Review

# Use of social media for e-Government in the public health sector: A systematic review of published studies

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## ARTICLE INFO

## ABSTRACT

Although the intersection between social media and health has received considerable research attention, little is known about how public sector health organizations are using social media for e-Government. This systematic literature review sought to capture, classify, appraise and synthesize relevant evidence from four international research databases and gray literature. From 2441 potentially relevant search results only 22 studies fully met the inclusion criteria. This modest evidence-base is mostly descriptive, unidisciplinary and lacks the theoretical depth seen in other branches of e-Government research. Most studies were published in the last five years in medical journals, focus on Twitter and come from high income countries. The reported e-Government objectives mainly fall into Bertot et al.'s (2010) categories of *transparency/accountability*, *democratic participation*, and *co-production*, with least emphasis on the latter. A unique category of *evaluation* also emerged. The lack of robust evidence makes it difficult to draw conclusions about the effectiveness of these approaches in the public health sector and further research is warranted.

## 1. Introduction

Governments worldwide are beginning to harness the Internet and related Information and Communications Technologies (ICT) in an effort to address citizens' desire for greater information access, institutional transparency, participative decision-making and access to public services. One channel through which these objectives are being pursued is social media, which include off-the-shelf networking sites, such as Facebook, microblogging services, such as Twitter, and information dissemination platforms, such as YouTube (Porumbescu, 2016).

International surveys indicate that four out of five countries now have a national information portal containing links to government social media accounts on platforms such as Facebook and Twitter (UN, 2016). This interest in social media is being driven by the promise of e-Government to "enable stakeholders and government to communicate, collaborate, and engage in governance" (Oliveira & Welch, 2013, p. 397). These stakeholders include, but are not limited to, citizens, employees, non-profit organizations and other arms of government, as described by the taxonomy of social media interactions first developed by Fang (2002).

The health sector represents a critical area of governmental responsibility in most countries, accounting for a major proportion of national spending, equivalent to 9.9% of global Gross Domestic Product

in 2014 (World Health Organization (WHO), 2014). Like other parts of the public sector, government departments of health, national agencies charged with monitoring, protecting and improving population health, and state-funded healthcare delivery organisations are under increasing pressure to engage with the e-Government agenda and it is likely that many are using social media specifically in order to do this. While there is a growing body of literature examining social media in health contexts; including aspects of public health communication, promotion and surveillance (e.g. Velasco, Agheneza, Denecke, Kirchner, & Eckmanns, 2014) little has been written about their use for enabling e-Government objectives (see Franco, Tursunbayeva, & Pagliari, 2016 for a discussion). Indeed, it is only recently that scholars have begun to explicitly link the concepts of e-Government, public health and social media; for example, Andersen, Medaglia, and Henriksen (2012) drew on e-Government theories in an exploratory study of the value impacts of social media for the Danish public health system and barriers to achieving these. Given the priority many governments are placing on digital services and the investments being made in social media engagement in the health sector, policy-makers and managers stand to benefit from a timely synthesis of relevant evidence, to guide future practice. Such a synthesis would also add value to the academic e-Government literature, in which healthcare is relatively underrepresented, compared with other public sectors. Our

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study aimed to address this deficit by using the rigorous "systematic review" technique to identify, classify, critically appraise and synthesise the corpus of published research evidence relevant to the adoption, use and impacts of social media for e-Government in the public health sector. In doing so we recognised that relevant articles may not explicitly use all of these terms but it may nevertheless be possible discern an implicit e-Government agenda from studies on the use of social media for delivering public health services (e.g. Thackeray, Neiger, Smith, & Van Wagenen, 2012). In order to facilitate our searches and study interpretation, we drew on the framework developed by Bertot, Jaeger, Munson, and Glaisyer's (2010), which deliniates four classes of social media interactions in the public sector, summarised as democratic participation, co-production, crowdsourcing and transparency/accountability, and Fang's (2002) e-Government taxonomy, both of which are described in detail in the Research methods section.

To the best of our knowledge, this is the first systematic literature review to have specifically investigated the adoption and use of social media by public health organizations, taking the perspective that they are also part of government (Salinsky, 2010).

## 2. Research methods

### 2.1. Systematic literature review approach

This form of literature review uses "a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing an existing body of completed and recorded work produced by researchers, scholars and practitioners." (Fink, 2010, p. 3). This approach was originally developed as a means of synthesising medical research evidence, but is increasingly used in other fields, such as social, policy and business studies (Stead, Gordon, Angus, & McDermott, 2007). In contrast to other types of literature review (e.g. narrative reviews and scoping reviews), systematic reviews focus on specific research questions with narrow parameters; are guided by inclusion/exclusion criteria set at outset (e.g. topics, settings, study types); extract data only from included studies; evaluate the quality of those studies, and base their conclusions largely on the evidence relating to the initial research question(s) (Armstrong, Hall, Doyle, & Waters, 2011; Holeman, Cookson, & Pagliari, 2016). In order to ensure a transparent and replicable process, we followed the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) guidelines (Dekker & Bekkers, 2015; Moher, Liberati, Tetzlaff, & Altman, 2009).

### 2.2. Search strategy

The search strategy and inclusion criteria were informed by a scoping review, which helped to define the concepts of public health (mindful of international differences), e-Government and social media, and the nexus between them (see Franco et al., 2016).

Four international research databases, covering the health, technology, business and social science disciplines (Cochrane Library, MEDLINE, Scopus and Web of Science Core Collection), were interrogated on July 12, 2015. The broad search query was constructed as follows: ("e-government" OR "government" OR "department" OR "organization" OR "agenc*" OR "hospital*" OR "clinic*") AND ("social media" OR "Facebook" OR "Twitter" OR "YouTube") AND ("health" OR "healthcare").

In addition to academic databases, we searched WHO reports and working papers (via WHO's Institutional Repository for Information Sharing) utilizing the same keywords used to search the online academic databases.

The reference lists of articles included in the final set were searched by hand (an approach also known as "snowballing"), as a means of checking for additional studies that may not have been indexed in the online research databases (Yeager et al., 2014).

### 2.3. Article screening and selection

All outputs were stored in EPPI-Reviewer 4 software, where they were first screened independently by the first author, based on their titles and abstracts. Full text versions of articles appearing to meet the inclusion criteria were obtained for further screening. The third author iteratively checked samples of the assessed articles to ensure consistency with the inclusion and exclusion criteria. This allowed for ambiguities or uncertainties to be discussed and addressed at an early stage, so that consensus could be reached between reviewers. Remaining disagreements were referred to the second author for arbitration.

#### 2.3.1. Inclusion criteria

- Academic or commercial (consultancy) research with a primary focus on the adoption and use of social media by public sector health organizations, at the regional or national levels, for interacting and enabling transactions with other governmental bodies, businesses or citizens, as part of a broader "e-Government" agenda. For example, studies focusing on social media adoption by government departments of health, regional health authorities, government-funded healthcare delivery organisations or national public health agencies.
- Studies published in any language between January 1, 2004 and July 12, 2015. The year 2004 has been chosen as a starting point, since this was when Facebook, the most widely used social media website, was created.

