LITERATURE REVIEW ON

EFFECTIVENESS OF THE USE OF SOCIAL MEDIA

A REPORT FOR PEEL PUBLIC HEALTH

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Executive Summary

Preliminary data from the field suggests that social media is becoming a powerful addition to the health communicators' toolkit. Although there is a great deal of interest in using social media as a tool for public health communications, the research evaluating its utility is still in its infancy. As of yet, few research studies have examined the broader utility of social media for the adoption of health promoting and protective behaviours. One of the chief conclusions of this report is that there is a paucity of peer-reviewed studies testing the utility of social media interventions for desired outcomes. Instead, research has focused on documenting the range of health-related behaviours and the content of health-related discourse on these platforms. Observational studies show an abundance of both informal health conversations related to public health issues and organized health-related activities on leading social media platforms such as YouTube, Twitter, and Facebook. The quality of health information available to users on these platforms is highly variable raising some concerns that social media users are exposed to unopposed viewpoints that counter core public health recommendations and contemporary medical science, such as those opposing immunization and promoting smoking.

Social media is currently utilized by public health organizations *both* as a broadcasting platform to amplify messages from traditional media sources (e.g., radio, television, print media) *and* as an entirely new way of collaborating and co-creating content with target audiences. In the latter approach, organizations have had to adapt their communications strategies to incorporate user-generated content and feedback. The process of engaging users to co-create content, to rate, rank and comment on communications, more so than the resulting message, is increasingly perceived to give a heightened authenticity to messages, improving trust in, and building users' relationships with, organizations. Social media, unlike traditional media campaigns, provides novel opportunities to embed and interject public health messaging into the daily online conversations of Canadians. In the future, it will also allow public health communicators to deliver a range of health promotion messages and self-monitoring tools through mobile applications, an innovation that will potentially increase the reach to those without computers, and will allow public health messaging to penetrate the day-to-day health conversations and activities of Canadians. The adoption of social media by leading public health organizations reflects a widespread sense that these tools are increasingly necessary to reach demographics who are abandoning traditional broadcast technologies (e.g., telephones, television) such as teens, or a significant portion of the public who are rapidly transforming the manner in which they interact with experts.

Backgrounder on Social Media Use

*In the era of the 24-hour news cycle, the traditional once-a-day press conference featuring talking heads with a bunch of fancy titles has to be revamped and supplemented with Twitter posts, YouTube videos and the like. The public needs to be engaged in conversations and debate about issues of public health, they don't need to be lectured to." -*Andre Picard, *The Globe and Mail,* June 9, 2010

Statistics Canada data indicate not only that more and more Canadians are using the internet at home in their daily lives (see Appendix 1 for a review of internet and social media usage trends), but that they are engaging in an ever more diverse array of online activities (1,2,3,4,5). These activities reflect the growing integration of online tools into Canadians' personal and professional lives and the shift from static "Web 1.0" platforms to the dynamic, interactive, and collaborative qualities of Web 2.0. In addition to evidence of the accelerating popularity of online platforms like Facebook, Twitter, and YouTube, new data also suggests that organizations can increase feelings of trust and loyalty through social media use (5). Such trends are already generating widespread interest in the use of Web 2.0 and social media platforms in research, policy and practice. The precise boundaries defining these terms, however, are still emerging within the literature. As the number, diversity, and inter-operability of new web-based and mobile platforms continue to proliferate, the characteristics and subcategories denoted by the term "social media" will need to be further disaggregated and refined.

There is general agreement, however, that the new media environment is characterized by **interactivity**, **user-generated content**, and **multi-directional** communication flows. Broadly, the transition to Web 2.0 marks a shift from a "one-way conversation" to a "multi-way conversation," in which users participate as both creators and consumers of web content (7,8). The nature of the content produced by users varies considerably across platforms, from passively collected data that can be fed back into the system and reflected back to users in word clouds or other popularity metrics, to content actively created, propagated, and iteratively revised by users in wikis, blogs, and video-sharing or social networking sites, on RSS feeds, or through the creation and circulation of "widgets," "gadgets," and "badges" that can be embedded in sites across the web (9, p.63). As Turnbull notes, the user behaviours

> *As of August, 2007, there were roughly 1200 Facebook communities advocating for cures for different diseases. The Canadian Cancer Society's Facebook community includes, as of the time of this writing, 14,730 members from around the world* (6, p.105).

enabled by Web 2.0 architecture have shifted the boundaries between experts/information-providers and laypeople/information-consumers: information is increasingly "… created and co-created by users in a dynamic, collective manner" (8, p.57). Eysenbach began using the neologism "apomediation" (apo: separateness, detachment) to describe the way new online platforms allow users to bypass formal intermediaries, expert gatekeepers, or other middlemen: users do not act entirely without guidance, but rely instead on peers, web tools, and the aggregate knowledge generated by new collaborative platforms (10).

The term "social media" is used somewhat loosely to describe an array of new Web 2.0 platforms. Although they are not always clearly distinguished in the literature, the interactivity associated with "social media" should be differentiated from more generalized forms of online user engagement. For instance, many websites invite users to input their own information, customize the layout and look of a page, prioritize certain kinds of content, or keep track of their own online activities over time. Social media, by contrast, is characterized by interactivity across multiple horizontal connections, which produce in aggregate a mutable, collectively generated user experience (11, see also Appendix 2 for a description of the most popular social media platforms). Even within a single platform, users make use, to varying degrees, of the opportunities afforded for collaboration and social networking. YouTube, for instance, can be used simply as a broadcast medium for propagating a movie trailer or public service ad. It is only when other users begin to link to, remix, repurpose, and discuss posted content that YouTube's character as a social media platform comes fully into view.

Social media platforms are being studied by health researchers and mobilized for a variety of purposes: recruitment for clinical trials; professional development and training for clinicians; inter-professional communication and coordination; training simulations; health social networks and health and illness support groups; health advocacy and fundraising for health organizations; development of interactive, self-management tools and plugins to popular social media platforms; public health messaging; infectious disease monitoring.

This report targets original research, case studies, reviews, and commentaries related to public health communication, although there are at times significant overlaps between this subfield and those listed above. In addition, we summarize information from online sources related to notable public health campaigns (extracted from podcasts, interviews, PowerPoint presentations, and key public health organizations' websites).

