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The emerging use of social media for health-related purposes in low and middle-income countries: A scoping review

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ABSTRACT

Background: Social media allows for instant access to, and dissemination of, information around the globe. Access to social media in low- and middle-income countries has increased exponentially in recent years due to technological advances. Despite this growth, the use of social media in low- and middle-income countries is less well-researched than in high-income countries.

Objective: To identify, explore and summarize the current state of the literature on the use of social media for health in low- and middle-income countries.

Methods: A scoping review was conducted on literature available to December 2017. Six databases were searched, and grey literature was identified through the Google and Google Scholar search engines. Literature was considered for inclusion if it (1) was published in English, (2) was conducted in or in relation to a low or middle-income country, (3) reported on as least one type of social media or social media use generally for health purposes, and (4) reported on at least one aspect of human health. Content analysis was performed to identify themes.

Results: Forty articles met the inclusion criteria. Thirty-one were research articles, and nine were review/discussion/descriptive and evaluative reports. Since 2010, when the first article was published, most of the literature has focused on Asian (n = 15) and African (n = 12) countries. Twitter (n = 11) and Facebook (n = 10) were the most frequently discussed individual social media platforms. Four themes were identified: (1) use for health education and influence (sub-themes were health behaviour and health education); (2) use within infectious disease and outbreak situations; (3) use within natural disaster, terrorism, crisis and emergency response situations; and (4) producers and consumers of social media for health (sub-themes were misinformation, organizational challenges, users' expectations, and challenges of unique sub-populations). Most studies addressed more than one theme.

Conclusion: Social media has the ability to facilitate disease surveillance, mass communication, health education, knowledge translation, and collaboration amongst health providers in low- and middle-income countries. Misinformation or poorly communicated information can contribute to negative health behaviours and adverse health outcomes amongst consumers, as well as hysteria and chaos. Organizations using social media should provide accurate and readable information. Promotion of credible social media sites by governments, health care professionals and researchers, as well as education on the appropriate use of social media, could help to lessen the effect of misinformation. This is a nascent body of literature and future research should investigate the relative effectiveness of various platforms for different users, other potential uses, and pursue a broader geographical focus.

1. Introduction

An increasing number of people worldwide use the Internet in their daily lives in various contexts, including for accessing health information [1]. Early Internet use for health focused on providing traditional patient education for health promotion and disease management [2] while more recently, the importance of online media use (e.g., YouTube) for health education and in times of public health crisis has been highlighted [3]. Recent shifts in trends and availability of technology-based social media services for public health initiatives offer enormous possibilities for health improvement [4].

Social media is a broad concept that encompasses Web-based operations that are used for computer-mediated communication [5]. These websites support functions such as social networking (e.g.,

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Facebook, MySpace, Google Plus), professional networking (e.g., LinkedIn), media sharing (e.g., YouTube, Flickr), content production such as blogs and microblogs (e.g., Tumblr, Blogger, Twitter), knowledge/information aggregation (e.g., Wikipedia), and virtual reality and gaming environments (e.g., Second Life) [1]. Facebook, which was established in 2004, is the most popular of these; in 2015, 72% of online adults globally were users [6] and in 2017 it was estimated that Facebook has approximately 1.8 billion active users [7]. These websites are often called social media platforms and are used to create, debate, modify and share material [8]. Social media allows for instant access to and dissemination of information both locally and around the world, and users have the opportunity to play an active part in the reporting and dissemination of online material [9]. The high prevalence of use emphasizes the potential for social media activities to impact people's knowledge, attitudes and behaviours in both high and low resource settings [10].

Historically, Internet access has been strongly linked to gross national income (GNI) per-capita, with social media use and popularity being limited in low- and middle-income countries (LMICs) [11].[1] However, significant technological gains have been emerging in LMICs [2,10], and with the recent growth and improvement in Internet access, social networking has become more popular in Latin America and the Middle East than it is in Europe and the United States [11]. The rapid improvement in Internet access within low-income settings has been enhanced through 'leap frogging,' which refers to the adoption of a more advanced technology while skipping the preceding stage of technology [12]. Leap frogging is made possible through the lower cost and greater efficiency of the new technology [13] as seen in Africa where cellular networks are expanding rapidly, having skipped installation of hard-wired infrastructures, thus facilitating wireless access to the Internet [14]. In 2015, one third of people across developing nations reported owning a smartphone [11], a fast-growing trend expected to accelerate in coming years.

The potential for health benefits of social media has been demonstrated through research conducted in high-income nations such as the United States, where social media is currently being used in almost every healthcare domain [15] and by an estimated 70% of healthcare organizations [16,67]. Social media has given healthcare professionals effective tools for communicating with populations for the purpose of health promotion and patient education, and has been credited with enabling more effective and responsive healthcare services [16,17]. For example, patients in the United Kingdom have reported that using services supported by social media has resulted in improved communication and shared-decision making, more positive interactions, and a shift towards treating the whole patient rather than just the disease [17].

Descriptions of, and investigations into, the use of social media for health in LMICs emerged only recently in the literature but is accelerating. Therefore, the aim of this study was to identify, explore and summarize the current state of the literature on the use of social media in LMICs for health purposes through a scoping review. The general research questions that guided this review were: (1) What is the current state of literature that addresses the use of social media for health purposes in LMICs? (2) For what purposes are social media being used in LMICs? (3) Who is using social media for health purposes in LMICs? and (4) What are the key issues and implications of social media use in LMICs for health purposes? It is anticipated that the findings of this report will be helpful for healthcare professionals, health organizations, and governments working in the context of low- and middle-income settings, and other researchers concerned with this topic.

[1] For the 2017 fiscal year, low income countries are defined as those having a GNI per capita of less than $1005 per year; middle income countries have a GNI per capita ranging between $1006 and $12,235 per year [65,66].

2. Methods

A systematic scoping review was selected as the best method for evaluating the literature in this project. Systematic scoping reviews are appropriate when the aim is to map the literature or evidence rather than seeking to answer a specific question by looking for only the best available information [18], particularly when the topic is new or varied, or lacks a prior systematic review. Scoping reviews can incorporate a range of literature including published and grey literature [19,20], whereas other forms of systematic reviews analyze empirical evidence from a more narrow body of literature focused on a specific research question with a particular research design [21].

2.1. Information sources

Given the multidisciplinary nature of the topic, a variety of information sources were examined. We searched six electronic databases comprising literature from nursing, medicine, allied health, global health, and social, behavioural, computer and engineering sciences: the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline/PubMed, Web of Science, CAB Direct (CAB Abstracts and Global Health), Compendex Engineering Village, and Compendex Engineering Village 2. Grey literature was identified through searches using the Google and Google Scholar search engines up to page 10. We also hand searched the 'Journal of Health Informatics in Developing Countries' as a specific source directly related to the topic, and screened reference lists of direct hit articles and lists of "similar articles" produced by the PubMed database.

2.2. Search strategy

The search strategy and comprehensive list of search terms were developed by the three authors, assisted by the university librarian. The general search terms were: social media, social networking sites, developing countries, middle-income countries, low-income countries, health, global health, and public health. Table 1 identifies the specific search strategies used for each database and search engine, and number of hits. All searches were conducted during the months of January 2016, November 2016, and for a final time in February 2018 for articles up to December 31, 2017.

2.3. Inclusion and exclusion criteria

Any literature describing the use of social media in relation to health in any low- or middle-income country, including any type of literature whether or not it involved research, among any population group, regardless of date of publication was considered. Therefore, literature was considered for inclusion if the article (1) was published in English, (2) was conducted in or in relation to a low- or middle-income country, (3) reported on as least one type of social media or social media/social networking use generally for health purposes, and (4) reported on at least one aspect of human health. Social media was defined as a collection of Internet-based applications that allow the creation and exchange of user-produced context [22]. We excluded literature that focused only on the *use* of mobile phones and cellular capabilities (i.e., such as telephoning or texting, and not devices that were used for social media access), and articles that focused only on mHealth, which is defined as medical or public health practice supported by mobile devices [23]. Literature that focused on low-income or low-resourced settings within high-income countries, and literature where social media was used solely as a method for data collection with no discussion of its use were also excluded.

