assessment of quality; however, Armstrong et al.<sup>23</sup> contend that this decision should depend on the resources available for the review as well as the purpose of the scoping review itself. The quantity of data that is generated in a scoping review can be significant and so it is important to find a balance between providing an overview of all types of evidence found and providing detailed data and assessment of a smaller number of studies.<sup>25</sup> Scoping studies also lack a thorough evaluation of the quality of results, instead producing a narrative account of all available data.<sup>24-25</sup> This approach serves to ensure that all resulting data is included in the review and does not limit the end number of articles, as in a systematic review. Lastly, to ensure the feasibility of the study and to keep with attainable timelines, the publication timeframe must be restricted.

## Conclusions

Using Arksey and O'Malley's<sup>25</sup> methodological framework for a scoping review, the aim of this study was to explore the breadth of existing evidence, as well as the connections made within the evidence, on the use of ICTs and their impact on women's empowerment across the globe. The issue of empowerment and ICTs is one that carries importance across many disciplines, contexts, sectors, populations, and geographical areas. The range of interventions utilized to support empowerment is infinite and there is no limit as to how ICTs can be implemented into daily lives. These findings and discussion provide a foundation on which future research regarding the concept of empowerment with ICTs can move forward. This study is the first of its kind to provide a comprehensive connection and discussion as to how empowerment is currently defined and operationalized, as well as how empowerment and ICTs come together to support women's ability to elevate their experience with oppression to experiencing empowerment.

Goals for women's empowerment at the international level are lacking the broader picture that is told from a gender inclusive perspective. To reach a goal of empowerment first, the term needs to be consistent, concise, and clear with a partnering framework to support future research and analysis. A comprehensive understanding of how empowerment and ICTs are currently being used to support the complexity of the concepts within society is required. In addition, these concepts need to reinforce and transcend established categories and sectors.

These concepts exist within the lives of women across the globe and as such, future research endeavours should aim to understand this broad complexity if this goal is to be achieved. The formation of partnerships and interagency alliances is critically important to approach this issue on the same broad scale as it exists.

### **Future Implications**

The implications of this research for policy makers and program developers could potentially improve women's access and use of ICTs with the goal of promoting empowerment through supportive interventions. Evidence that women of poor socio-economic status are being eliminated from research studies and programs that claim to support women's empowerment, suggest that access and funding play a large role in policy and program development. Local policies have the greatest potential of improving the uptake of ICTs, as this process occurs initially at the individual level. Policy change needs to begin with a focus on how these resources will address socio-economic and gender issues. Local and national governments need to invest in surveys that inquire how and why women are using technology to support their lives and families. Equally as important is the inquiry of women's perceptions regarding how they prefer to use ICTs to benefit their daily lives or the barriers they experience. A global survey undertaken by the UN Statistics Division in 2011 indicated that only 30 percent of countries regularly produce sex-disaggregated statistics and current data collection does not at all focus on qualitative data collection that would represent the voices of women.<sup>88</sup> Future data should be translated into gender sensitive policies that support equal access and use of ICTs. The development and implementation of such policies should involve representation of women from all socio-economic backgrounds and ages to ensure in-depth results. Examples include policies that allow women to effectively access and participate in ICTs within society, the delivery of ICTs at a reasonable cost for all, as well as policies that regulate the cost and provision of services linked to ICTs such as availability of cell phone, easily accessible WiFi sites, and cost-effective internet plans.

There are implications for policy makers, nurses in all domains of practice, and other health care professionals, who work within a variety of settings across the globe. Opportunities exist for further evaluation as to how empowerment is being measured and used in conjunction with ICTs, as well as which frameworks are being used to guide research in this area. This research also provides guidance for HCPs to assist in reducing barriers for women by improving access to ICTs. This includes the assessment and appraisal of women's current and potential resources, awareness of current and relevant ICTs for varying populations as well as the importance of connecting disadvantaged women with ICTs as a resource for health. Information and communication technologies can have a positive impact on women's ability to develop and utilize resources and to ultimately build capacity. The ability to access resources and build capacity can improve women's competence to make strategic life choices and to achieve empowerment. The social determinants of health and the concept of social justice are the foundation on which these capabilities are built and can serve as a guideline for nursing practice.

## **Abbreviations**

SDG: Sustainable Development Goals

ICT: Information and communication technology

ICTs: Information and communications technologies

WHO: World Health Organization

UN: United Nations

ITU: International Telecommunication Union

GPS: Global Positioning System

SIM: Subscriber Identity Module

## **Declarations**

### **Ethics approval and consent to participate**

Approval from the University of Saskatchewan Behavioural Research Ethics Board was waived for this study as the information retrieved was publicly available.

### **Consent for publication**

Not applicable.

### **Availability of data and material**

Not applicable.

### **Competing interests**

The authors declare that the only competing interest is that Pammla Petrucka is an Editorial Board Member.

### **Funding**

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### **Authors' contributions**

AM was responsible for the design of the research project, data collection, as well as the majority of the data analysis and interpretation. AM was the primary contributor in drafting the manuscript, as well as in making critical revisions.

PP assisted in analyzing and interpreting the data, contributed to the organization and editing of the manuscript, as well as assisted with critical revisions. All authors read and approved the final manuscript.