Research Methods

We conducted a systematic literature search of multiple databases, chosen for their coverage of a range of relevant disciplines, including medicine, public health, psychology, business / marketing, and related social sciences using the keywords "social media" (health databases) or "social media" AND "health" (social sciences/business/periodical databases). Between July 14 and July 16, 2010, we (JK and RS) executed keyword searches (See Figure 1 for the list of databases searched and the keywords utilized and the process of article selection and exclusion). Search results (n=551) were imported into the reference software Endnote and combined into a master database for analysis. The final set of articles (n=39) was analyzed using the following categories: article type, research methodology, and major themes. The reviewer wrote a brief description of each article and, where appropriate, identified any new references (snowball) cited that may be relevant to this report (see Appendix 3). Snowball references were then compiled and vetted using the same procedure as articles found through the database searches. Reviewed papers were also ranked for relevance from "low" to "high" as they related to the core objectives of this report.
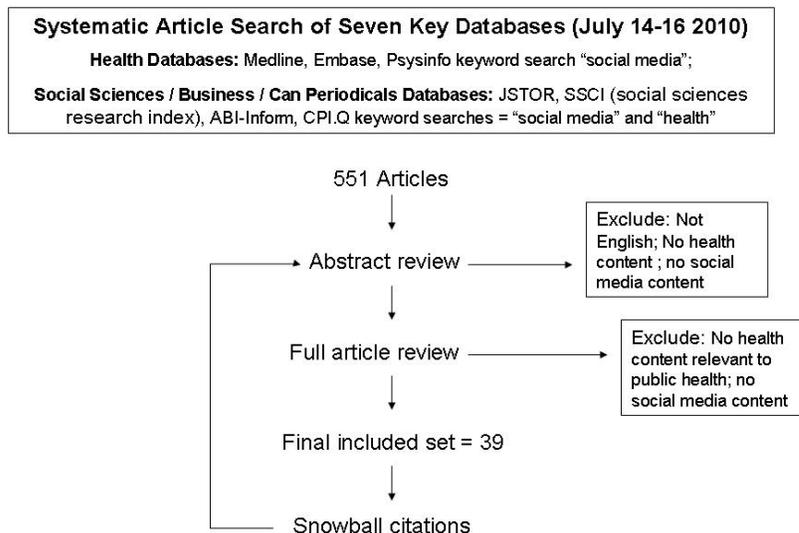

Figure 1: Search strategy and inclusion criteria. Exact duplicates were identified and eliminated as well as articles written in languages other than English. Article abstracts were reviewed for their social media and health/public health communication content by both JK and RS. A subset of articles was reviewed in parallel by both (JK and RS) and the results showed 100% agreement in the application exclusion and inclusion criteria. Articles that appeared to fulfill both criteria were selected to be reviewed in full. When there was any doubt, articles were selected for full review. Articles without an abstract were also reviewed in full. During the secondary round of analysis, we excluded articles where, despite the abstract, there was no useful content related to health communication or social media. Again, agreement between the reviewers was validated by a parallel review of a sub-sample of articles (by JK and RS).

Results

Of the 39 articles we reviewed, we ranked 17 articles as highly relevant, 14 articles of medium relevance and 8 articles of low relevance. Most of the articles included in this review were original research articles. 22 of the included articles were classified as original research articles, while 10 were classified as commentaries (or opinion pieces), 4 as reports (including recommendations for action) and 4 as reviews (overviews of the utility of social media) (Appendix 3). Of the twenty-two original research articles, thirteen were case studies either of specific social media interventions or examined discourse, content, and activity on specific platforms. Nine used content analyses to capture current social media behaviours and characterize the quality and reception of health messaging on the platforms (12-20). The most frequent mainstream platforms studied were YouTube, Twitter and Facebook while some studies utilized custom interfaces with social media capabilities (21). One consistent finding of these observational studies was an abundance of both informal health conversations related to public health issues and organized health-related activities on leading social media platforms such as YouTube, Twitter, and Facebook. The quality of health information available to users on these platforms is highly variable, raising some concerns that social media users are exposed to viewpoints (in some cases unopposed by public health experts) that counter core public health recommendations and contemporary science, such as platforms with a significant discourse opposing children's immunization or promoting smoking.

The single **controlled intervention study** in our review failed to *isolate* the social media component of the communication campaign to assess its precise impact on issue awareness or measured outcomes, such as improved exercise and diet (21). Thus, one of our chief findings for this report was a paucity of peer-reviewed studies testing the utility of social media communication interventions for desired outcomes (e.g., increased issue-awareness, changes in the public's health competency, or adoption of desired behaviours). When controlled research included an evaluative component, the results were often confounded by a failure to isolate the intervention from other communication strategies. A limitation of many social media case studies was the complex and multi-faceted social media interactions described. This made it difficult to identify the boundaries of a particular intervention and to determine how the results of these studies could be generalized from one health issues to a broader public health context (i.e., does social media work well for particular outcome categories such as improved literacy and awareness but not for necessarily for behavioural change?). The literature also provides limited insight into how the utility of social media might vary depending on the particular public health objectives governing an intervention – for example, are there differences in the way social

media influences public opinion and action during epidemics as opposed to in a campaign for chronic disease prevention?

Nonetheless, a significant number of articles reviewed (28) outlined the potential applications of social media for public health communications (9,11-15,17,20,22,23,25-37) asserting that the participatory web is rapidly transforming the way the public relates to medical professions and how average citizens seek out and consume medical information (10,16,39). A small body of public health researchers have focused their attention on the potential for harnessing these platforms to health protection and promotion objectives and are exploring the role social media can play to increase the reach and relevance of public health messaging. These researchers are beginning to articulate a framework to outline the utility of these platforms and to identify lessons learned from social media campaigns in the private and public sectors.

Five major themes were extracted from the article set. They consisted of the following, in order of frequency:

Themes	Frequency*
I. Potential applications	28
II. Current uses of social media for health communication	21
III. Infodemiology / Infoveillance	5
IV. The utility of social media for health communication (and potential pitfalls)	4
V. Circumvention of advertising regulations through social media (e.g., Tobacco advertising, junk food advertising to children)	3

Table 1: Thematic domains identified in the literature review. *Number of articles that met this criteria-Some articles matched >1 category so the sum of hits will exceed the total number of articles reviewed; identified themes occurring at least twice are listed in the table).

In addition to the major themes, we identified several case studies of public health campaigns using social media that illustrate the opportunities and challenges in utilizing these platforms for public health communications. The thematic domains are described below and the selected case studies in Appendix 4.