#### 2.3.2. Exclusion criteria

- Studies focused on private sector health organizations.
- Studies focused on individual departments or specialites within public sector health organizations, such as emergency departments, cardiology services or diabetes clinics; for example, to enable a social support group, network with professional colleagues or send targeted messages to patients. This review, in contrast, concerns activities undertaken at the wider organizational level and aimed at enabling information exchange or transactions between public health organizations and other parts of government, citizens or businesses (e.g. Gazley & Guo, 2015).
- Studies primarily focused on the use of social media for health surveillance or research.
- Studies published before January 1, 2004.

The specific study inclusion and exclusion criteria are shown in Textbox 1.

### 2.4. Critical appraisal of study quality

As per systematic review requirements, the quality of the included studies was rated using the Critical Appraisal Skills Programme (CASP, 2013) checklist, which was slightly modified by adding a "not clear" (0.5) option for each item to the standard "yes" (1) or "no" (0) (These modifications are common in systematic reviews; for example, see Tursunbayeva, Bunduchi, Franco, & Pagliari, 2016). The first author assessed all the eligible studies, while the third author independently assessed a random sample in order to appraise inter-rater consistency and resolve any ambiguities. This exercise revealed only very minor discrepancies, therefore further secondary assessment by the third author focused only on studies that the first author was unsure of. The table derived from the quality assessment exercise is shown in Appendix A.

### 2.5. Data extraction and thematic analysis

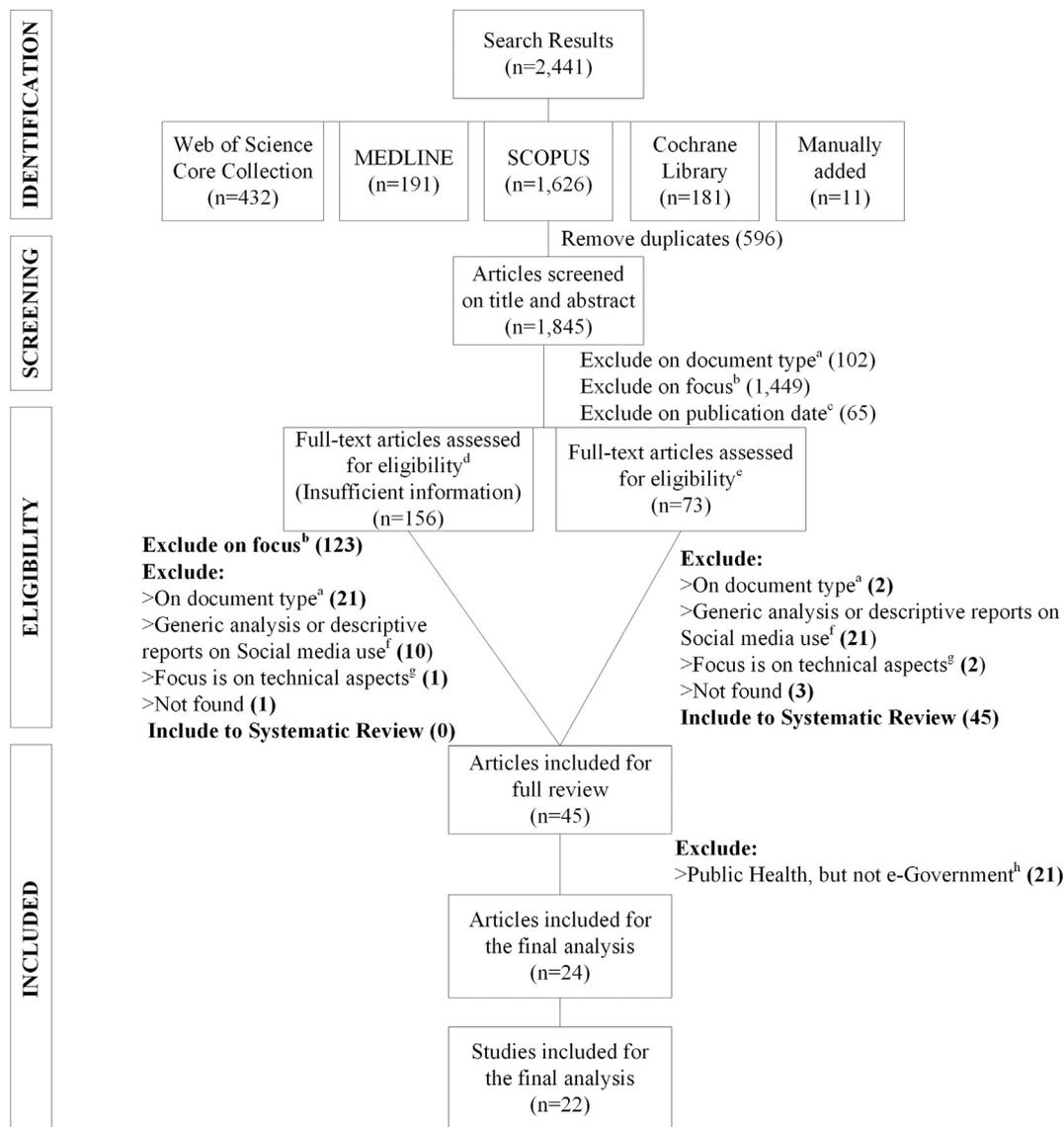The first author extracted information from all eligible studies with

**Fig. 1.** PRISMA flow chart.

the help of a research assistant, using a structured form containing the following fields: study authors, publication year; journal discipline; setting (type of organization, country/region in which the study was conducted, year when the study was conducted); type of social media used; stated objective for using social media; research purpose/questions; theoretical basis; study design; main findings; conclusion/comments. This extracted information was then verified by the other two authors.

Extracted study findings were firstly coded using the modified taxonomy of Fang (2002): Government-to-Citizen (G2C); Citizen-to-Government (C2G); Government-to-Business (G2B); Business-to-Government (B2G); Government-to-Government (G2G). Fang's categories of Government-to-Nonprofit (G2N) and Government-to-Employee (G2E) were eliminated, as a first reading revealed that none of the qualifying studies mentioned these. A separate category of Government-to-Professionals (e.g. clinicians, managers) also emerged. In addition to identifying the stakeholders involved, we identified the originator of the interaction (e.g. public health organizations or citizens).

Various models have been proposed for interpreting social media interactions in the public sector (e.g. Mergel, 2013; The White House, 2009). We chose to adopt the framework used by Bertot et al. (2010), which provided a convenient means of categorizing study findings

according to their objectives and intended outcomes. The categories, as described by the authors, are as follows:

- "**Democratic participation and engagement**, through which social media technologies are used to involve the public in government decision processes, to foster participatory dialog and policy development and implementation.
- **Co-production**, through which governments and the public jointly develop, design, and deliver government services to improve service quality, delivery, and responsiveness.
- **Crowdsourcing solutions and innovations**, through which governments seek innovation through public knowledge and talent to develop innovative solutions to large-scale societal issues. To facilitate crowdsourcing, the government shares data and other inputs so that the public has a foundational base on which to innovate.
- **Transparency and accountability**, through which government is open and transparent regarding its operations to build trust and foster accountability" (Bertot et al., 2010).