2.4. Search results and selection of literature

One author (EH) searched the six selected databases and two search

Table 1
Search Strategy and Number of Hits for each Database and Search Engine.

Source	N	Strategy
CINAHL	n = 48	((MH "Social Media") OR (MH "Social Networking") OR facebook or twitter or instagram or myspace or blogs or tumblr) AND ((MH "Public Health+") OR (MH 'Health+") OR health) AND ((MH "Developing Countries') OR (MH "Africa+") OR (MH "Asia+") OR (MH "Indian Ocean Islands+") OR (MH "Pacific Islands)) AND (promot[a] OR disease outbreak[a] OR monitor[a] OR surveill[a] OR aware[a] OR map[a])
Medline	n = 49	((blogging/OR social media/OR social networking/) OR (facebook or twitter or instagram or myspace or blog[a] or tumblr)) AND ((Health Education/or Health/or Health Equity/or Global Health/or Health Communication/or Public Health/) OR (health promot[a] or disease outbreak[a] or health monitor[a] or health surveill[a] or health aware[a] or health map[a])) AND (Developing Countries/OR (Africa[a] or Asia[a] or "Indian Ocean Island[a]" or "Pacific Island[a]"))
Web of Science	n = 34	(("social network[a]" OR 'social media') AND health AND developing countr[a]) **(Limited to Health Care Sciences Services and Medical Informatics only option)**
CAB Direct	n = 324	"social media" AND "health" AND "developing countries"
Compendex Engineering Village 2	n = 13**(Search date: January & November 2016)**	({Social networking (online)} WN CV) AND ((((Condition monitoring} WN CV) OR ({Hazards} WN CV) OR ({Health} WN CV) OR ({Health care} WN CV) OR ({Health care–Nursing[a]} WN CV) OR ({Medicine} WN CV) OR ({Medical problems} WN CV) OR ({Nursing} WN CV) OR ({Nutrition} WN CV) OR ({Public health} WN CV) OR ({Telemedicine} WN CV))) AND ({Developing countries} WN CV)
Compendex Engineering Village	n = 21 **(Search date: February 2018)**	((((((Condition monitoring} WN CV) OR ({Hazards} WN CV) OR ({Health} WN CV) OR ({Health care} WN CV) OR ({Health care–Nursing[a]} WN CV) OR ({Medicine} WN CV) OR ({Medical problems} WN CV) OR ({Nursing} WN CV) OR ({Nutrition} WN CV) OR ({Public health} WN CV) OR ({Telemedicine} WN CV)))) AND (1884–2017 WN YR)) AND ((((((Developing countries} WN CV)))) AND (1884–2017 WN YR)) AND ((((((Social networking (online)} WN CV)))) AND (1884–2017 WN YR))
Google	n = 25	(intitle:facebook OR intitle:twitter OR intitle:instagram OR intitle:myspace OR intitle:blogs OR intitle:tumblr OR intitle:"social network[a]" OR intitle:'social media') AND "health" AND ("Africa" OR "Asia" OR "Indian Ocean Islands" OR "Pacific Islands" OR "developing country" OR "developing countries") AND (site:edu OR site:ac.uk filetype:pdf OR site:.gov OR site:.gc.ca OR filetype:pdf)
Google Scholar	n = 15	(("social network[a]" OR 'social media') AND health AND developing countr[a])
Total	N = 529	

[a] Compendex Engineering Village 2 database was not available to the authors in February 2018.

engines yielding 529 individual articles for possible inclusion in this scoping review. After removing duplicate citations (n = 17), titles and abstracts were reviewed for appropriateness resulting in the removal of another 420 articles. Five citations were added from hand searching the 'Journal of Health Informatics in Developing Countries', the reference lists of key articles, and other literature identified through the "Similar Articles" algorithm in the PubMed database (https://www.ncbi.nlm.nih.gov/books/NBK3827/#pubmedhelp.Computation_of_Similar_Articl). The full text of each of the remaining 97 articles was then screened by EH using the inclusion/exclusion criteria, yielding a final sample of 40 articles. Published, peer-reviewed literature constituted 39 of the articles, while one was grey literature. Fig. 1 outlines the systematic process followed for identifying and selecting literature.

2.5. Data extraction and categorization

General and specific information about the 40 articles was extracted including: title of the article; author's name; source of publication; publication year; objectives/purpose of the piece as stated by the author; characteristics of the focal population; country/geographical focus; type of literature (e.g., research, non-research); research methods used (if applicable); health focus; type of social media; reported findings (if applicable); and authors' recommendations (e.g., future potential and implications for research). Data extracted from each article were recorded in an Excel worksheet in order to categorize and compare characteristics. For example, type of social media was categorized as Facebook, Twitter, YouTube, and social media used as a general term; and health foci were categorized as infectious disease, disaster relief, prevention, chronic disease management, and behaviour change campaigns. As this was a scoping review and the focus was not on the best available evidence, risk of bias and overall quality were not assessed.

2.6. Analysis

Analysis and synthesis occurred along two lines. First, we analyzed and summarized the general characteristics of the articles. Further analysis and synthesis of the articles was then undertaken to answer the research questions that guided this study and to identify the emerging themes that presented in the selected literature. Characteristics of each article were analyzed through several readings of each piece and coded into groupings of similar thematic categories recorded in the Excel worksheet. All three authors reviewed the 40 articles and achieved consensus on the analysis and synthesis.

3. Results

3.1. Summary of the selected literature

Question 1 was addressed first. Forty articles were identified for this scoping review after utilizing the inclusion and exclusion criteria. A majority of the literature was research-based. Publication dates ranged from 2010 to 2017, with the majority of literature published from 2014 to 2017. Infectious disease surveillance, global emergency response, and the use of social media for health communication were the most common contexts of papers that were published during this period of increased activity in 2014–2017. Four themes were identified: use for health education and influence; use within infectious disease and outbreak situations; use within natural disaster, terrorism, crisis and emergency response situations; and producers and consumers of social media for health. The geographical focus of the literature was centered on Asian and African nations, with little to no emphasis on other low- and middle-income areas of the world. Table 2 and the Table A1 in Appendix A provide an overview of the articles included in this scoping review. The following sections discuss these findings in greater detail.