Potential Applications, Current Uses, and Utility of Social Media for Health Communication

There was a significant overlap in articles describing the **current** and **potential applications** of social media for public health communications. Many of these applications related to empirical results underscoring the presumed **utility** of social media. The sections outlined below (a-e) describe the rationale for adoption, the central areas of opportunity, and challenges described in the literature.

a) Current and Potential Social Media Applications Reflect Changing Consumer Expectations

There has been a fundamental shift in what citizens expect of both information delivery services and encounters with health professionals (26,31). Hesse et al (2009) argue that just as consumers now expect twenty-four hour access to information through online applications, they increasingly expect 24-hour customer service capabilities, including expanded self-serve options online. Consumers want to be able to bypass traditional gatekeepers of system information (31), whether they are booking flights or conducting bank transactions, expecting timely, transparent access to information *they want, in the form they want it in, and as they need it*. Information-seekers adapted to today's media environment put great store in the wisdom of the crowd, relying on other users' reviews for purchasing decisions and other patients' experiences for health related decisions.

> *"Social media experts speculate that there will be more change precipitated by advances in the new media environment within the next 5 years than there has been in overall communication environment over the previous 50."*(31)

Trends in consumer behaviours and expectations diverge significantly from norms of pre-scripted experiences and rigid one-way communications to conversations mediated by peers and online communities. Patients are frequently arriving at medical appointments having searched for health information online, blogged about their concerns, and posted questions to both peer-and expert-reviewed social networks. The consultation does not end once the health professional delivers opinions and/or advice, nor will unresolved concerns or issues wait for a follow up appointment. Health information consumers now have access to a broad array of experientially rich and customizable health information-sharing applications (13,22,29). These applications are used to seek out information and share health experiences (including rating and commenting on clinical encounters and individual health professionals): reading online posts on an issue can influence patients' attitudes toward health issues and can affect decision to comply with prescribed treatment or medical advice (6,13,20,22).

Public health communications in the era of social media must strike a difficult balance between understanding what is on the health agenda of specific populations and attempting to set the health agenda of targeted populations to improve health outcomes.

b) New Communication Objectives: From "Push" to "Push/Pull"

As described above, social media applications are an integral component of communications for a large portion of the Canadian public. Most public health organizations have already invested in Web 1.0 platforms, such as organization websites, which are intended to provide a one-stop shop for local public health services and a platform for health promotion, whether providing updates on food recalls, promoting clinics or educational seminars on breast feeding, or offering smoking cessation resources (e.g., http://www.peelregion.ca/health/). The rationale for implementing social media campaigns varies, but there are principles and components in common in campaigns deployed by major public health organizations (see Table 2). The US CDC's explicit rationale for using social media is to "…provide users with access to credible, science-based health information when, where, and how you want it. A variety of social media tools are used to reinforce and personalize messages, reach new audiences, and build a communication infrastructure based on open information exchange" (39). In an interview with Erik Augustson of the US National Cancer Institute (2010), he describes the drive to experiment with new media for the NIH/NCI's *Smoke Free Women*'s campaign as a need to "take public health interventions to where the people are" or to "establish a presence in new media before people get there" (40). One feature of many strategies is a clear shift away from the sole objective of driving traffic to campaign websites. Most social media strategies emphasize *reach*, *message reinforcement*, *tailoring messages*, *engagement* and *facilitating an open exchange of information with the public*.

Agency	Social Media Strategy
US CDC	**Provide access** to credible, science-based health information when, where, and how the public wants it. Use tools and platforms to: **Reach** new audiences; **Reinforce** and personalize messages**; Build** open information-exchange infrastructure
PHAC	"Monitor the conversation, participate in the conversation, initiate the conversation, share content, include social media in all marketing initiatives." **Create** (Wikis, podcasts videos); **Share** (MSN, Google, Yahoo)**; Marketing** (Flikr, YouTube, Facebook); **Monitor and Participate** (Google blog search, Technocrati, Bloglines)
ONT MOHLTC	**Listen; Refine; Leverage** word of mouth advertising; **Customize /** provide relevant messages; **Invite** user-generated content

Table 2: A summary of the social media strategies of leading public health organizations

Hesse (2009) argues that social media provide public health communicators with tools to improve users' autonomy, health competency, and social connectedness (relatedness) (31). These in turn improve users' ability to respond to public health recommendations for health promotion and disease prevention (Table 3).

Autonomy	Competency	Relatedness / Social Connectedness
• Self-help management tools, e.g., quit smoking applications for Facebook, mobile phones • Personalized health information; development of patient-centered health records (Google Health, Microsoft Health Vault) • Health Portals such as Web MD, trusted sites for health information	• Improve functional health literacy- through social network applications, interactive tutorials & medication reminders. • *Information* Prescriptions • Skills augmentation (similar to spell-checker, online applications can augment users skills to help them find and process health information); collective wisdom- users ranking, commenting and rating of health interventions	• Patient and Health Intervention networks, such as online weight-loss social networks that provide individual and group incentives and monitoring • Health advocacy groups (e.g., Breast cancer awareness) • Shared Communities of Knowledge (e.g., Wiki Public Health)

Table 3: Key ways health communication can improve healthy living in the new media environment Adapted from (31).

c) The Promise of Improving Reach: Maximizing receipt of message and change of awareness
An increasingly large percentage of the population now participates in online forums as illustrated in Appendix 1. The potential audiences of both online and social media applications far exceeds that of traditional media, and the rate of penetration is accelerating for new media. It has been estimated that it would take **38 years for radio** to disseminate a message to **50 million people**, 13 years for television, 4 years for the internet, 3 years for the iPod, **and less than 3 months for Facebook** (41).

Populations that are difficult to reach via traditional media (due to geographic remoteness or other social factors) can be targeted and effectively reached via social media. Seeman et al. (2008) note that the anonymity and accessibility of social media can help ease the participation of youth and people with stigmatizing illnesses (6). For example, they reported that men suffering from depression are more likely to participate in online support groups than face-to-face forums because depression is still a stigmatizing illness for many men. Similarly, Erik Augustson (2010) of the U.S. National Cancer Institute observed in an interview that mobile social media applications associated with the Smoke Free Women campaign are being designed

to reach inner city youth, who use cell phones extensively and are difficult to reach via other channels (40).

Social media platforms allow organizations to freely take advantage of existing social networks and virally spread their messages. While creative costs to develop a public health campaign for social media are likely similar to traditional media, the costs of amplifying transmission or modifying a campaign in response to audience reception are negligible. The only barrier to responding to changing conditions in real time lies in the limits of organizational capacity.