The results of this coding exercise were later compared with the Digital Public Service Innovation Framework of Bertot, Estevez, and

**Textbox 1**.Specific article inclusion and exclusion criteria and legend to Fig. 1.

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[a]*Exclude on Document type*: Blog posts; Workshop descriptions; Collection of conference proceedings; Editorials; Interviews; Commentaries; Letters to the Editor; Publication in online magazines; Features; Perspectives; News; Presentations; Analysis; Expert Reviews; Student Essays; Journal supplementary materials; Brief reports; Correspondence; Highlights; Description of special issues; Observations.

[b]*Exclude on Focus*: Studies on social media not in health organizations; Studies not focused on social media; Studies focused on social media other than Facebook, Twitter and YouTube; Studies primarily focused on social media for health surveillance (e.g. such as flu tracking) or research; Studies focused on social media uses by specific professional or patient groups (e.g. diabetes specialists or patients) or by individuals; Studies focused on individual units within public sector health organizations, such as emergency care or cardiology services and individual clinics; Studies focused on privacy, compliance or legal issues for social media or risks associated with them; Studies primarily focused on using social media for health education or for recruiting research participants; Studies focused on the use of social media at the Medical conferences; Studies focused on social media used by private sector health organizations to promote their services or support interaction with their patients/customers/partner businesses; Studies focused on the use of social media to promote, increase awareness and support some specific health-related behaviors or evaluating effectiveness of these promotional campaigns; Studies analyzing secondary data posted on social media in order to understand aspects of particular health condition/s or patient communities; Studies that do not primarily focus on social media use by public health organizations (e.g. articles that only report existence of social media on hospital websites); Studies focused on innovative social media patient practices, or studies mentioning adoption of social media as a part of the organizational innovation strategy, or use of social media for growing medical practice.

[c]*Exclude on Publication date*: Studies published before January 1, 2004 or after July 12, 2015.

[d]*Include-Insufficient information*: Articles where no abstract was available, or when it was not clear whether social media was used by health organization, or whether this health organization was public or whether the primary focus of the study was on the use of social media by health organizations for e-Government.

[e]*Include-Potentially relevant*: Potentially relevant articles referring to social media for e-Government in the Public Health Sector.

[f]*Exclude-Generic/descriptive*: High level papers describing the concept of social media and how it might be used or is being used in public health organizations.

[g]*Exclude-Technical focus*: Articles focused on creating social media applications or automated systems/approaches to analyse social media content.

[h]*Exclude-Public health, but not e-Government*: Studies related to the use of SM by public health organizations, but not related to e-Government.

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Janowski (2016), which was not available at the time of data extraction and analysis but provides a useful means of cross-verification. This framework classifies innovative e-Government services according to whether they are: Transparent; Participatory, Anticipatory; Co-created; Personalized; Context aware; or Context smart (see Bertot et al., 2016 for discussion).

**3. Results and discussion**

2441 results were generated by the search strategy and 1845 titles and abstracts remained after removing 596 duplicates. Of these titles/abstracts, 229 qualified for full text review, 73 due to their potential relevance and 156 because there was insufficient information in the title or abstract to be able to judge this. After examining the full texts and excluding articles not appearing to meet the inclusion criteria, 45 publications remained. 21 of these were excluded at the data extraction stage due to only describing social media adoption rates by public health organizations, without specifying the purposes or consequences of these uses, or because they were found to be irrelevant to e-Government.

In summary, 24 publications representing 22 separate studies (see Table 1) were included in the final analysis. The stages of selection are illustrated in Fig. 1, using a PRISMA flow chart (Moher et al., 2009). Further explanation is given in the detailed legend shown in Textbox 1.

*3.1. Publication characteristics*

All of the 24 qualifying articles were published within the last five years (between 2011 and 2015), peaking in 2014 when 9 were published (see Fig. 2). Data collection for the 22 studies represented in the articles was mostly undertaken between 2009 and 2014, as shown by the gray bars in Fig. 2.

We observed that, on average, almost two years typically passes between the period of data collection and the publication of results, although research on social media represents a "rapidly changing landscape" (McCorkindale & DiStaso, 2014). This suggests that the conventional academic literature may be lagging behind as a source of relevant information on social media in health.

Almost all ($n = 22$) of the publications included in the final analysis were journal articles. The other two were conference papers. Journal articles were initially classified into subject areas according to the taxonomy used by the Scimago Journal ranking portal (Scimagojr, 2016), for example, computer science, medicine, or business, management and accounting, and then using the broader disciplinary categories of medicine, ICT and social science; the latter also encompassing business and management. One article (Donelle & Booth, 2012) from a journal not covered by Scimagojr was manually assigned to the medicine category. This analysis revealed that 15 articles were published in medical journals, 2 in social science journals, one in an ICT journal, and the remaining four in inter-disciplinary journals: two in social science and ICT and two in social science and medicine. This mainly unidisciplinary and medical focus suggests that research in this area is still academically siloed, which may reflect university incentives to publish in high impact speciality journals.

*3.2. High level aims of the included studies*

Although all of the 22 eligible studies had unique research aims and questions, it was nonetheless possible to group them into the following two classes:

- Studies focused on *describing approaches* to social media use (S1; S2;