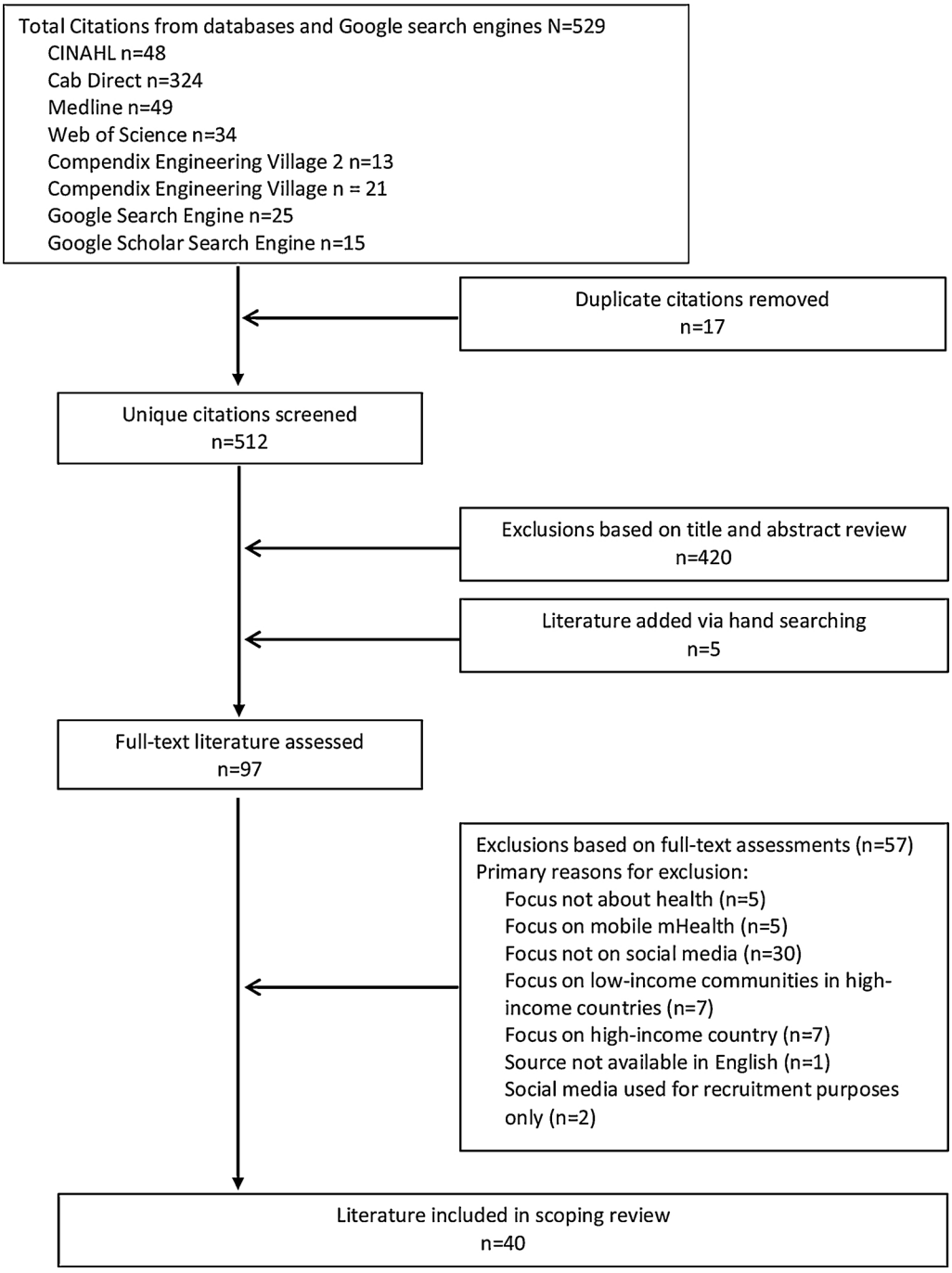

Fig. 1. Flowchart of Article Selection.

3.2. Timeline: evolution of the literature

Literature on this topic began to show its presence in 2010 with a descriptive book chapter aimed at promoting skill building for HIV-positive youth in Kenya; this chapter analyzed the findings of a small quantitative study that was conducted by a separate research group, and focused on identifying opportunities for social media use [37]. However, there were very few articles published until 2014 (see Table 3). The use of social media for health behaviour change campaigns emerged in the literature in 2011 [49], and has been a regular topic since then. The use of mixed methods research, and the incorporation of theory or other conceptual frameworks was first seen in 2013, the year growth on the topic started to build (Amrita and Biswas, 2013; [30,54]. This highlights a certain level of maturation of the state of literature even at this early point, three years since the beginning of publication on the topic. There were more articles published in 2014 than 2015 through 2017, and the largest number of quantitative articles were published in 2016.

3.3. Type of article

Thirty-one of the 40 articles (78%) were research-based, employing various methodologies. Twenty-four of these used quantitative methods. There were also five qualitative and two mixed-method study designs. Nine of the articles (22%) were not research-based; these included reviews, discussions, descriptions of specific social media interventions, and evaluations of case studies and public health campaigns. Although the first quantitative research study was reported in

Table 2
Description and Analysis of Included Articles (in alphabetical order).

#	Author and Year	Journal or Source	Title of Article	Type of Article	Geographic Focus	Type of Social Media	Themes			
							Health Ed/ Influence	Outbreak/ Infect. Disease	Disaster/ Emergency	Production & Use of SM
1	Ahmed and Bath (2015)[24]	17th International Symposium on Health Information Management Research	The Ebola epidemic on Twitter: Challenges for health informatics	Descriptive Abstract	Not Geographic specific	Twitter				X
2	Alexander (2014) [25]	Science and Engineering Ethics	Social media in disaster risk reduction and crisis management	Review	Examples from Nigeria and Haiti	Social media in general			X	
3	Amrita and Biswas (2013)[15]	Medicine 2.0	Health care social media: Expectations of users in a developing country	Quantitative Research	India	Social media in general				X
4	Basch et al. (2015) [3]	Disaster Medicine and Public Health Preparedness	Coverage of the Ebola virus disease epidemic on YouTube	Quantitative Research	Not Geographic specific	YouTube		X		
5	Choi et al. (2017) [26]	Computers in Human Behavior	The impact of social media on risk perceptions during the MERS outbreak in South Korea.	Quantitative Research	South Korea	Social media in general	X	X		X
6	Chow et al. (2017) [27]	Sexually Transmitted Diseases	Demographics, Behaviors, and Sexual Health Characteristics of High Risk MSM and Transgender Women Who Use Social Media to Meet Sex Partners in Lima, Peru	Quantitative Research	Peru	Social media in general	X			X
7	Coberly et al. (2014)[28]	Online Journal Public Health Informatics	Tweeting Fever: Are Tweet Extracts a Valid Surrogate Data Source for Dengue Fever?	Quantitative Research	Philippines	Twitter	X	X		
8	Da'ar et al. (2017) [29]	Journal of Infection and Public Health	Impact of Twitter intensity, time, and location on message lapse of bluebird's pursuit of fleas in Madagascar	Quantitative Research	Madagascar	Twitter		X	X	
9	Fung et al. (2013) [30]	Infectious Diseases of Poverty	Chinese social media reaction to the MERS-CoV and avian influenza A(H7N9) outbreaks	Quantitative Research	China	Sina Weibo microblog		X		
10	Garett et al. (2017)[31]	Prevention Science	Ethical Issues in Using Social Media to Deliver an HIV Prevention Intervention: Results from the HOPE Peru Study	Qualitative Research	Peru	Facebook	X			X
11	Gu et al. (2014) [32]	Journal of Medical Internet Research	Importance of Internet surveillance in public health emergency control and prevention: Evidence from a digital epidemiologic study during avian influenza A H7N9 outbreaks	Quantitative Research	China	Sina Wiebo microblog & Baidu website		X		
12	Gurman and Ellenberger (2015)[58]	Journal of Health Communication	Reaching the global community during disasters: Findings from a content analysis of the organizational use of Twitter after the 2010 Haiti earthquake	Quantitative Research	Haiti	Twitter			X	X
13	Hamill et al. (2013)[10]	Tobacco Control	I 'like' MPOWER: using Facebook, online ads and new media to mobilise tobacco control communities in low-income and middle-income countries	Descriptive Case Studies	Egypt and India	Facebook, online ads/photos	X			X
14	Henwood et al. (2016)[33]	AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV	Acceptability and use of a virtual support group for HIV-positive youth in Khayelitsha, Cape Town using the MXit social networking platform	Quantitative Research	South Africa	MXit social networking tool				X
15	Horter et al. (2014)[17]	PLoS-ONE	"I can also serve as an inspiration": A qualitative study of the TB&Me blogging experience and its role in MDR-TB treatment	Qualitative Research	Not Geographic Specific	TB&Me blog	X			X
16	None stated (2012)[56]	International Federation of Red Cross and Red Crescent Societies	Case Study: Malaria prevention through social media	Case Study Discussion	Cambodia, Laos and Vietnam	Facebook	X			X
17				Review	Not Geographic Specific	YouTube	X			X