One challenge public health agencies face once they engage with social media is getting the attention of the vast audience amid an onslaught of online content and chatter. Messages that run counter to public health goals have been widely disseminated, and public health organizations have only occasionally been able to successfully re-direct the conversation, challenge inaccuracies, and respond to the promotion of unsafe or unhealthy behaviours. Messages opposing vaccination or promoting tobacco and fast food products have been widely disseminated using social media (12,14,28,42). Such messaging demands a response from public health authorities via the same channels. Building elegant, useful, and engaging experiences online will have sub-optimal results if the organization does not understand what drives user traffic and take advantage of the ever evolving tools required to funnel users to the agency's applications. For example, when a mainstream public health media campaign alerts the public to a health issue and urges them to seek out further information from their organization's website or take a specific action, most people will typically perform a "Google search" for further information rather than google the *agency* or type in the advertised url (43). If the agencies' web interface does not appear in the first ten Google results, the campaign will inadvertently drive the public to sites that may contain contradictory information.

In the past few years researchers have raised concerns that the front page search returns (the top ten search results) for public health topics frequently lead to poor quality information (12). Recently, however, public health organizations have been more successful in having their organizations rank higher in Google searches through the use of traffic-driving tools such as sponsored links, blog and news aggregators, and advertising options on YouTube, Facebook and Twitter. Leading health agencies have largely adopted these strategies and, unlike five years ago, a Google Canada search for "flu vaccine" (on August 9th, 2010) has federal agencies and reputable health blogs dominating the top ten search returns.

However, public health agencies still lag when it comes to adopting social media platforms. This is concerning, because there is some evidence that health information-seeking is *migrating* to social media sites like Facebook and YouTube, and there are an increasing number of health-related searches taking place on these platforms (44). In a keyword search of "flu vaccine" on YouTube on the same day (August 9th, 2010) all top ten results would be classified as vaccine critical (Appendix 5). This result confirms what Keelan et al (2007) found in their study of vaccine-related information on YouTube and confirms that public health organizations have yet to penetrate YouTube as they have Google search (Appendix 5).

d) The Promise of Engagement: Potential for Improved Learning and Behaviour Change Outcomes

Marketers often maintain that the "brands that break through are the ones that engage consumers, and that the internet has made it easier to engage consumers by allowing them to contribute directly to marketing campaigns and brand development" (28, p. 213). Studies of internet interventions have shown a high correlation between site usage (measured for example by user logins and time on site) and behaviour change (51). However, research involving internet interventions also show drop out rates often approaching 50 percent, leading Gunther Eysenbach to refer to a "law of attrition" governing participation in internet-based interventions. (22,45). Subsequent research has shown that improved participation and engagement correlate strongly with the degree of interactivity of the platform and the experiential richness of the interface (6,13,20). This effect has been most clearly demonstrated in studies documenting the social marketing activities of the tobacco and fast food industries (See section on the circumvention of advertising regulations (24,28,42). There is also the concern that having a broad reach or connecting with new audiences is limited by the "echo chamber" effect, a phenomenon where people only gravitate to online opinions and information that affirm preconceived ideology and beliefs.

e) The Potential to Tailor Messages

Web 2.0 interventions offer numerous advantages over traditional communication campaigns because they can provide fine-grained demographic information and continuous statistics on intervention-engagement, platform usage, sharing and feedback behaviours.

> *"The Internet has made measurable what was previously immeasurable: The distribution of health information in a population, tracking (in real time) health information trends over time, and identifying gaps between information supply and demand."* (46, p.4).

Messages can be tailored to specific groups and respond to changing attitudes and behaviours over time. While several review articles discussed the advantages of being able to profile target demographics and tailor messages to reach them, none of the social media campaigns detailed in the published literature described efforts to tailor messages in response to usage analytics. Theoretically, agencies should be able to take advantage of computer signatures and platforms' user profiles to extract the geographic, demographic, and social characteristics of viewers. Such tools can then be used to gauge community interest and further refine their messaging to meet specific audience's needs.

While preliminary data suggest that social media campaigns are successful in improving both reach and user engagement, data supporting social media interventions for desired behaviour change remains largely anecdotal but bolstered by strong theoretical premises. Social media, unlike traditional media campaigns, provides novel opportunities to embed and interject public health messaging into the daily online conversations of Canadians. Using social media applications, it is possible to track an individual's health-related discourse and automatically tailor and deliver relevant health messages to them at the moment they are seeking information or chatting about a health issue. In the future, it will also allow public health communicators to deliver a range of health promotion messages and self-monitoring tools through mobile applications, an innovation that will potentially increase the penetration to users without computers, and will allow public health messaging to penetrate the day-to-day health conversations and activities of Canadians. These tools, in conjunction with the cultural shifts in how the public seeks, shares, and responds to health information, suggest opportunities to improve citizen's autonomy, health literacy and competency and connections with community supports (10,46,47).

"Infodemiology" and "Infoveillance"

Five of the articles in this review had a substantive focus on infodemiology (11,12,25,48,49). The term "infodemiology," coined by Eysenbach, is defined as the "epidemiology of information" (47). More specifically, it is the study of information and communication patterns surrounding illness and diseases for public health purposes. Novel tools for automated content analysis are being developed to scan the millions of text entries on blogs, social networking sites, and news aggregators to identify trends in public conversations about illness and disease prevention. Research has shown consistently that internet users deploy search engines like Google to seek out health information (43); this has driven the development of a suite of internet usage-analytic tools to study this behaviour, many of which are freely available. Such tools, developed for business and marketing purposes (e.g., Google analytics, Yahoo marketing

analytics), are being harnessed to create a fine-grained profile of online searching behaviours. Knowing *what information people are searching for* and *what they find* can help public health professionals track current health concerns, attitudes and opinions, and to identify gaps in knowledge, supporting the development of communications materials that are responsive to the needs of the public. While public health professionals have traditionally used polling and focus groups to monitor the public mood and knowledge about health issues and behaviours, the new field of infodemiology promises to extract, in real-time, useful information from ordinary, day-to-day conversations and activities. These techniques are relatively inexpensive, and unlike traditional telephone polling, they can provide continuous *in situ* monitoring and help delineate diverse segments of the population.