**Table 1**
Characteristics of studies meeting the inclusion criteria.

| # | Authors, year (discipline; SJR) | Study aims | Organizational or institutional focus (number) | Country (income group[a]) | SM type (data year) | Study design | Study quality | Classes of e-Government [Bertot et al., 2010 taxonomy] |
|---|---|---|---|---|---|---|---|---|
| S1 | Bhattacharya, Srinivasan, & Polgreen, 2014 (Medicine; SJR = 1.39) | To investigate factors associated with engagement of U.S. Federal Health Agencies via Twitter | Federal Health Agencies (130 accounts of 25 agencies) | U.S. (high) | Twitter (2012) | Mixed method | 7 | Democratic participation; transparency and accountability; others (G2G; G2C) |
| S2 | Donelle & Booth, 2012 (Medicine; not in SJR) | To analyse the content of health-related Twitter posts according to the Public Health Agency of Canada's Determinant of Health framework. To examine the influence of socio-political factors including government health reforms | General public and other stakeholders. Governmental healthcare reform (N/A) | North America (focused mainly on U.S. and Canada) (high) | Twitter (2009) | Qual. | 6.5 | Democratic participation; others (C2G) |
| S3 | Steele & Dumbrell, 2012 (N/A) Dumbrell & Steele, 2013a (ICT; SJR = 0.11) Dumbrell & Steele, 2013b (N/A) | To analyse the characteristics of information disseminated via Twitter by Australian public sector health organizations and explore how citizens participate in onward dissemination | Government health organizations (n = 16) | Australia (high) | Twitter (2012) | Mixed method | 6 | Transparency and accountability; democratic participation (G2C; G2G; G2P) |
| S4 | Glover et al., 2015 (Medicine; SJR = 1.8) | To examine the extent to which hospitals utilize SM and whether user-generated metrics on Facebook correlate with hospital quality measures | Hospitals (n = 315 performing better than and n = 364 performing worse than the U.S. national rate on 30-day readmissions) | U.S. (high) | Facebook (2011–2012) | Quant. | 6.5 | Evaluation (C2G) |
| S5 | Greaves et al., 2014 (Medicine; SJR = 2.59) | To examine whether tweets sent to NHS hospitals in England contain information about care quality and whether Tweet sentiment is associated with patient survey data and standardised mortality rates | NHS Hospitals (n = 75) | UK (high) | Twitter (2012–2013) | Mixed method | 7 | Evaluation; transparency and accountability (C2G) |
| S6 | Harris, Mansour et al., 2014a (Medicine/Social Science; SJR = 5.77) | To analyse citizens' use of a public-health agency's Twitter hashtag to report food poisoning incidents | Chicago Department of Public Health (N/A) | U.S. (high) | Twitter (2013) | Mixed method | 3.5 | Co-production (C2G; G2C) |
| S7 | Harris, Moreland-Russell et al., 2014b (Medicine; SJR = 1.65) | To analyse public responses to proposed e-cigarette regulations on Twitter, by volume, content, networks | Chicago Department of Public Health (N/A) | U.S. (high) | Twitter (2014) | Mixed method | 6 | Democratic participation (C2G; B2G) |
| S8 | King et al., 2013 (Medicine; SJR = 0.73) | To investigate the role of Twitter in informing, debating and influencing opinion on health policy, how SM sentiment reflects opinion polls and which users have the most influence | English NHS (N/A) | UK (high) | Twitter (2011–2012) | Mixed method | 6 | Democratic participation (C2G; P2G; B2G) |
| S9 | Lachlan, Spence, Edwards, Reno, & Edwards, 2014 (Social Science/ICT; SJR = 1.65) | To evaluate whether the speed with which agencies update their disease postings on Twitter influences the public's perception of their credibility | Analogue to the Centers for Disease Control (N/A) | U.S. (high) | Twitter (N.S.) | Quant. | 4.5 | Transparency and accountability; evaluation (G2C) |
| S10 | Lee & Kwak, 2012 (Social Science; SJR = 1.38) | To inform an open government maturity model for SM-based public engagement, using case studies with five U.S. government healthcare agencies | Food and Drug Administration; U.S. Department of Health and Human Services; Centers for Medicare and Medicaid + others (N/A) | U.S. (high) | Twitter, Facebook, YouTube + others (N.S.) | Qual. | 5.5 | Transparency and accountability; co-production; others (G2C; C2G) |
| S11 | Liu & Kim, 2011 (Social Science; SJR = 0.8) | To compare how public health organisations framed the 2009 H1N1 pandemic via SM compared with traditional media | Department of Health and Human Services, Centers for Disease Control, WHO + others (N/A) | U.S. (high) | Facebook, Twitter (2009) | Quant. | 6 | Transparency and accountability (G2C) |
| S12 | McCaughey et al., 2014 (Social Science/ICT; SJR = 0.88) | To evaluate the impact of SM on organizational performance | Hospitals (n = 106) | U.S. (high) | Facebook, Twitter, YouTube + others (N.S.) | Quant. | 6 | Evaluation (C2G) |

*(continued on next page)*

**Table 1** (*continued*)

| # | Authors, year (discipline; SJR) | Study aims | Country (income group[a]) | Organizational or institutional focus (number) | SM type (data year) | Study design | Study quality | Classes of e-Government [Bertot et al., 2010 taxonomy] |
|---|---|---|---|---|---|---|---|---|
| S13 | Neiger, Thackeray, Burton, Thackeray, & Reese, 2013 (Medicine; SJR = 1.65) | To examine how LHDs use Twitter to share information, engage with followers and promote action, and whether use varies depending on size of population served | U.S. (high) | LHDs (n = 210) | Twitter (2012) | Quant. | 7 | Smaller LHDs: Co-production; transparency and accountability; bigger LHDs: transparency and accountability; co-production (G2C) |
| S14 | Richter, Muhlestein, & Wilks, 2014 (Social Science/Medicine; SJR = 0.43) | To examine hospital characteristics associated with SM use and to examine how U.S. hospitals' use Facebook | U.S. (high) | Hospitals (n = 471) | Facebook, Twitter, YouTube + others (2012–2013) | Quant. | 6 | Co-production; transparency and accountability (G2C; C2G; G2B) |
| S15 | Shan et al., 2015 (Medicine; SJR = 1.06) | To examine the use and impact of SM on 2-way communication between consumers and public-sector food safety or nutrition agencies | UK and Ireland (high) | Government food safety agencies and food-related health promotion organizations (n = 5) | Facebook, Twitter, YouTube (2012–2013) | Qual. | 5.5 | Evaluation; transparency and accountability; others (C2G; G2C; G2B) |
| S16 | Street, Hennessy, Watt, Hiller, & Elshaug, 2011 (Medicine; SJR = 0.85) | To examine whether SM analysis can elucidate community perspectives, media framing and sociopolitical issues around disinvestment in existing health technologies (assisted reproduction) | Australia (high) | Australian Government through Universal health insurance program - Medicare (N/A) | Facebook + others (2010) | Qual. | 6 | Democratic participation (C2C; C2G) |
| S17 | Thackeray et al., 2012 (Medicine; SJR = 1.37) | To assess the extent to which SHDs are using SM, which SM applications are used most often and how often SM is used to engage audiences | U.S. (high) | SHDs (n = 50) | Twitter Facebook + others (2011) | Mixed method | 6 | Transparency and accountability; others (G2C; C2G) |
| S18 | Thackeray, Neiger, Burton, & Thackeray, 2013 (Medicine; SJR = 1.65) | To discover whether SHDs are primarily using Twitter for one-way information sharing or community engagement, and how this compares with nonprofit organizations | U.S. (high) | SHDs (n = 39) | Twitter (2012) | Mixed method | 6.5 | Transparency and accountability; co-production; democratic participation (G2C) |
| S19 | Van de Belt et al., 2015 (Medicine; SJR = 1.65) | To identify the value of SM in monitoring healthcare quality and safety through user reporting of incidents and risks | Netherlands (high) | Dutch Healthcare Inspectorate (N/A) | Twitter Facebook + others (N.S.) | Mixed method | 5.5 | Evaluation (C2G) |
| S20 | Vanzetta et al., 2014 (Medicine; SJR = 0.32) | To ascertain how many Local Health Authorities and public hospitals have a presence on Facebook, Twitter or YouTube, how well these are known to the public, and how they engage with citizens via SM | Italy (high) | Local Health Authorities (Aziende Sanitarie Locali) (n = 149) and public hospitals (n = 96) | Facebook, Twitter, YouTube (2012) | Mixed method | 5.5 | Transparency and accountability (G2C; C2G) |
| S21 | Verhoef, Van de Belt, Engelen, Schoonhoven, & Kool, 2014 (Medicine; SJR = 1.65) | To analyze the relationship between SM and quality of care | Review: N/A Consultation: (high) | Review: N/A Consultation: Dutch public health agencies | Facebook + others (N/A) | Review + consultation with public health agencies | 6.5 | Evaluation (C2G) |
| S22 | Yamaguchi et al., 2013 (Medicine; SJR = 1.39) | To examine the effect of SM activity on the collection of signatures opposing government health reform (reimbursement of traditional medicine) | Japan (high) | Japanese Society of Oriental Medicine opposing the medical policy of Government Revitalization Unit (N/A) | Twitter (and an Internet Forum) (2009) | Quant. | 6 | Democratic participation (C2G) |