(*continued on next page*)

Table 2 (*continued*)

#	Author and Year	Journal or Source	Title of Article	Type of Article	Geographic Focus	Type of Social Media	Themes			
							Health Ed/ Influence	Outbreak/ Infect. Disease	Disaster/ Emergency	Production & Use of SM
	Jamwal and Kumar (2016)[59]	Indian Journal of Palliative Care	Maintaining the social flow of evidence-informed palliative care: Use and misuse of YouTube							
18	Jiang and Beaudoin (2016)[34]	Journal of Health Communication International Perspectives	Smoking prevention in China: A content analysis of an anti-smoking social media campaign	Quantitative Research	China	Sina Weibo microblog				X
19	Kituyi et al. (2014)[35]	Conference Proceedings	Towards a framework for the adoption of social media in health in Sub-Saharan Africa	Mixed Methods	Sub-Saharan Africa	Social media in general				
20	Krueger et al. (2016)[36]	AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV	HIV testing among social media-using Peruvian men who have sex with men: Correlates and social context	Quantitative Research	Peru	Facebook	X			X
21	Kwaak et al. (2010)[37]	Chapter in "HIV and culture confluence"	Sexual and reproductive desires and practices of Kenyan young positives: Opportunities for skills building through social media	Quantitative Research	Kenya	Social media in general	X			X
22	Liu et al. (2016)[38]	International Journal of Environmental Research and Public Health	Chinese public attention to the outbreak of Ebola in West Africa: Evidence from the online Big Data platform	Quantitative Research	China	Sina Weibo microblog & Baidu website		X		
23	Lukhele et al. (2016)[39]	African Journal of AIDS Research	Multiple sexual partnerships and their correlates among Facebook users in Swaziland: An online cross-sectional study	Quantitative Research	Swaziland	Facebook	X			X
24	Lwin et al. (2014)[40]	Acta Tropica	A 21st century approach to tackling dengue: Crowd sourced surveillance, predictive mapping and tailored communication	Descriptive	Sri Lanka	MoBuzz social network site	X	X		
25	Lwin et al. (2016)[41]	Health Education Research	Social media-based civic engagement solutions for dengue prevention in Sri Lanka: Results of receptivity assessment	Quantitative Research	Sri Lanka	MoBuzz social network site		X		
26	Maity et al. (2015)[42]	Clinical Microbiology Newsletter	An online survey to assess awareness of Ebola virus disease	Quantitative Research	India	WhatsApp, Facebook, Viber, Twitter		X		
27	McCool et al. (2014)[43]	BMC Public Health	Perceived social and media influences on tobacco use among Samoan youth	Qualitative Research	Samoa	Social media in general	X			X
28	McGough et al. (2017)[44]	PloS Negl Tropical Diseases	Forecasting Zika Incidence in the 2016 Latin America Outbreak Combining Traditional Disease Surveillance with Search, Social Media, and News Report Data	Quantitative Research	Latin America	Twitter microblogs		X		X
29	Müller et al. (2017)[45]	IDS Bulletin	Digital pathways to sex education	Quantitative Research	China, India, Kenya, Mexico and Egypt	SM generally, but FB is highlighted	X			X
30	Nduka et al. (2014)[46]	International Journal of Medicine	The use of social media in combating the Ebola virus in Nigeria – A review	Review	Ebola-stricken West Africa	Social media in general		X		
31	Odlum and Yoon (2015)[9]	American Journal of Infection Control	What can we learn about the Ebola outbreak from tweets?	Quantitative Research	Not Geographic Specific	Twitter		X		X
32	Oyeyemi et al. (2014)[47]	British Medical Journal (Clinical research ed.)	Ebola, Twitter, and misinformation: A dangerous combination?	Quantitative Research	Guinea, Liberia, Nigeria	Twitter		X		X
33	Piroska (2013)[48]	American Journal of Public Health	Using a mobile photo booth and Facebook to promote positive health messages among men who have sex with men in Cambodia	Descriptive	Cambodia	Facebook, mobile photo booth	X			X
34	Purdy (2011)[49]	Reproductive Health Matters	Using the Internet and social media to promote condom use in Turkey	Descriptive	Turkey	Facebook, Google ads	X			
35	Sastry and Lovari (2017)[57]	Health Communication		Qualitative Research				X		

(*continued on next page*)

Table 2 (*continued*)

#	Author and Year	Journal or Source	Title of Article	Type of Article	Geographic Focus	Type of Social Media	Themes			
							Health Ed/ Influence	Outbreak/ Infect. Disease	Disaster/ Emergency	Production & Use of SM
			Communicating the Ontological Narrative of Ebola: An Emerging Disease in the Time of "Epidemic 2.0"		Not geographically specific, but focuses on the Ebola outbreak in West Africa.	Facebook post from the WHO and the US CDC				
36	Simon et al. (2014)[50]	PLoS-ONE	Twitter in the cross fire: The use of social media in the Westgate mall terror attack in Kenya	Quantitative Research	Kenya	Twitter			X	
37	Southwell et al. (2016)[51]	Emerging Infectious Diseases	Zika virus-related news coverage and online behavior, United States, Guatemala, and Brazil	Quantitative Research	Guatemala, Brazil, USA	Twitter, Google trends		X		X
38	Thomas and Adeniyi (2013) [54]	Developing Country Studies	Health personnel's perception on the use of social media in healthcare delivery system in rural and urban communities of Oyo State, Nigeria	Mixed Methods Research	Nigeria	Social media in general				X
39	van Heijningen and van Clief (2017)[52]	IDS Bulletin	Enabling Online Safe Spaces: A Case Study of Love Matters Kenya	Qualitative Research	Kenya	Facebook	X			X
40	Yoo et al. (2016) [53]	Computers in Human Behavior	The effects of SNS communication: How expressing and receiving information predict MERS-preventive behavioral intentions in South Korea	Quantitative Research	South Korea	Twitter, Facebook & other social network sites	X	X		X

2010 [37], it was not until 2016 that quantitative studies (n = 8) dominated the publications on social media use for health.

3.4. Geographical focus

Most of the literature has focused on Asian (n = 15, 38%) and African (n = 12, 30%) countries, with countries such as India, China, Kenya and Nigeria being a reoccurring focus in several of the articles. Seven articles (18%) with a specific geographical focus addressed social media use in Haiti, the Samoan Islands, Peru, and Guatemala and Brazil. Four of the articles (10%) discussed the use of social media in developing countries more generally, without a specific geographical focus. Finally, three articles (8%) included results from more than one geographical group; Alexander [25] included examples from Nigeria and Haiti, Hamill et al. [10] examined case studies from Egypt and India, and Müller et al. [45] analyzed social media data from China, India, Kenya, Mexico and Egypt.

3.5. Type of social media

The specific type of social media addressed most frequently independently in the literature to date has been Twitter with eleven citations out of the 40 (28%). Most of these have been published since 2013 and correspond with the literature on the Ebola outbreak of 2013–2014 or the surveillance of other infectious diseases. Facebook was discussed independently in ten articles (25%). Literature that did not specify a particular platform or addressed social media in general accounted for nine citations (23%). Eight articles (20%) were classified as 'Other Forms' and focused on platforms such as YouTube, blogs, and specific social media applications for disease and health behaviour surveillance methods. Two articles (5%) specifically addressed more than one social media platform; Nduka et al. [46] discussed both the use of Twitter and Facebook during infectious disease information dissemination, and Purdy [49] examined together Facebook and blogs within an advertising campaign. DeMers [55] noted that Facebook, which was established in 2004, has dominated the social media arena since the early 2000's both for health and non-health related use, but the findings from this review show the recent emergence and importance of Twitter, which was established in 2006, for communications regarding infectious disease control and health surveillance.