(a) Syndromic surveillance using novel internet analytics
In 2006 Gunther Eysenbach published a seminal proof of principle study, which demonstrated the utility of using novel infodemiology techniques to improve infectious disease tracking and surveillance (50). Paying roughly $365 for the 2004-5 flu season for a Google click ad (an ad that would appear when information-seekers typed flu-specific key words into the Google search engine), his flu-click rate correlated more closely with retrospectively confirmed cases of flu than the cases tracked from clinical settings using the "influenza-like illness" Physicians Sentinel Surveillance system (ILI-SPR). Even more promising, Eysenbach's click ad was better at predicting confirmed cases of flu in the following week than the ILI-SPR dataset, leading Eysenbach and others to conclude that this approach could help the health care system anticipate demand for treatments and for information about particular illnesses (51, p.46).

In another study, Kumanan Wilson and John Brownstein (2009) found that during the Canadian listeriosis outbreak, searching-behaviour related to listeriosis tracked closely with retrospectively confirmed lab cases and preceded official announcements that there was an epidemic (52). Harvesting data from existing online discourse is also the principle behind the WHO's *Global Public Health Intelligence Network* (GPHIN). GPHIN was developed when the WHO recognised that mainstream media sources were identifying outbreaks before their sentinel surveillance networks (51). Using a combination of an automated and manual content review, GPHIN scours news aggregators and "red-flags" stories that may have relevance to infectious disease surveillance. GPHIN is credited with identifying SARS in China, prompting the WHO to instigate the investigation that led to the identification of the outbreak (51). *Infovigil*, an infoveillance system developed at the Centre for Global e-Health Innovation at the University Health Network in Toronto, continuously monitors and mines information from both Web 1.0 sites and popular social media platforms (e.g., blogs, Twitter). One recent study mined Twitter

data to explore public understanding of antibiotics (11) and found gaps in popular ideas about antibiotics that could be addressed by a public health communication campaign. The authors also concluded that Twitter is a powerful medium for the amplification of informal medical advice and opinion, but the study also demonstrated the power of infoveillance techniques to identify gaps in public awareness of anti-biotic resistance.

While the utility of these tools for syndromic surveillance is still being tested (51,53,54), it is clear that infodemiology provides tools to track both real epidemics and what Eysenbach has called "epidemics of fear". Tracking both types of conversations can be used to "improve health communication, learn about [a] population's behaviour and knowledge, and build consumer health vocabulary"(47).

(b) Network and group analysis to identify communities of belief about public health messaging / issues

Using advances in automated online community identification and network analyses, researchers are attempting to combine social networking analysis (the identification of online communities, relations between community members and network opinion leaders) and novel infodemiology techniques. Corley et al (2010) explored the utility of mining data from social media platforms for discussions of influenza in order to identify communities that may be of interest to public health (48). By using both automated and manual analyses to articulate and identify specific groups having conversations about influenza, they located key organizations involved in disseminating information about flu and captured current discourse and opinions on the topic. They concluded that this type of analysis could be extremely relevant to public health communication specialists, as it identifies the dominant sources of public conversations about flu. Not surprisingly blog content generated by users topped the list of opinion leaders for flu, followed by mainstream and local news outlets, international media, LiveJournal, the entertainment industry (e.g., Viacom, Reed), and large news conglomerates (e.g., News Corp, Disney).

(c) Data remixing: Mashups and 2-D and 3-D data visualisation tools

New technologies and freely available data pipeline tools (tools that translate, compare and combine data from several sources), such as Yahoo Pipes, are being deployed to re-mix and repurpose data. The resulting data "mashups" can help map disease outbreaks from a variety of medical, mainstream media, and user-generated content sources, in real time, and allow for novel visualisation of disease paths, occurrences and experiences (25). These tools are both didactic and elegant, allowing the public to visualise patterns of illness, risk factors for disease, and

healthy environments. Freeware "data pipes" can harvest and link information from a variety of publicly available sources (government weather data, geographic location, infectious disease reporting) or semantic or coded data (data that conforms to agreed-upon standards) to create new 2D and 3D geographic maps that can be highly tailored to the users' interests or needs (25).

These ideas are best illustrated in *HealthMap*, a free, automated system for monitoring, organizing, and visualizing reports of global disease outbreaks according to geography, time, and infectious disease agents (55). Users can view continuously updated disease maps while choosing to view specific locations, dates and diseases. *HealthMap* acquires data primarily from Google News, ProMed and health authorities such as the WHO to create a picture of the incidence and spread of infectious disease, globally. *HealthMap* recently began incorporating blogs, microblogs, social networking sites and other first hand reports into their database providing opportunities for more democratic participation in illness reporting and potentially by-passing obstructive political structures (via Twitter or iPhones applications) (51,55). HealthMap was used extensively during the recent H1N1 outbreak for daily monitoring and tracking of the spread of the disease.

(d) Collaborative Tools for Disease Surveillance and Knowledge-Exchange: Enlisting the public in disease reporting

Several grassroots applications have emerged that take advantage of mashup technologies and the collaborative tools of social media in order to create citizen-generated or self-reported health maps. Unlike *HealthMap*, the social media site *Who is Sick?* (http://whoissick.org/sickness/) focuses on empowering citizens to report on symptoms and illness and using zip codes maps the incidence of these symptoms. The website provides users with the opportunity to post their own illness experiences, search localities for similar experiences, enter into a discussion on disease or symptom-specific forums and finally provides graphics and analysis tools to show sickness trends and current outbreaks. The utility allows users to seek out local or travel health information of utility to them and in their own words, "without the hassle of dealing with hospitals or doctors" (http://whoissick.org/sickness/) (See Appendix 6).

Research exploring the utility of infoveillance tools provides a toolkit of applications for ongoing monitoring of public sentiment attitudes and options related to public health issues. Accessing "out of the box" tools and software plug-ins for continuous social media monitoring is becoming a standard practice for social media campaigns.

Circumvention of Advertising Regulations Through Social Media

The pressure on public health units to develop a social media strategy derives significantly from the growing ubiquity of social media across a wide range of milieux. As the use of social media becomes more widespread, and as the private sector becomes increasingly adept at taking advantage of opportunities for social media marketing, it will only be more necessary for public health authorities to develop their own capacities to monitor and engage with social media marketing. A new strand of research is emerging within the health-related literature on social media, focusing on the way advertising regulations are being circumvented through the use of social media-based marketing. A 2008 monograph by the U.S. National Cancer Institute, for instance, flagged the need for research into new web-based strategies for tobacco marketing, and a few subsequent studies have explored in detail the strategies and outcomes of interactive online marketing (28, p.212).