[a] Classified according to the World Bank's (2016) Country and Lending Groups. Abbreviations: SM = social media; SJR = Scientific Journal Rankings of Scimago Journal ranking portal; Qual. = qualitative; Quant. = quantitative; N.S. = not specified; N/A = not applicable; NHS = National Health Service; LHD = Local Health Department; SHD = State Health Department.
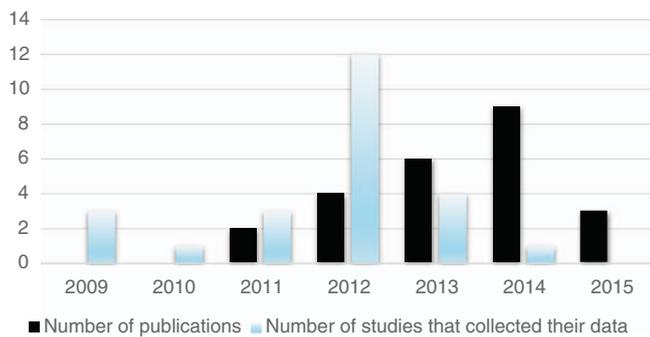
**Fig. 2.** Number of included studies by year of publication and year of data collection.*Data for five studies was collected for more than one year (e.g. 2011–2012) and five studies did not specify when their data was collected.

S3; S4; S5; S6; S7; S8; S10; S11; S13; S14; S15; S16; S17; S18; S20). For example, these studies described health organizations' characteristics and how they are associated with social media use (S14), compared health organizations' use of social media with traditional media channels (S11) or examined social media use in public health organisations to inform an Open Government Maturity Model (S10).

- Studies focused on *assessing the impact or value* of using social media (S4; S5; S9; S12; S16; S19; S21; S22). For example, these examined the association between organizations' use of social media and their brand rating (S12), their perceived trustworthiness (e.g. through sharing patient feedback or complaints) (S9), quality of care (S4; S21) or patient outcomes (standardized mortality rates) (S5), and the effectiveness of social media as a means of enabling stakeholders to influence health policies or reforms (S22).

Detailed information on the specific context, aims and objectives of each study is summarized in Table 1.

### 3.3. Country, units of analysis and social media types studied

Twenty studies were specific to a particular country. All of these studies were conducted in high-income countries (see Table 1): 12 in the U.S., three in the UK (one including Ireland), two in Australia, and one each in Italy, the Netherlands and Japan. One study was a scoping review of international literature, exploring the role of social media and rating sites as tools for understanding quality of care (S21). We identified only one study examining the use of social media by public health organizations for e-Government in more than one country, namely the US and Canada (S2), although broader international comparisons of e-Government exist in the literature (e.g. Mickoleit, 2014). Importantly, no studies meeting the inclusion criteria took place in low- and middle-income countries (LMIC), despite there being a high need for government transparency and accountability in many of these regions (World Justice Project, 2015) and the potential of e-Government to support sustainable development (UN, 2016). Recent literature reviews have nevertheless documented innovative uses of social media in LMIC to support aspects of e-Government in the public health system (Holeman et al., 2016). Taken together, these results suggest a need for new international and interdisciplinary research to shed light on how the appropriateness and usefulness of e-Government approaches using social media may differ across political, socioeconomic and cultural contexts.

A diverse range of public-sector health organisations were examined in the included studies. Five studied specific hospitals (S4; S5; S12; S14; S20) two studied state-level public health departments (S17; S18), two studied a large urban department of public health (S6; S7) and two studied local health departments (S13; S20). The remaining studies focused on other types of public health organization, as shown in Table 1.

Half of the 22 studies focused on a single social medium; mostly Twitter (*n* = 10), and one on Facebook (*n* = 1). Others studied several platforms in parallel: Facebook and Twitter (*n* = 1); Facebook, Twitter and YouTube (*n* = 2); Facebook, Twitter or YouTube plus another social medium outwith our inclusion criteria (*n* = 8). For studies in the latter category we extracted and coded only the findings related to Facebook, Twitter or YouTube, as per our inclusion criteria.

Twitter was the social medium described most frequently as a means of enabling health organizations to pursue goals around *Democratic Participation*, *Transparency* and *Accountability*, or *Co-production*, and was also mentioned as having potential to address the other e-Government objectives described in the Digital Public Service Innovation Framework (Bertot et al., 2016). However, this also reflects the dominance of Twitter in the corpus of studies. For the *Evaluation* purposes that emerged in our research (see Section 3.7.3 for details), Twitter and Facebook were used equally (see Table 1 for further details). Very few of the included studies provided separate findings for the use of YouTube in the context of e-Government in public health (e.g. it was usually mentioned under the generic umbrella of social media), despite YouTube reportedly being one of the most commonly used social media by government overall (e.g. Abdelsalam, Reddick, Gamal, & Al-shaar, 2013).

### 3.4. Research designs and study quality

Almost half of the studies used mixed methods (*n* = 10). Seven employed quantitative designs (e.g. quantitative content analysis, descriptive statistics, etc.), while four used qualitative designs. One study was a literature review.

None of the qualifying studies received a maximum score of 8 on the quality assessment scale, although more than half were ranked as being of good quality (scoring 5.5–6) and seven as high quality (scoring 6 +) including three mixed methods studies, one literature review, one qualitative and two quantitative studies. Studies which received lower quality ratings (scores below 5) did so because they had not adequately justified their research design, did not clearly state the value of their research findings for practice and future research or did not consider sources of potential bias (see Appendix A). The articles were mostly published in high quality journals according to the Scimagojr Journal Rank Indicator (Scimagojr, 2016), the lowest being Applied Mechanics and Materials (SJR = 0.11) (Dumbrell & Steele, 2013a) and the highest being Morbidity and Mortality Weekly Report (SJR = 5.77) (Harris, Mansour et al., 2014a).

#### 3.4.1. Software used to extract data from social media

In addition to formal research designs, several articles reported using specific software to extract or analyse data from social media, mostly from Twitter. These included Twitter Streaming Application Programming (S1; S5; S12; S13; S18), The Archivist (S2), twitteR package for R version 2.15.2 (S7) and NodeXL (S7) for data extraction, and SentiStrength (S1) and TheySay Ltd. for data analysis (S5). Some studies chose to extract and categorize Twitter data manually, after finding that programs such as Twitonomy, TweetVolume, TweetStats, "did not provide the necessary functionality for region-wide, domain-wide or "tweet meaning"-based data capture and categorization" (S3). One study (S17) used the data capture software Snag-It to make screenshots, while two studies (S15; S16) used Nvivo by QSR International to analyse data posted on multiple social media.