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## Figures

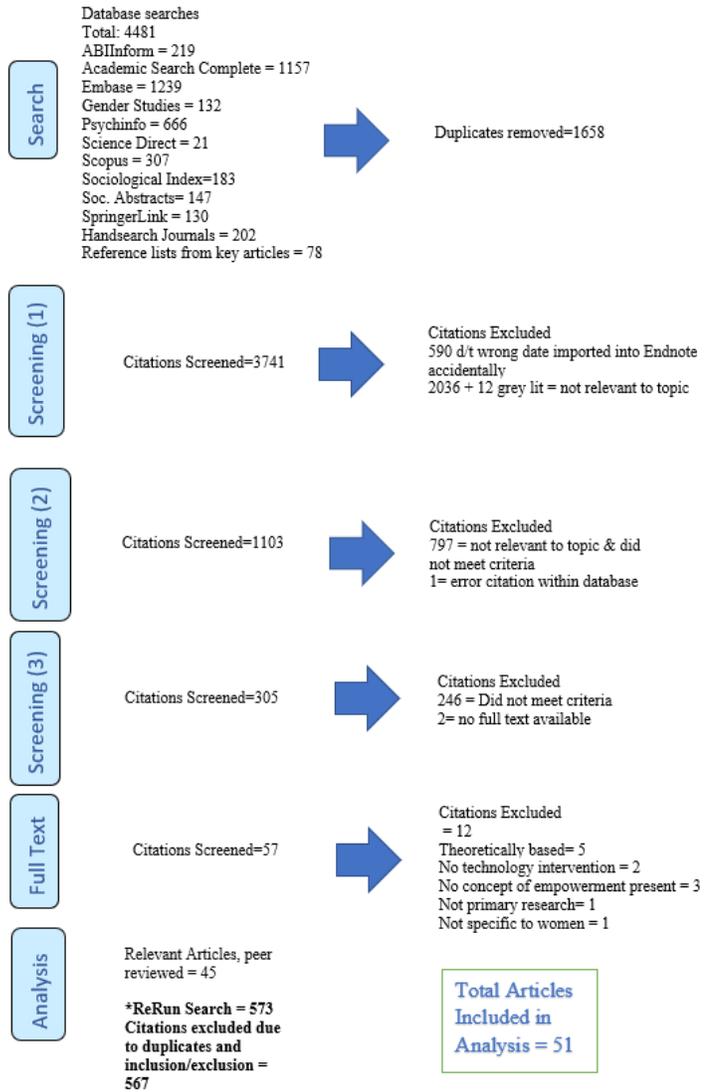


Figure 1

PRISMA Flow for Screening Process

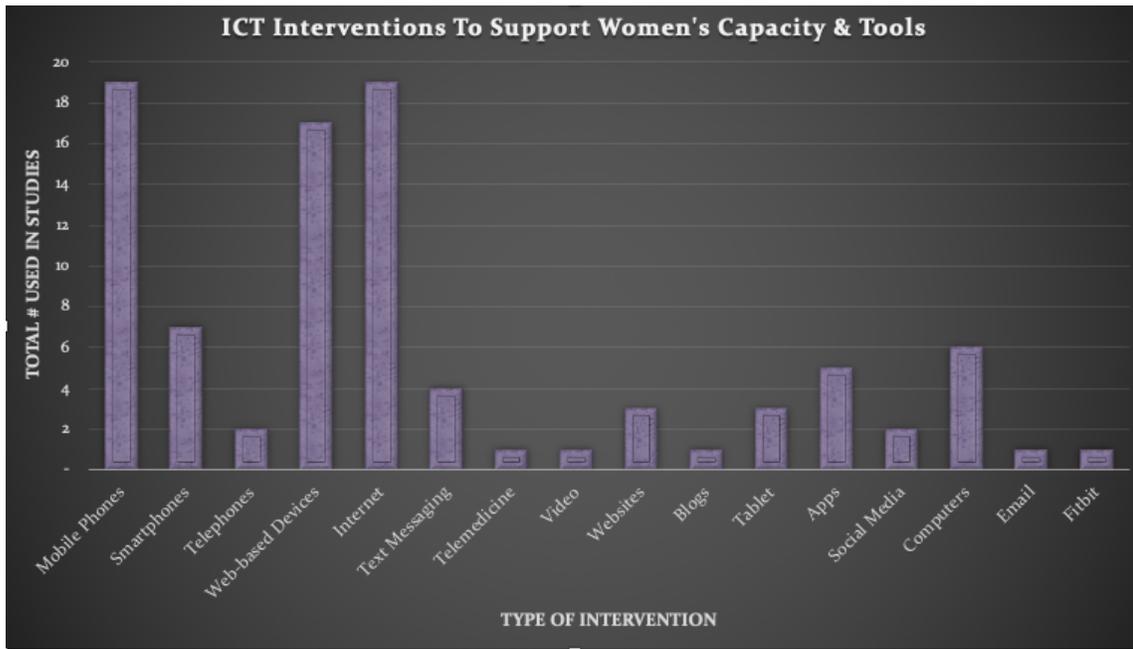


Figure 2

ICT Interventions to Support Women's Capacities and Tools

## Supplementary Files

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- [PRISMAChecklist.pdf](#)