In "Open source marketing: Camel cigarette brand marketing in the 'Web 2.0' world," Freeman and Chapman (2009) describe how Camel has adapted to advertising regulations in the age of social media. The authors highlight the ways in which social media strategies blur the line between market research and brand promotion through "open source marketing" (28, p.213). "Open source marketing" describes a collaborative approach to brand development and promotion, in which consumers play an active role in shaping brand identities and promotional materials. In 2008, Camel hired the marketing company RJ Reynolds to launch a campaign that engaged tobacco consumers in the process of redesigning the packaging for Camel cigarettes. While ostensibly conducting market research with existing adult smokers, the process of recruiting consumers to rate and propose pack designs and logos was itself a powerful form of brand promotion, enabling a high level of engagement between the brand and the public (28, p.214).

Camel's website featured a video thanking consumers for their part in redesigning Camel's cigarette pack and invited further opportunities to sharing opinions on a blog, vote, and post opinions on YouTube (28, p.214). When the winning designs were chosen, Camel mailed personalized sample packaging to the participants: "if a design was chosen by say, 'Jim from New Jersey,' they printed that right on the box -- to personalize it and show that Camel had listened and chosen what actual people had asked for" (28, p.215). The RJ Reynolds campaign was perceived by the company as "a massive success," which "resurrected the brand" and expanded its market share in the U.S. (28, p.215).

Montgomery (2009) similarly describes the innovative ways in which companies are using interactive marketing techniques to promote their brands, focusing particularly on youth markets for food and beverages (42). Drawing literature from behavioural and neuro-sciences, Montgomery argues that teens are particularly susceptible to the integrated, ubiquitous marketing of products using social media applications. Marketers are increasingly leveraging teens' social media activities to encourage brand engagement and word of mouth advertising and ultimately to forge powerful relationships between their brand and individual youth's identities and activities. For instance, the authors describe Coca Cola's "Sprite Sips" widget, which allows Facebook users to add and configure a Sprite Cartoon to append to their homepage. The campaign's facebook page currently has 2,781 friends (updated statistic Aug 3, 2010). Red Bull also provides a widget encouraging users to challenge their friends to a rock, paper, scissors competition, capitalizing on adolescents' web habits to turn teens into passive marketers of their product.

The evident efficacy of such campaigns has important implications for public health strategy: on the one hand, many of the marketing innovations emerging from the private sector can be adapted to the context of public health communication in the age of social media, particularly those that encourage public engagement and build relationships between agencies and the public. On the other hand, the creative use of social marketing strategies by tobacco, alcohol, and fast food industries has created an urgent need for new approaches to regulating and responding to the promotion of such products. Montgomery (2009) notes, for instance, that marketers are devoting energy to identifying "alpha" users or opinion leaders in social networks. Coca-cola, Kraft, Pepsi, Taco Bell and other companies conduct network analyses to identify opinion leaders, who can then be recruited to spread brand information or experiences (42, p.21). The "Heart Truth" campaign, dedicated to raising awareness about heart disease among women, similarly recognized the importance of identifying "high-influence bloggers" to launching a successful social media strategy. "The team discovered that although approaching many bloggers is the key to success, carefully identifying influential, active bloggers – and monitoring and supporting their coverage over time – holds great promise for leveraging social media. Through this approach, the team discovered one particular blogger each year who, because of the right combination of audience, theme, and placement, sent a large volume of traffic to The Heart Truth web pages" (9, p.62).

In a marketing context, companies will sometimes offer payment to the influential individuals they have identified in a particular network, leveraging their network authenticity and authority to sell commercial products (42). Such individuals do not always reveal publicly that they are

employed by the company to help create positive buzz about its products. The informality and dispersed nature of such advertising makes it very difficult to monitor or regulate, as it may be impossible to distinguish between disinterested expressions of consumer opinion and stealth marketing materials that are at least partially initiated, funded, and monitored by an interested company.

Feasibility

Reported costs of mounting many social media campaigns are extremely modest: setting up surveillance and monitoring systems can be free or executed with a very small advertising budget (in the thousands of dollars). Eysenbach, for example, reported running his Google analytic's flu tracker for an entire season for less than $365 (50). Additionally, using video and graphic art contests, organizations can encourage the public to create compelling campaign material to provide testimonials supporting healthy behaviours, such as quitting smoking or vaccinating against flu. While the creation of high quality video content or podcasts is generally contracted out to professional media companies, presumably at traditional market rates, it is technically feasible to produce low cost video and audio clips using a desk top computer and video- and audio-editing software.

Evaluating the costs of public health social media campaigns detailed in this report is difficult because most government agencies use pooled technical and administrative support and existing overhead costs for launching these campaigns. High-level website developers, network maintenance and server space represent significant costs if an agency is building their campaign from the ground up. In addition, if the agency lacks personnel resources to support the campaign through all of its stages – including ongoing public engagement – the implementation of a social media campaign may represent significant personnel costs. Bennett (2009) noted that many research trials of communication interventions were extremely inexpensive to develop and deliver; however, the relatively small study population sizes and relatively short duration of research studies limits the instructiveness of these studies, at least for agencies considering implementing long-term campaigns to reach broad audiences. In addition, most research trials are similarly supported by university or hospital infrastructure which includes bandwith, network support and server space (22). Bennet (2009) also noted that with current trends toward tailoring messages and creating highly responsive and interactive communications, the once insignificant costs will likely escalate (more sophisticated computers, networks and demands for server space), although it is unlikely that the dissemination costs would approach a traditional print, radio or television campaign – if the agency was leveraging existing overhead and technical support (22). Some applications, such as mobile text messaging, are usually contracted out to

third party companies where costs depend on number of texts, number of subscribers and the length of a campaign. Costs for virtual world campaigns can vary widely depending on the sophistication of the activity or simulations developed (e.g., posting a bulletin board or an e-pamphlet on the CDC's Health Island can be free).

As an illustrative example, the US National Cancer Institute's *Smoke Free Women* campaign, developed a Facebook and Twitter application for a few thousand dollars (Augustson 2010). The development period for the whole campaign was six months and employed a six-member team drawn from: core staff, masters-level fellows, a masters-level program manager, and a contracted computer programmer. Each member of the team spent only a portion of their work week on the project, and interns or masters-level students rotated through several projects. Critical to the project's success was the appointment of project manager, who served as an "e-health ambassador," spending 1-2 hours a day engaged with the platforms (posting a minimum of four tweets a day and one Facebook post a day, in addition to responding to users' comments and questions). Augustson noted that the key to the success of the project was hiring a young project manager with social media expertise – who was "native" to these sites and thus required no orientation or training to be comfortable interacting on these platforms. Augustson also observed that individuals who interact naturally and habitually on new social media platforms have mastered the social norms that govern these spaces, and thus are able to project a more authentic and trustworthy persona (40).