### 3.5. Theoretical frameworks

Over half of the studies (*n* = 13) did not specify any theoretical perspective. In the remaining papers, theories were cited as *explanatory/interpretive frameworks*, e.g. Rogers' diffusion of innovations theory (S11); as *practical/guiding frameworks*, e.g. the Public Health Agency of Canada's Determinants of Health framework (S2), the Rand Public

Health Disaster Trust Scale (S8), the National Health Service's (NHS) framework for quality (Darzi, 2008) (S5); or as *methodological frameworks* to aid analysis of social media data, e.g. Grounded Theory (S9; S16), Lovejoy and Saxton's (2012) tweet coding framework (S13; S18), McCroskey and Teven's (1999) Measure of Source Credibility (S8), or for guiding a review e.g. Arksey and O'Malley's (2005) scoping study approach (S21).

The applied emphasis of the included studies confirms the results of our scoping study (Franco et al., 2016) and is in line with other analyses which have concluded that research on social media (Pan & Crotts, 2012) and e-Government (Heeks & Bailur, 2007) is largely atheoretical. Given the importance of theory for the social, health and information sciences, this represents an important gap and illustrates the relative immaturity of e-Government in public health as both a topic of research and a field of practice. New research in this area needs to better integrate theory in order to move beyond describing how social media are being used for e-Government in public health into explaining why it may be beneficial, or otherwise, and the role of contextual factors.

### 3.6. Type and direction of social media interaction

All of the studies either focused on, or mentioned in their findings, the interaction between public sector (government) health organizations and citizens (G2C or C2G). Others described public health organizations interacting with Businesses (G2B), other Governmental departments (G2G) and Professionals such as clinicians (G2P). Some described citizens actively engaging in policy discussions with public health organizations (C2G) or discussing these issues with one another (C2C). The direction of interactions between public health organizations and various stakeholders described in the studies is illustrated in Fig. 3, including uni-directional and bi-directional forms. This also indicates a relative paucity of studies examining public health organizations' interactions with businesses (G2B or B2G), other governmental departments (G2G) and relevant professional groups (G2P or P2G), which would benefit from further research.

### 3.7. Reasons for using social media

We used Bertot et al.'s (2010) framework for classifying the social media interactions referred to in the studies. However, we found a high degree of overlap between Bertot et al.'s categories of *Crowdsourcing solutions* and *Co-production* and, for this reason, we merged the two. We also added a new category which emerged as a separate theme, concerned with the *Evaluation* of public health services by citizens, via feedback, comments or suggestions posted on social media. Table 2 summarises the studies according to the adapted categories of e-Government (Bertot et al., 2010) and social media interactions (Fang, 2002).

#### 3.7.1. Transparency and accountability

*Transparency and accountability* (Bertot et al.'s (2016) *transparent* category) were the main reasons cited for public health organizations' interaction with the aforementioned stakeholders (see Table 2). In these cases, information sharing was primarily between government and citizens, in both directions: G2C (e.g. S1) and C2G (e.g. S5).

Transparency and accountability mainly involved using Facebook, Twitter or YouTube in order to post information about the organization itself (e.g. staff members, services, accreditation), to provide updates on ongoing activities (e.g. news, job openings, events, projects) or to increase awareness of their Open Data resources. However, studies described this as a largely one-way interaction, where public health organizations provide and stakeholders receive information. One study observed that small public health organizations were more likely to post tweets about themselves, although large public health organizations tweet more in general (S13). Another study described how a transparent approach to resolving patient problems via social media could help to improve health organizations' public image (S15).

#### 3.7.2. Democratic participation

*Democratic participation* (Bertot et al.'s (2016) *participatory* category) was the next most frequently cited reason for public health organizations' use of social media in e-Government (see Table 2). Articles described social media as multi-disciplinary, non-hierarchical meeting places where citizens and professionals could share information and refine or reinforce their own views (S8). This allowed stakeholders to voice opposition or support for proposed health legislation or reforms, whilst enabling public health organizations to "listen" to and understand their views, as well as to disseminate information about the proposals in question.

Thus one study found that governmental health organizations used social media to disseminate health policy news more often than other health-related organizations, such as not-for-profits (S3), possibly reflecting a greater requirement for civic engagement. Although none of the included studies reported that citizens' comments on social media had directly influenced health policy, several authors pointed out that social media are widely used by policy makers and may play a significant role in informing government decisions. For example, a study in the US showed how a municipal public health department used social media to understand citizens' views about proposed e-cigarette regulation (S7). Another, from the UK, found that a diverse range of stakeholders had engaged with information about health and social care reforms on Twitter and that negative sentiment towards these reforms echoed those found in public opinion polls (S8).

Social media can also be used by advocacy groups to influence health policy; for example, a Japanese study found that it increased the number of online signatures collected in a campaign to oppose reforms to the reimbursement of traditional medicines (S22).
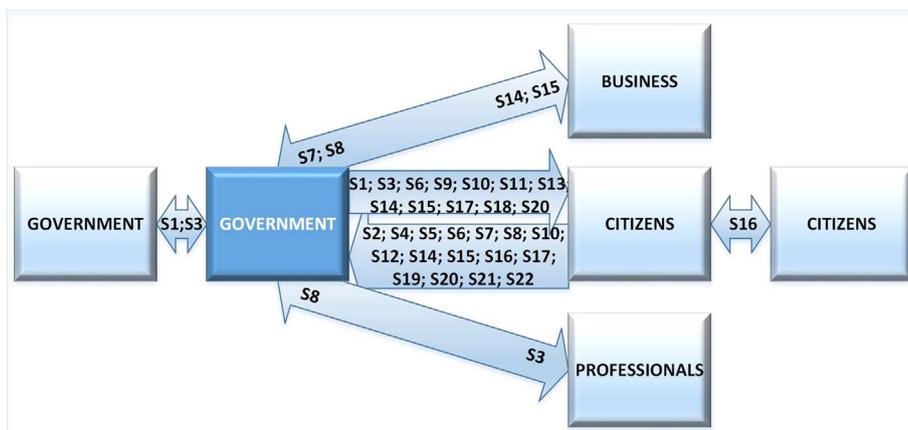


**Fig. 3.** Direction of public health organizations' interactions with stakeholders.

**Table 2**
Reasons for stakeholder interaction via social media.

| Category | Transparency and accountability | Democratic participation | Evaluation | Co-production | Other uses |
|---|---|---|---|---|---|
| G2G | S1; S3 | S1; S3 | | | S1 |
| G2C | S1; S3; S9; S10; S11; S13; S14; S15; S17; S18; S20 | S1; S3; S18 | S9; S15 | S6; S10; S13; S14; S18 | S1; S10; S15; S17 |
| G2P | S3 | S3 | | | |
| G2B | S14; S15 | | S15 | S14 | S15 |
| C2G | S5; S10; S14; S15; S17; S20 | S2; S7; S8; S16; S22 | S4; S5; S12; S15; S19; S21 | S6; S10; S14 | S2; S10; S15; S17 |
| C2C | | S16 | | | |
| B2G | | S7; S8 | | | |
| P2G | | S8 | | | |