3.6. Themes of the literature

To answer research questions 2, 3 and 4 the included literature was further classified into four distinct themes of social media use for health: its use for health education and influence (n = 28), use within infectious disease and outbreak situations (n = 17), use within natural disaster, terrorism, crisis and emergency response contexts (n = 3), and producers and consumers of social media for health (n = 34). The issues are outlined in the thematic sections and implications are discussed in a later section. Thirty-three articles addressed more than one thematic category.

3.6.1. Theme 1: health education and influence

Twenty-eight articles (70%) focused on the use of social media for health educational purposes and influence including communication related to health promotion and behaviour change, risk reduction, and support adherence for treatment regimes. Education campaigns using social media included campaigns to reduce tobacco use [10,43], support patients undergoing HIV treatment [37], influence sexual health behaviours [48,49]; Muller et al., 2017, and influence behaviours related to MERS, and malaria and dengue fever transmission [26,40,56].

3.6.2. Theme 2: infectious disease and outbreak situations

The use of social media pertaining to infectious disease and outbreak situations was another common thread within this theme, and

Table 3
Summary of the Evolution of Literature.

Year	Number of articles per year	Description of the Literature
2010	1	Descriptive book chapter utilizing Kenyan quantitative study
2011	1	Descriptive health behaviour advertising campaign by a private company for sexual health
2012	0	
2013	3	Mixed methods, framework use, and theory development began
2014	11	Quantitative studies (n = 3); Predominantly crisis management, infectious disease control and surveillance
2015	7	Quantitative studies (n = 4)
2016	9	Quantitative studies (n = 8) and a review on social media potential for health communication
2017[a]	8	Quantitative (n = 6) and qualitative studies (n = 2) focusing on epidemic surveillance, infectious disease information, and sexual health topics

Note: [a] To December 31, 2017.

was addressed by seventeen (43%) of the papers. Seven of these articles focused on the use of social media within the recent Ebola outbreak of 2013–2014 [3,9,38,42,46,57] eight others highlighted social media use in recent influenza/MERS, and dengue fever and bubonic plague outbreaks [30,32,40,41]; Yoo et al., 2016; [26,28,29]. Two papers analyzed social media response following news coverage of the Zika Virus [51,57]. A sub-category that emerged under this theme was the focus of four articles on the online public response to outbreak and infectious disease threats on social media platforms [3,30,32,51]. The authors of these papers highlighted the importance of early surveillance of public reaction and response for preparation, clarification, and the control of rumors and misinformation.

3.6.3. Theme 3: natural disaster, terrorism, crisis and emergency response

A small number of the papers (n = 3, 8%) addressed the use of social media within such contexts as natural disasters, terrorism, and the response to crisis and emergency situations. These papers reported on positive and negative patterns of social media use in global emergency and crisis situations. Specific lessons that were highlighted in the literature included what was learned about crisis management practices from the Nigerian famine of the 1960′s [25], the effectiveness of the Twitter response of organizations following the 2010 Haitian earthquake [32], and how social media was used during the 2013 Westgate Mall terror attack in Kenya [50]. Natural disaster, terrorism, crisis and emergency response was separated from infectious disease and outbreak situations described above in order to highlight more specifically the different conditions and environments in which social media use has been shown to be influential. Although literature on natural disasters, terrorism and emergency response occurred less frequently than those of infectious disease and outbreaks, it is important to recognize the distinction between the two while highlighting the similarities in process and platform use (i.e., Twitter remains the most common platform method used in the literature of both threads).

3.6.4. Theme 4: the production and consumption of social media

A focus on the production and consumption of social media was the most prominent theme identified in the literature. Several papers discussed how the production of social media by various types of organizations has changed in recent years, along with unique barriers they experience. Others explored the specific challenges of information production with the use of Twitter. With respect to the consumption of social media for health, two sub-categories were found to be present in several articles: the consumption experiences of young and marginalized populations, and the expectations and assumptions of consumers of social media LMICs.

3.6.4.1. The production of social media. Ten (25%) of the papers focused on health organizations as producers of social media messages. These health organizations include governmental and non-governmental organizations. These articles discussed changes in organizations' use of social media that have occurred as a result of the evolution of technology and shifting trends of social media use, in a bid to strengthen their engagement with vulnerable populations. Challenges of production, and problem solving strategies, that were highlighted included capacity building and training within organizations [56], working in tandem with traditional communication approaches [10], logistic barriers, strategies to disseminate information quickly [33,57,58], combating misinformation by pairing public announcements with credible informational resources [51,57], and the appropriate selection of new media tools for successful campaigns [10,27,34,44,52,58].

3.6.4.2. Misinformation and challenges of tweets. Key challenges that have consistently been identified within the literature of this review are related to the quality of information available [9,24,28,42,47,58], particularly with respect to the use of Twitter. Six papers (15%), all published since 2014, have highlighted the unique challenges and the potential for misinformation through Twitter. For example, Oyeyemi et al. [47] found 59% of retweets on Ebola-related information in West Africa contained inaccurate information. Non-government organizations, public health and government agencies have been identified as pivotal in the quick response required to disseminate correct information and amend misinformation [9,28,47,58].

3.6.4.3. Young and marginalized populations as consumers of social media. Ten articles (25%) highlighted the unique barriers faced by young and marginalized consumers of social media in LMICs. Populations such as LGBT individuals [27,31,36,48], adolescents [43,45,52], and people with diagnoses such as tuberculosis [17] and HIV [27,33,37] were highlighted in these papers. Health educational campaigns, and support and empowerment for treatment adherence and prevention were the more specific uses of social media within these groups; all of the articles described healthcare providers' use of social media to reach these populations, as well as barriers that inhibit this process such as privacy issues, and access to offline supports where needed. Four of these citations were published between 2010 and 2014, indicating that vulnerable groups were one of the first populations targeted through the use of social media within the context of LMICs.

3.6.4.4. Expectations and assumptions of consumers. Seven articles (18%) focused on the expectations and assumptions of consumers of social media, four of which were published in 2016 and two in 2017. Four research articles targeted the general public [15,26,39,53] another study sampled a stakeholder group of healthcare professionals in Nigeria for their perceptions of the use of social media for healthcare delivery in their state [54]. Two other papers focused more specifically on consumers accessing information for specific health issues: palliative care [59], and an anti-tobacco campaign [34]. All seven articles highlighted consumers' expectations of accuracy in social media messaging as well as feasibility issues related to the implementation and sustainability of social media use for health-related purposes (i.e., the maintenance of health-related information requires consistent resource allocation).

4. Discussion

4.1. Key findings

Findings of this scoping review suggest that social media is increasingly being used for health-related purposes in LMICs by a variety of stakeholders including patients, healthcare professionals, the general public, and governmental and non-governmental organizations. Publication dates ranged from 2010 to 2017 with most of the articles being published from 2014 to 2017. The increased volume of literature during these four years was concurrent with the Ebola crisis and other infectious disease outbreaks around the world. The literature has centered on Asian and African nations, with few articles addressing other geographic areas. Research articles are increasingly present in the literature but, to date, have been limited to non-experimental and descriptive studies. Governmental and non-governmental organizations have been the key producers of social media for health in LMICs, while end-users are typically young or marginalized populations. With its recent use in outbreak, crisis, and disaster management and control, Twitter has been the most popular platform reported in the literature.