Challenges / Pitfalls

Some of the key challenges identified in the literature and case studies reviewed involve agencies' ability to interact with social media in real time. As we discuss in earlier sections, regular and ongoing interaction and engagement is a critical component of a social media strategy. For agencies, this may require streamlining message-approval processes or establishing guidelines to train and empower frontline communicators to engage and interact directly with the public. In a discussion of their social media strategy, Marc Hudson of the Public Health Agency of Canada identified the following barriers to implementing a social media strategy (7). First, government agencies are risk-adverse and slow to change. Frequently, by the time they navigate approval processes, adapt, develop and implement strategies for new media, users behaviours on the platforms have evolved, and the public conversation shifts to new platforms. Second, there are typically multiple layers of policies and processes governing information flow which impairs rapid responses to public mood or individual information needs or requests. People expect responses in hours or days, not weeks, or they will seek information elsewhere. Third, poor technical infrastructure and internet access can impair some agencies' ability to interact with

bandwidth-intensive sites, for example, SecondLife requires good processing speeds and a fast internet connection to be functional. Forth, security measures (network firewalls) and other restrictions impair professional's ability to engage with new media and the approval process to access some sites may delay experimentation with new media. Finally, the federal government's official language mandate adds a further complexity to executing rapid and interactive communications with the public. Agencies dealing with linguistic minorities will face similar challenges (7).

A common concern raised in the published literature (38,66,67,68,69,70) relates to populations with limited online access, poor literacy skills, and disabilities that impair access to social media platforms: "… health scientists exploring the issue of the digital divide have found evidence of a *double* divide. Specifically, those without internet access (a large portion of whom may be without adequate health care access) are prevented from gaining health information available on the Internet" (38). There are also concerns that these populations are precisely the most vulnerable and most in need of the attention of public health agencies. However some researchers suggest that social media platforms can actually augment poor health literacy or basic literacy skills (6, 31). Automated spelling correctors and "keyword suggestion" applications assist both poor spellers and those with imprecise knowledge about what their looking for, usually based on information other searchers found useful. Others suggest that digital penetration into marginalized groups actually improves access to some specific demographics, such as inner city youth, " … a recent study reported that more than 90% of African-American teens were online, spending some 26 hours a week on the Internet" (42, p.S20).

Social media platforms also mine data and compile fine-grained user profiles based on online activity. This information is being used for targeted marketing of commercial products, but it also could be used by health communicators to reach users with high risk behaviours or health concerns. A youth discussing STD testing on Facebook or seeking information through Google can be targeted by local agencies using sponsored links and click ads to advertise sources of good information and health services. This brings the public the information they need at the moment they are actually searching for assistance. However, the digital divide does exclude specific demographics from participating in social media, and while this divide appears to be rapidly disappearing, especially with the advent of cellphone-based social media applications, public health organizations must take into consideration current technological penetration in their locale when designing campaigns for specific audiences.

Another difficulty in implementing social media campaigns is the current lack of evidence supporting a positive impact on desired behaviour changes. As described in this report, there is good evidence that these strategies increase reach, and with user-generated content can improve confidence in messaging but little evidence connecting the use of social media platforms with behavioural changes. The lag between the research cycle and the rapid evolution of social media platforms and norms in health information seeking behaviours continues to pose challenges for evidence-based communications strategies. Frequently it takes between six months and two years to bring a controlled study of a health communication intervention to press. Yet, social media trends are measured in months, not years, and while some behaviours seem to be evolving slowly over time and relatively stable (searching Google for health information), others, like the emergence of micro-blogging, have rapidly transformed day-to-day communication habits and similarly require rapid responses by public health agencies. The *Journal of Medical Internet Research* is attempting to address these issues by implementing a rapid review process, bringing original research to press within six weeks of submission.

To summarize, the significant pitfalls in implementing social media campaigns for public health communication identified by this review are: agencies' capacity and responsiveness; the digital divide; the rapid evolution of social media platforms and usage patterns; and the lack of an evidence-base to guide best practices.

Summary

Social media is becoming a powerful addition to the health communicators' toolkit. Social media is currently utilized *both* as broadcasting platform to amplify messages from traditional media sources (e.g., radio, television, print media) to demographics who are abandoning traditional broadcast technologies (e.g., telephones, television) *and* as an entirely new way of collaborating and co-creating content with target audiences. There is a general belief that the participatory web, or social media, is rapidly transforming how the public relates to medical professions and how average citizens seek out and consume medical information (10,16,38). Leading public health organizations are driven to integrate social media tools into their communication strategies because of this profound shift in citizen's communication behaviours and new expectations about the degree of openness, transparency and responsiveness of the communication environment. In addition, many health agencies are following the lead of corporations and political parties in adopting the comparatively inexpensive range of infoveillance and dissemination tools in order to monitor, in real-time, health conversations and to interject their agency's viewpoint *in situ* and then capitalizing on social media's ability to leverage social networks for "word of mouth" advertising. Agencies are also taking advantage of user-generated feedback and commentary to

improve message visibility and a variety of paid-media tools to spread messages "virally" through entire platforms of users, potentially reaching millions of viewers in a relatively short period of time.

Although there is a great deal of interest in social media as a tool of public health communication, the research evaluating the impact of social media campaigns for public health is still in its infancy. There are few peer-reviewed studies testing the utility of social media interventions for desired outcomes (e.g., increased issue-awareness, changes in the public's health competency, or adoption of desired behaviours), and where there were evaluative components in original research studies, the results were often confounded by a failure to isolate the intervention from other communication strategies. It is also unclear how the results of individual studies could or should be generalized from one health issue to a broader public health context. Does social media work well for particular outcome categories such as improved literacy and awareness but not for necessarily for behavioural change? The literature also provides only limited insight into whether the utility of social media applications varies among distinct public health objectives: for example, are there differences in the way social media influence public opinion and action during epidemics as opposed to a long-running campaign for chronic disease prevention?