While opportunities for advocacy may offer public benefit by giving a voice to civil society organisations, social media also present opportunities for certain groups or individuals to gain influence in ways that may be seen as unrepresentative, unfair or even anti-democratic. For example, in the aforementioned study of NHS reforms (S8), tweets from newspapers and celebrities were disproportionately represented and the authors caution that Twitter should be regarded as a place for sharing views rather than a forum for genuine debate (King et al., 2013). The use of social media channels for corporate lobbying represents a particular challenge for e-Government in the context of public health. For example, Harris, Moreland-Russell et al. (2014b) analysed Twitter activity in response to information disseminated by the Chicago Public Health Department regarding local proposals to regulate electronic cigarettes as tobacco products. They describe how the department's Twitter account was rapidly inundated with hundreds of messages arguing against the legislation. Most of these were found to originate outside the area and many bore hallmarks of corporate "astroturfing", in contrast to the smaller number of local postings, which were more in favour of the proposal (S7).

Overall, these findings are consistent with other e-Government research demonstrating the ability of social media to engage and enable citizens to participate in the policy making process (Mergel, 2013), whilst also highlighting the need for vigilance in identifying cases of misuse.

### 3.7.3. Evaluation

*Evaluation* emerged as a strong theme and was mentioned in almost a third of the qualifying studies (see Table 2). Most studies in this category examined how social media may be used as a means of evaluating the reputation of public health organizations or the quality of their services.

Examples include a recent US study, which found that hospitals with high rates of readmission (indicating poorer care) received less favourable Facebook ratings compared to those with fewer readmissions, although the authors caution that Facebook ratings may represent historical rather than current trends in quality (S4). In contrast, a study of Twitter postings to English hospitals found that relatively few related to quality and there was no correlation between social media sentiment and established measures of patient experience or outcomes, leading the authors to conclude that efforts to use social media as a medium for quality monitoring may be unrealistic (S5). In the latter cases, healthcare organisations were the passive recipients or subjects of social media posting, however researchers have also observed that hospitals which actively engaged with multiple social media channels received higher scores in patient experience surveys, and more favourable recommendations, suggesting that reputational effects may be more salient than governance ones. The authors of another US study propose a "value matrix" to help hospitals calculate the return on their investment in social media activities, and suggest its usefulness for leveraging government incentives for value-based care, which are partly dependent on measures of patient experience (S12). Eligible studies also mentioned the importance of social media for health system regulators and those responsible for monitoring and supervising the

quality and safety of public health organizations, including food safety (e.g. S15). However, a study assessing the value of Twitter and Facebook for the Dutch Healthcare Inspectorate found that it made little difference, which the authors explained in terms of the unwillingness of Dutch citizens to share their health experiences or name their health care provider in tweets or public Facebook posts (S19).

### 3.7.4. Co-production

*Co-production* (Bertot et al.'s (2016) *co-created* category) was the least reported use of social media by public health organizations for e-Government (see Table 2), echoing previous analyses of the e-Government literature that have shown the dominance of one-way interaction between governmental organizations and citizens (Riarh & Roy, 2014).

Several authors mentioned that very few organizations use social media in order to ask external stakeholders to do something to benefit their organizations (e.g. S13; S14). Nevertheless, some describe organizations actively soliciting the collaboration of citizens or patients, such as requesting volunteers (e.g. S18) or collecting suggestions on how to improve services, as undertaken by the U.S. Centers for Medicare and Medicaid and the Food and Drug Administration (S10). One study observed that Local Health Departments (LHD) asked their followers to do something for the organization more often if they were small, compared with larger LHDs. Possible explanations offered by the authors include the limited capacity of small LHDs to provide a wide range of services and a sense of familiarity or cohesion that might be more common within rural communities served by smaller health organisations (S13).

### 3.7.5. Other uses

Several authors (e.g. S1, S2; S15; and S17) considered other ways in which data from social media interactions might be used to inform health organisations, which to some extent reflect the remaining, arguably future-focused, categories described by Bertot et al. (2016) as *anticipatory*, *personalized*, *context-aware* and *context smart*, although these were not explicitly articulated. For example, in their "open government maturity model for social media-based public engagement" - which was informed by case studies of healthcare administration agencies (S10) - Lee and Kwak (2012) describe the potential for data collected from public health organizations' online portals, mobiles and social media to feed analytics that support rapid and timely decision-making, virtuous cycles of public engagement and collaboration, and continuous quality improvement within public health organisations, although they point out that these functions had yet to be integrated at the time of writing.

## 4. Challenges and limitations

Our background research to inform the review protocol (Franco et al., 2016) highlighted the challenges involved in defining the scope of the public health sector, given national differences in health system structure and financing, and helped to clarify this for the purposes of our inclusion and exclusion criteria. Nevertheless, the studies yielded by our search strategy reported a diversity of public health organisa-

tions, some clearly labelled as such and others only evident through further reading. For example, we included one study of a food standards agency based on a separate definition of these as governmental agencies with a public health remit (S15).

Our search results contained many studies that simply reported social media adoption rates by public health organizations (e.g. Bermúdez-Tamayo et al., 2013; Griffis et al., 2014) or described social media interactions between public health organizations without specifying the reasons for those interactions (e.g. Harris, Choucair, Maier, Jolani, & Bernhardt, 2014). These were excluded from our analysis since they did not explicitly link social media to e-Government. Likewise, we excluded studies that described social media practices within specific healthcare units, since these typically involve the provision of information or support to specific groups of patients, rather than addressing e-Government objectives at the wider organizational level, which is the focus of our systematic review. We also excluded studies using social media data as a tool for understanding specific illnesses or patient communities, which could arguably be classed as a type of e-Government "listening" activity but is more akin to digital health surveillance or eHealth research (e.g. Pagliari & Vijaykumar, 2016). Although these studies fall outwith the scope of our systematic review there is doubtless relevant knowledge to be gained from synthesising them, and other reviewers may wish to do so.

Our coding framework would have benefitted from documenting whether authors considered the ethical implications of the social media uses they describe. Given the difficulty of disguising citizens' and patients' identities on social media, simply mining these data for research or to inform public services raises ethical challenges, particularly when consent has not been or cannot be obtained, as in sentiment analysis from Twitter data. There would be value in further research to assess the extent to which these practices are consistent with privacy laws and policies, and acceptable to stakeholders.

Finally, all of the included studies were conducted in high-income countries, despite the fact that our searches covered international databases, including WHO. We are aware, from a separate review, that cases of social media use for aspects of e-Government in the public health sector of LMIC exist, although these would not typically be classed as research (see Holeman et al., 2016 for discussion). Other approaches to evidence capture, such as scoping reviews of innovation projects and expert consultations, may therefore be necessary to uncover this activity.

## 5. Summary and conclusions

To the best of our knowledge, this is the first systematic review to have captured, appraised and synthesised the corpus of research evidence on the use and impacts of social media for e-Government in the public health sector. Its key messages are summarised in Textbox 2.