The use of social media is forecast to increase and it is likely there will be changes in user trends [11]. Each use of social media for health comes with its own benefits and challenges that must be considered by decision-makers when choosing a platform or design for different projects. Positive effects that have been attributed to the use of social media for health in low-resourced settings are those related to infectious disease surveillance and prediction [3,9,28,29], mass communication [25,58], and education and knowledge translation (Hamill et al., 2015; [56]. Regardless of the progress that has been made and the apparent benefits, there are several negative effects and barriers that require further attention and more rigorous study by researchers in the future. Poor quality of information and the misinformation potential of social media are at the forefront of these concerns [24,25,42,47].

4.2. Gaps and potential for future research

There are several areas that present opportunities and need for future research. The first issue is the narrow geographic focus of the existing literature; the absence of literature focusing on regions such as Eastern Europe or the Middle East means that we have no information on the prevalence, types of use, or barriers to the use of social media use for health in these areas. There are also population groups that have been neglected, such maternal-child populations. Although there has been considerable research focused on mHealth and maternal-child health [60], our scoping review did not identify maternal-child health as a focal topic or potential user group for social media use in LMICs. Social media may be a useful adjunct to the use of mHealth applications concerning maternal-child health, and its use for these populations should be studied. Utilizing social media for maternal-child health education and behaviour change campaigns could be a viable way for research in this specific context to begin.

Future research should include prevalence studies to identify who is and who is not using social media, what social media platforms are being used, and well-designed survey studies to identify preferences and barriers to use of social media for health in the context of LMICs. Experimental and well-designed quasi-experimental studies are also needed to test aspects of social media use for health in LMICS, for example, to inform implementation strategies.

4.3. Implications

The findings of this scoping review offer beginning lessons for health care organizations, health care professionals, researchers, and the general public who are concerned with optimizing the use of social media in LMICs for health-related purposes. Despite the limited volume of the literature, there is evidence that the use of social media in LMICs has the potential for far-reaching influence on health, especially for public health issues. Social media has the ability to facilitate disease surveillance, mass communication, health education, knowledge translation, and collaboration among health providers. However, concerns about the information quality and the potential for misinformation may act as a barrier to its use. Moreover, misinformation or poorly communicated information can contribute to negative health behaviours and adverse health outcomes amongst consumers [61], as well as hysteria and chaos. In addition to attending to accuracy, organizations using social media should give attention to the readability of an organization's social media pages and platforms to build credibility and enhance user friendliness. Promotion of credible social media sites by governments, health care professionals and researchers, as well as education on the appropriate use of social media, could help to lessen the effect of misinformation. Finally, there may be lessons to be learned from the leap-frog effect that has been observed in relation to the use of social media for health purposes in LMICs, with the potential for rapid advances to be made in other areas of health care or other sectors, such as education.

4.4. Limitations

A limitation to this review is the exclusion of articles not published in English. Although this is common in scoping reviews [62], we may have missed relevant papers published in the languages of the LMICs. Second, although an effort was made to minimize publication bias by searching systematically for grey literature through Google and Google Scholar search engines, publication bias cannot be entirely excluded. For example, each search in the Google database yielded several hundred thousand results, but for time and resource reasons, the search was limited to the first ten pages of each search result. This may have led to some relevant results being unintentionally excluded. However, as both Google and Google Scholar search results are generally sorted by relevance, with the most applicable information listed first [63], this may have limited the degree of publication bias. In addition, literature published since February 15, 2018 (the date of our final search) is not included.

4.5. Conclusions

This scoping review provides a descriptive map of the literature on the use of social media for health-related purposes in LMICs. Despite being a relatively young body of literature, development and maturation of the field can already be seen at this early stage, with the increasing number of research articles. The potential health benefits are vast, but there are also challenges to its effective use, particularly with respect to information quality and to reduce the potential for misinformation. More research is needed to address gaps in the social media literature related to its limited geographical focus and focus on descriptive research. As a tweet can spread faster than a virus, developing a deeper understanding of effective social media use is necessary for organizations, governments, policy makers, educators and researchers involved in LMICs to maximize effectiveness and efficiency.

Conflict of interest

None.

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Summary points

What was already known about the topic:

- There is extensive use of the Internet and social media for health-related purposes in high-income countries.
- Significant technological gains have resulted in increased access to social media in low- and middle-income countries (LMICs).

What this research adds to our knowledge:

- Social media is being used in LMICs for health-related purposes (e.g., to facilitate disease surveillance, mass communication, health education, and knowledge translation).
- The body of literature on social media use in LMICs is young, but beginning to mature with the recent, increased reporting of research studies.
- Additional research is needed to expand the geographical focus and test strategies to facilitate the effective and efficient use of social media for health purposes in LMICs.
- Increasing familiarity with existing and upcoming social media platforms, and the promotion of credible sites, is essential for healthcare professionals, agencies, and researchers.

Acknowledgment

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Appendix A

Table A1
Overview of Articles included in this Scoping Review.

#	Author	Year	Findings
1	Ahmed et al.	2015	Key challenges exist with large sample Twitter data related to information quality, ethical and privacy issues, validity and reliability of information, and feasibility.
2	Alexander	2014	Ways in which social media (SM) can be used positively in a disaster risk reduction and crisis response: As a listening function for monitoring a situation, for crowd-sourcing and collaborative development, for creating social cohesion and promoting therapeutic initiatives, and for the furtherance of causes and research. Negative side of SM use in the same context: Misinformation, exaggerations and inaccurate information (increasing the sense of chaos and insecurity), sheer volume of information (considerable ambiguity about whether SM exert a benign or a malignant influence on public safety and security), and ethical dilemmas. Ethics an important issue for privacy and misrepresentation. Some recent successes with social media use in crisis situations.
3	Amrita et al.	2013	Majority of people responded they expect that health care becomes more accessible and available. Negative influence was highlighted in the openness of privacy. Users are very skeptical towards keeping their identity and friend's list open. The less disclosure of health care interests is very prominent. Respondents wish to get advice from experienced people and not only from health experts. Usability shows a positive influence where people want to be in directory listings. The users of SM in India expect that they can best utilize social media through emergency service information. They want to be able to learn the operations of the SM site quickly and expect to know about health camps and insurance collaborations. People like to become friends with people with similar interests based on their interests identified.
4	Basch et al.	2015	Over one-third of the videos mentioned how Ebola Virus Disease (EVD) was generally transmitted (39%), with 30% mentioning bodily fluids; 17% mentioning infected fruit bats, monkeys, or handling infected bush meat; 15% mentioning transmission through other avenues such as a deceased body; and 4% mentioning transmission through objects. The death toll in West Africa was mentioned in 32% of the videos. Cases in the United States (21%), fear (19%), and anxiety (20%) were highlighted in about one-fifth of the videos, whereas 19% were comedy skits, and a smaller percentage were about a conspiracy theory (12%) or hoax (5%). There was little mention of treatment (4%) and no mention of the need for US funding of disaster preparedness; coordination between local, state, and federal governments; or beds ready for containment.
5	Choi et al.	2017	Online survey of 1000 people in South Korea during the 2015 MERS outbreak. The main hypotheses tested were: social media use would be positively correlated to risk perception of MERS; and self-efficacy would be negatively related to risk perception. Types of cognitive processing were also examined: systematic processing involves sifting through large amounts of information based on judegment task, and heuristic processing involves making a decision based on experience or simple rules. Mean age of respondents was 45.24yrs; 50% male. Female respondent and internet use were associated with increased risk perception. Social media use and systematic-heuristic processing affected risk perception of MERS ($R^2 = 0.20$)
6	Chow et al.	2017	This study reported on a survey that examined men who have sex with men (MSM) and found fiveMen who have sex with men and who use social media were younger, more likely to identify as gay, and were more educated. In addition, those who used social media more frequently had an increased number of sex partners Anonymous sex partners and had sexy transmitted diseases. Several social media sites were used to facilitate sexual hook-ups, the most common my Facebook.
7	Coberly et al.	2014	This pilot study investigated whether Twitter could be a viable data source for monitoring dengue-like illness in the Philippines. The researchers mined tweets during a 2011 dengue outbreak in two regions in the Philippines for key words related to dengue and latitude and longitude if available via geotag. These data were mapped to public health data related to dengue-like cases reported during the same timeframe. They found a moderate correlation between tweets and reported cases of dengue-like illness during the same time period.
8	Da'ar et al.	2017	This study examined the time lapse between tweets and retweets For a Bubonic plague outbreak in Madagascar in 2014. The researchers found that when there was a high frequency of tweets the time lag between tweets and retweets was increased. In addition, they found that tweets distributed in the morning had a longer time lapse then tweets distributed in the afternoon. The researchers did not find a relationship between location of tweet (west of plague epicenter versus east of plague epicenter) on time lag to retweet.
9	Fung et al.	2013	Reaction to the H7N9 (bird flu) outbreak in 2013 was about two orders of magnitude stronger than the one to the MERS-CoV outbreak in 2012. The results confirmed the hypothesis that the Chinese online community reacted more strongly to an outbreak that was in China than one outside China.

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Table A1 (*continued*)

#	Author	Year	Findings
10	Garett et al.	2017	The purpose of this study was to explore the ethical implications of a Facebook study that was designed to support peer-to-peer communication about HIV testing and prevention in Peru. The researchers found that the participants were overall comfortable with participating in the peer-to-peer Facebook intervention, were more likely to have safe sex, and more likely to get tested for HIV regularly.
11	Gu et al.	2014	Internet surveillance was used to investigate the public reaction to the H7N9 outbreaks over time during the first 25 days of the H7N9 epidemic in China in the spring of 2013. The indexes of public reaction, daily posted and forwarded number of blogs and Baidu Attention Index (BAI) from Baidu website, to H7N9 outbreaks were significantly higher in 7 provinces/cities with human H7N9 cases than those in 2 provinces without cases. Both daily posted and forwarded number and BAI were positively associated with the cumulative case fatality rate of human H7N9 infection.
12	Gurman et al.	2015	Study findings indicate that the ways in which organizations used Twitter changed over time. Chi-square analyses demonstrated that organizations decreased in their use of certain strategies to disseminate information through Twitter, such as the use of links. Organizations did not change in their use of techniques to involve users (e.g., retweet, call to action), with the exception of using tweets as a fundraising mechanism.
13	Hamill et al.	2015	Case Study #1-'Packhead'- Findings: Online application that allowed users to take pictures from their online photo galleries to build custom graphic pack warnings. Failure was deemed due to users were found to be uncomfortable sharing 'ugly' photos, and the application was not novel enough to attract mainstream media attention. Case Study #2-'Smoke Free Alexandria'- Findings: Facebook page and ads. Positively framed messages and active page management seemed to work well. Case Study #3-'Chewonthis.In"- Findings: used a blend of online advertising, community engagement, and social media sharing to obtain reach. Deemed to be the most successful campaign of the three with the largest reach.
14	Henwood et al.	2016	The acceptability and uptake was assessed of the cell-phone based social networking platform MXit in relation to supporting HIV infected youth in South Africa. Although MXit use was low overall, study participants indicated willingness to interact with their peers on social media and suggested improvements for the MXit platform, using a more popular platform such as Facebook, and to include pertinent topic discussion for their specific population and context.
15	Horter et al.	2014	Three key themes emerged from data analysis of the TB&Me blog: participants found that blogging was useful for adherence to multidrug-resistant tuberculosis (MDR-TB) treatment, provided alternative support to patients and gave patients strength and voice, and provided a tool for patient expression and empowerment. Triangulation of results showed that the predominant ideas and majority themes found in the blogger participant group were echoed in the project staff group. The responses of the stakeholder group supported some of the blogger and project staff responses, as well as providing insight into blog exposure and access.
16	International Federation of Red Cross and Red Crescent Societies	2014	By targeting communications and operational staff, the projects were able to combine on-the ground knowledge of programs with communications expertise. While technology continues to transform humanitarian communications at a rapid rate, it is essential to consider the different starting point of each National Society in relation to the specific country context, the internet accessibility and the internal resources and capacities. The workshop and training from this project have helped to develop a skilled set of social media representatives from each National Society, as well as providing a forum by which colleagues from within the region can share their learning and examples of best practice.
17	Jamwal, et al.	2016	The evidence reviewed by this article found YouTube to be an increasingly important and utilized medium for use in aspects of palliative care practice worldwide. Within developing countries however, more efficacy studies on the impact of this platform on palliative care delivery are still needed.
18	Jiang and Beaudoin	2016	Microblog posts from the Sina Weibo platform were analyzed showing the most common content characteristics of perceived risk, subjective norms, and self-efficacy within the context of smoking prevention and cessation.
19	Kituyi et al.	2014	No findings yet as this is just the proposal.
20	Krueger et al.	2016	This study sampled Peruvian men who have sex with men (MSM) in order to determine the association between HIV testing and behavioural, demographic and stigma-related factors in this population. Findings suggest younger men were found to be significantly more associated with lower rates of testing, those who participated in online discussions about HIV testing were more likely to be tested themselves, and AIDS-related stigma remains a significant obstacle for MSM and HIV testing.
21	Kwaak et al.	2010	This chapter highlights some of the findings and recommendations of a diagnostic study and related life-skills workshop that assessed the sexual and reproductive health (SRH) information and service needs of young people living with HIV in Kenya with a view to identifying opportunities for the use of social media to address some of these needs. The findings of the diagnostic study show that the SRH needs of HIV-positive young people require social programs that address their aspirations and rights in the context of chronic illness and vulnerability. There is also a need for innovative strategies such as the use of social media to address issues of SRH, empowerment, self-esteem, desires and professional aspirations of HIV-positive adolescents within HIV and AIDS programs.
22	Liu et al.	2016	In order to understand and evaluate public reaction in China to the Ebola outbreak in West Africa in 2014 through Internet surveillance, Baidu Index (BDI) and Sina Micro Index (SMI) data were collected from their official websites. Hotspot areas were identified and qualitative analysis indicated public attention increased with negative news until the appearance of a positive news statement. This study highlighted the potential use of online surveillance in relation to public communication and education in infectious disease contexts.
23	Lukhele et al.	2016	This study attempted to investigate the relationship between multiple sexual partners (MSP) and their correlates among Swaziland Facebook users. Findings revealed a significant association between having MSP and time spent on Facebook and having had sex with someone met on Facebook. In a high-HIV prevalent setting such as Swaziland, the effect of potential risky sexual behaviours among Facebook users should be noted.
24	Lwin et al.	2014	A social media system for dengue prevention in Sri Lanka is described, which includes predictive surveillance, civic engagement and health communication. The system, known as "Mo-Buzz," established real-time connections between citizens and authorities, and provides the ability to forewarn about outbreaks, initiating preventative action. The authors present challenges and lessons learnt including content validation, stakeholder collaborations and applied trans-disciplinary research. The potential for this system to be replicated and used in other infectious disease outbreak situations is highlighted.
25	Lwin et al.	2016	

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Table A1 (*continued*)