While most publically-funded health organizations are beginning to use social media in ways that are consistent with e-Government objectives, our review shows that few published studies have explicitly linked these concepts. Of those that exist, most focus on social media as a channel for organization-citizen interaction (dissemination and feedback), rather than other forms of stakeholder-to-stakeholder interaction described in Fang's (2002) e-Government taxonomy. The specific e-

Government objectives described in these studies are broadly compatible with the categories proposed by Bertot and colleagues in 2010. In this regard, the strongest emphasis is on facilitating the transparency/ accountability of public services and enabling democratic participation/engagement, while active co-production by citizens appears less frequently, likely reflecting the healthcare sector's prioritization of evidence-based medicine and policy. A separate category of "evaluation" also emerged as a distinct theme, involving the use of social media to actively solicit or passively listen to citizens' opinions on the quality of public health services, alongside studies evaluating the potential of social media to yield this information. This evaluation category represents a potential addition to Bertot's model and warrants further study. While our analysis pre-dated Bertot et al.'s (2016) Digital Service Innovation Framework, it is easy to see how some of the observed uses of social media in public health could inform "smart, anticipatory" approaches; such as monitoring nascent indicators of reputational risk to inform rapid quality improvement activities. With advances in data science the potential for automated social media analytics to drive adaptive "learning health systems" in the future is considerable (Krumholz, 2014). At the present time, however, research and practice involving social media for e-Government in the public health sector is relatively immature compared with other areas of e-Government research. This is reflected in the lack of theoretical depth which we have observed in this literature, the dominance of descriptive analyses and the absence of multi-disciplinary and international studies which could shed light on important contextual influences. We recommend investment in new interdisciplinary research to better articulate the value proposition for social media as a facilitator of e-Government in public health organizations and to build evidence of their uses, impacts and contextual mediators, drawing on multiple stakeholder perspectives. Such evidence will be vital for guiding managers and policymakers as to the most cost-effective, appropriate and responsible uses of these approaches in this essential, but increasingly resource-constrained, public sector.

## Conflicts of interest

Not known.

## Appendix A. Studies according to methodological quality assessment criteria (CASP, 2013)

| Category (Questions) | Considerations | Yes | Not clear | No |
|---|---|---|---|---|
| Research objectives (Was there a clear statement of the aims of | Is there a rationale for why the study was undertaken? | S1; S2; S3; S4; S5; S7; S8; S9; S10; S11; S12; S13; S14; S15; S16; S17; S18; S19; S20; S21; | S6 | |

**Textbox 2.** Key messages.

- 4 international research databases and 1 source of gray literature were systematically searched, using key words, to identify studies focused specifically on the use of social media for e-Government in the public health sector.
- Out of 2441 search results only 22 studies matched the eligibility criteria.
- These studies date exclusively from the last 5 years, come from high income countries and were published in academic journals (mostly medical).
- The studies are mainly descriptive, unidisciplinary and atheoretical, although scored well on methodological quality criteria.
- Twitter was the most commonly studied social medium.
- Most studies focused on interactions between public health organizations and citizens, rather than between other e-Government stakeholders, as described by Fang (2002), although some fell into a new category of Government-to-Professionals.
- The e-Government objectives for which social media were being deployed mostly related to Bertot et al.'s (2010) categories of *transparency* and *accountability* (openness) and *democratic participation* (consultation and feedback), with a lesser emphasis on *co-production* (collaboration). *Evaluation* (e.g. of organizational performance) also emerged as a unique theme.
- More interdisciplinary research is needed to understand how public health organizations are using social media for e-Government, to articulate their pathways to impact, to evaluate their effectiveness in achieving e-Government objectives and to examine the contextual factors influencing each of these.
- While systematic reviews are highly focused and prioritise published research, a broader scoping review would be useful for documenting further examples of social media use for e-Government in different public health settings internationally.

| | | | | |
|---|---|---|---|---|
| the research?) | | S22 | | |
| Research design (Was the research design appropriate to address the aims of the research?) | Has the researcher justified the research design (e.g. have they discussed how they decided which methods to use)? | S1; S2; S3; S4; S5; S16; S21; S22 | S7; S8; S9; S10; S11; S12; S13; S14; S15; S17; S18; S19; S20 | S6 |
| Sampling (Was the recruitment strategy appropriate to the aims of the research?) | Has the researcher explained how the participants or cases were identified and selected? Have the researchers explained why the participants or cases they selected were the most appropriate to provide access to the type of knowledge sought by the study? Was the sample size sufficiently large? | S1; S3; S5; S7; S13; S14; S16; S17; S18; S20; S21; S22 | S2; S4; S6; S8; S9; S10; S11; S12; S15; S19 | |
| Data collection (Was the data collected in a way that addressed the research issue?) | Is it clear how data was collected? Has the researcher justified the methods that were chosen? Has the researcher made the methods explicit? If the methods were modified during the study, has the researcher explained how and why? Whether the form of the data is clear (e.g. tape recording, notes etc.) | S1; S3; S4; S5; S7; S8; S10; S11; S12; S13; S16; S17; S18; S19; S20; S21 | S2; S6; S9; S14; S15; S22 | |
| Data analysis (Was the data analysis sufficiently rigorous?) | Was there an in-depth description of the analysis process? If thematic analysis was used, is it clear how the categories/themes were derived from the data? Has sufficient data been presented to support the findings? To what extent has contradictory data been taken into account? Whether quality control methods were used to verify the results? | S1; S2; S4; S5; S7; S11; S12; S13; S18; S22 | S3; S6; S8; S9; S10; S14; S15; S16; S17; S19; S20; S21 | |
| Reflexivity (Has the relationship between researcher and participants been adequately considered?) | Has the researcher critically examined their own role, potential bias and influence during the formulation of research questions, sample recruitment, data collection, and analysis and selection of data for presentation? How the researcher responded to events during the study and whether they considered the implications of any changes in the research design? | | S2; S8; S13; S14; S15; S17; S18; S21 | S1; S3; S4; S5; S6; S7; S9; S10; S11; S12; S16; S19; S20; S22 |
| Findings (Is there a clear statement of findings?) | Are the findings explicit? Has an adequate discussion of the evidence, | S1; S2; S3; S4; S5; S6; S7; S8; S9; S10; S11; S12; S13; S14; | | |

| | both for and against the researcher's arguments, been demonstrated? Has the researcher discussed the credibility of their findings (e.g. triangulation)? Are limitations of the study discussed explicitly? Are the findings discussed in relation to the original research questions? Are the conclusions justified by the results? | S15; S16; S17; S18; S19; S20; S21; S22 | |
| Value of the research (Is the study of value for research and practice?) | Does the researcher discuss the contribution the study makes to existing knowledge or understanding? Does the research identify new areas in which research is necessary? Does the researcher discuss whether or how the findings can be transferred to other populations, or consider other ways in which the research can be used? | S1; S2; S4; S5; S8; S10; S11; S12; S13; S14; S15; S19 | S3; S6; S7; S9; S16; S17; S18; S20; S21; S22 |

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