#	Author	Year	Findings
			The overall receptivity assessment offered positive, above average scores (> 4.00) for reach of the three aspects of potential adoption of Mo-Buzz (response efficacy, self efficacy and intention-to-use), suggesting a definitive need for such a system. The strong feedback on response efficacy alludes to a prevailing public sentiment about the value of a pro-active, interactive system that can protect people from dengue by forewarning them about dengue outbreaks, and enables real-time communication with health authorities. The positive response on self-efficacy is testament to the latent power of mobile phones as tools of public health intervention delivery in Sri Lanka. Finally, the strong intention-to-use scores provide evidence-based encouragement for consideration of launching a public version of the Mo-Buzz system.
26	Maity et al.	2015	Misconceptions about Ebola Virus Disease (EVD) focused mainly on the transmission and symptoms of the disease. There was a gap in the understanding of the haemorrhagic nature of the disease. About 35% of the participants failed to realize that bleeding is one of the characteristic symptoms of EVD. Almost 40% of the study participants were not aware of a sexual mode of transmission. The results also showed that half of the study group had no idea that semen from a recovered patient harbors the virus for at least 7 weeks. One of the most important ways in which EVD can be prevented is by strict adherence to hand washing. This fact was unknown by 40% of the participants who were unaware of this basic practice of hygiene for preventing disease transmission. Awareness regarding the preventive measures, modes of transmission, and symptoms of EVD is required to fill the existing gaps in knowledge.
27	McCool et al.	2014	Family is critically important for representing normative tobacco use in Samoa. The use of digital media is determined by parental views in the home. Media access remains highly regulated within more traditional households. Loyalty to traditional cultural practices (Fa'a Samoa) underpinned views on the limited influence of media on social norms around tobacco use. Parents were thought to have the greatest influence on youth smoking. Tobacco use was viewed as a personal or family issue, and not a problem that was amendable to change at a societal level. Strikingly, there was a general lack of understanding about the influence media has on tobacco use opinions, attitudes and behaviour.
28	McGough et al.	2017	This study attempted to create a predictive model of Zika cases in Latin America. They used Twitter tweets, google searches and HealthMap reports and compared their predictive model to actual reports. The best performing models were seen in countries where Twitter feeds were accessible.
29	Müller et al.	2017	The purpose of this study was to explore the use the sex education site "Love Matters" in China, India, Kenya, Mexico and Egypt between 16 July to 16 December 2015. The researchers explored the method that the site was accessed and the frequency of sharing the site in social networks. They found that social media was the most common way to learn about the site for all countries except China which had the highest access via referral (i.e., traffic sent from other websites via links).
30	Nduka et al.	2014	The cross-country recent epidemic of Ebola Virus Disease (EVD) and the Nigeria success story has been variously commended. This paper reviews the Nigerian Strategy, which led to successful containment of the epidemic in the country. Evidence shows that a concerted effort involving several epidemiologic steps and mass awareness interventions taken by different groups and healthcare organizations and governments were deployed. The positive role of SM in containing the epidemic is very commendable and is highlighted. This article suggests the Nigerian strategy can be deployed in managing different cases of epidemics in developing and developed countries, and provides evidence that developing countries can provide direction for major global health challenges.
31	Odlum et al.	2015	A total of 42,236 tweets (16,499 unique and 25,737 retweets) mentioning Ebola were posted and disseminated to 9,362,267,048 people, 63 times higher than the initial number. Tweets started to rise in Nigeria 3–7 days prior to the official announcement of the first probable Ebola case. The topics discussed in tweets include risk factors, prevention education, disease trends, and compassion. Findings demonstrate the usefulness of Twitter mining to inform public health education.
32	Oyeyemi et al.	2014	The most common misinformation was that Ebola might be cured by the plant ewedu or by blood transfusion. Drinking and washing in salty water were also mentioned. Among these tweets, 248 (44%) were retweeted at least once; 95 of these contained scientifically correct information (38.3%), whereas 146 contained medical misinformation (58.9%; $P < 0.001$). While most erroneous tweets were left undisputed, in some cases they were corrected by a Nigerian government agency and this correction spread on Twitter three days later.
33	Piroska	2013	Reaching all segments of the men who have sex with men (MSM) and transgender population with sexual health services is difficult. The MStyle campaign successfully reached 90% of visible MSM in target areas via clubs, special events, social marketing, and referrals. As part of this campaign, the MStyle photo booth showed how social media photographs can be used to promote public health messages for safer sexual intercourse.
34	Purdy	2011	By utilizing a wide range of digital platforms − a new website, Facebook page, Google Adwords, an e-newsletter, viral marketing, banner ads and involving bloggers − the condom brand Fiesta achieved strong recognition among the target audience of sexually active young people, though far more men than women. Retail audits, Internet analysis and sales performance suggest that using the Internet was instrumental in establishing Fiesta. Sales reached 4.3 million condoms (of which 8% were sold online) in the first 18 months. In contrast, Kiss, a far more inexpensive condom, launched at the same time but with no digital campaign, sold 2.6 million.
35	Sastry et al.	2017	In this study the researchers conducted narrative analysis of Facebook posts from the US-CDC and the WHO during the Ebola outbreak in 2015. The researchers identified three phases to the narrative: 1) consulting and containing; 2) Ebola as a global threat; 3) Ebola threat to US. They found that the WHO presented a non-partisan perspective while the US-CDC presented a perspective that focused on managing the risk of Ebola in the USA.
36	Simon et al.	2014	The program Twittermate was used to collect, store and analyze tweets from individuals, emergency responders, and NGOs following the Westgate Mall terror attack in Kenya. Four main categories of hash tags were identified: geographical locations, terror attack, social support, and organizations. The abundance of Twitter accounts providing official information made it difficult to synchronize and follow the flow of information. Many organizations posted simultaneously, by their manager and by the organization itself. Creating situational awareness was facilitated by information tweeted by the public. Threat assessment was updated through the information posted on social media. Security breaches led to the relay of sensitive data. At times, misinformation was only corrected after two days. The authors recommend development of a standard operating procedure to enable multiple responders to observe and unite their social media feeds in emergency situations.
37	Southwell et al.	2016	

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Table A1 (*continued*)

#	Author	Year	Findings
			The relationships between news coverage, online search behaviour, and social media mentions related to the Zika virus were analyzed in early 2016. Results suggest that official public health authority announcements offer small windows for information sharing, engagement, and online searching that offer opportunities through education. Outside of these announcements, sharing and searching are less apparent. These findings suggest the potential benefit in paring announcements with the provision of information resources.
38	Thomas et al.	2013	Health care personnel respondents had a high knowledge of social media, and were favorably disposed to the use of social media in healthcare delivery. There exist a significant relationship between respondents' knowledge ($r = 0.267$; $p < 0.05$) and the perception of health personnel on the use of social media for health care delivery, while there is no significant difference ($F = 0.956$; $p > 0.05$) in respondents' perception of health personnel on the use of social media for health care delivery across the medical personnel interviewed. Many health care personnel in Oyo state they have a robust knowledge of social media and think it can be very useful for healthcare delivery, they still do not use it or even see the feasibility of its implementation in Nigeria. This is largely due to the fact that they do not think their patients will accept the idea, a large percentage that is illiterate and ignorant of social media.
39	van Heijningen et al.	2017	The purpose of this case study was to examine the Facebook page for the sex education site Love Matters and identify best practices for creating an online safe space. The researchers observed posts to Facebook during 2015 and then created a Facebook page that allowed participants to post their thoughts about the Love Matters Facebook page in Kenya. Participants indicated that they valued how facebook helped them find friends, and provide social support. They also appreciated having a code of ethics and moderators who removed offensive information when necessary. The authors contend that if sexual health organizations want to influence youth, they need to both offline and online, which is where youth are interacting.
40	Yoo et al.	2016	Ways in which message expression and reception on social networking sites (SNS) affected individuals' intention to engage in Middle East respiratory syndrome (MERS)-preventative behaviours were studied. Findings suggest the presence of effects from expressing and receiving MERS-related communication via SNS in South Korea. The authors conclude communication professionals should actively utilize SNS during public health crises and infectious disease outbreaks.

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