There is some evidence that social media tactics can have a positive impact on the reach of public health messages effectively increasing public awareness, increase knowledge and skill, and change behaviours. For instance, behavioural-change studies clearly demonstrate the importance of social connections to support behavioural-change (71). Studies of internet interventions also show that online networks facilitate the creation and maintenance of such supportive social connections and facilitate patient activation and empowerment through more direct participation in managing health issues (71,73). Thus it is highly likely that health-focused social media communications and information-exchange could have a significant impact on behaviour relevant to public health, but as yet we have no *proof of principle*.

Key Findings of this report:
1. Social Media platforms **improve reach** and **promote** campaign messages and organizations' activities. They can simultaneously enable: i) rapid and ongoing capturing of public mood, sentiment and knowledge about health issues; ii) free or extremely inexpensive amplification of broadcast messages; iii) a range of opportunities to tailor messages and engage the public in a conversation about health promotion and health protection; iv) user-generated content and

feedback systems which **improve loyalty and trust** in organizations and **confidence** in information.

2. Corporations are already there: Companies are heavily investing in developing a social media presence to increase the impact of their advertising dollars, to send tailored messages to target audiences, and to create stronger relationships with existing customers. In addition, leading North American public health organizations, in particular the US Center for Disease Control, have integrated, or are moving to integrate, social media into all their communications.

3. More research is required to articulate the impact of social media on issue-awareness, behavioural change and improved health outcomes.

4. Coordination of social media material and collaboration with public health organizations at all levels of government will become increasingly critical.

Recommendations

The strategies adopted by both researchers and public health agencies sampled in this study and their lessons learned leads us to suggest the following guidelines and recommendations for developing a social media strategy:

1. Establish clear objectives: Distinguish between increasing reach and awareness (message amplification) and expanding the scope of messages (collaborative, iterative message development).

2. Know your target audiences, where they are "present" online and what key behaviours they engage in (understand the cultural norms of each platform): (e.g., youth are currently more likely to Twitter; women between the ages of 25-35 are likely to be posting to Facebook daily).

3. Design campaigns for longevity and/or have exit strategies and clear archiving processes: Material from social media campaigns can "live forever" online and can reappear in circulation years after the campaign ends. It is important to consider date-stamping or providing explicit local and temporal context to information in order to prevent users in the future from using dated information that may no longer be appropriate.

4. Determine Resource Needs: For many platforms that require daily monitoring and responses (e.g., Facebook, Twitter) it is important to allocate sufficient time and resources for ongoing interactions.

5. Determine an Agency Content-Clearance Processes and / or Prepare Pre-approved Messaging Scripts: Some social media platforms require rapid clearance processes to enable real-time interactions with users (SecondLife, Twitter, Facebook) while immediate response are not critical on other platforms (YouTube).

6. Listen to online health discourse. Monitor the reception of campaign materials, and react to gaps, contradictory information or satirical responses to campaign materials. Both manual and automated infoveillance tools are available. Most platforms have freely available analytic tools, news aggregators and fee-for-service infoveillance monitoring is available.

7. Encourage or sponsor research investigating social media applications and specific health objectives.

8. Encourage coordination of materials and messages with municipal, provincial and federal agencies (share resources and leverage national-level campaigns). Consider incorporating high quality content from existing campaigns. Integrating popular and high quality materials from other public health agencies will not only leverage existing public health resources but through cross-linking and redirecting of traffic can improve the visibility of high-quality of information online and through reverse traffic flow, improve your own agency's visibility.

As research and experience with diverse social media platforms grows, it is likely that a more fine-grained typology will emerge to describe the distinct capabilities of each platform and the utility for specific public health interventions. There is a trend toward platform convergence, indicating that engaging with social media should be thought of as a complex and inter-related system: Twitter feeds direct traffic to YouTube, widgets enable connectivity to Facebook, and social bookmarking or aggregators transform users' interface with the web and with mobile devices (32). Researchers are exploring opportunities to measure the impact of social media campaigns through user surveys conducted over Facebook, Twitter, or other platforms but more intervention research is critically needed.

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1. Appendix 1: StatsCan Data on Canadian Internet Use

This appendix illustrates a concerning digital divide between those over and under the age of sixty-five and between those with or without high school education. However, the trend from 2005 to 2009 shows that uptake and access to the internet among those over sixty-five and without high-school education has accelerated and this is narrowing or closing the gap, although the gap in those without high-school education remains a concern.

In 2009, 98% of people aged 16 to 24 went online, up slightly from 96% two years earlier. Of those aged 45 or older, two-thirds (66%) went online during 2009, up from 56% in 2007. This age group, traditionally slower to adopt and use the Internet, accounted for 60% of all new Internet users since 2007 (Table 1).

While Statistics Canada has not, to date, collected information specifically on social media use, there are several private marketing companies that have and data from these provide some limited information about trends and penetration.[1] *6S Marketing* executed a survey of Canadian social media usage in 2009 and found that 70% of respondents used social media with Facebook being the most popular platform (70% surveyed had an account). 47% of respondents had a Twitter account with the majority being between 19-25 years of age (4).

A recent *Leger* marketing survey of 1500 Canadians already using social media found that 40% of social media users login at least once a day, that users felt the information on social media sites was balanced and honest (31% agreed that social media is more credible than advertising), and found great utility in other reader's comments and feedback about products. Significantly, they reported that their opinions were influenced by information they found on social media. About one-quarter of all users reported that they had a better opinion of organizations who engaged in social media (5).

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[1] These surveys are proprietary; their sampling techniques are not clearly stated; while the numbers are fairly consistent, it is likely that they inflate Canadian social media penetration.

Canadian Personal Internet Users	2005 (%)	2007 (%)	2009 (%)
All Internet users	**67.9**	**73.2**	**80.3**
Household type			
Single family households with unmarried children under age 18	80.9	86.4	91.1
Single family households without unmarried children under age 18	62.5	67.5	76.4
One-person households	48.7	53	63.1
Multi-family households	78.8	80.6	86.4
Sex			
Males	68	74.1	81
Females	67.8	72.3	79.7
Age			
34 years and under	88.9	93.1	96.5
35 to 54 years	75	79.8	87.8
55 to 64 years	53.8	60.8	71.1
65 years and over	23.8	28.8	40.7
Level of education			
Less than high school	31.2	43.2	50.7
High school or college	72	76.8	83.4
University degree	89.4	92.5	94.7
Personal income quartile3,4,5,6			
Lowest quartile	58.7	68.8	76.2
Third quartile	71.3	75.5	83.1
Highest quartile	83.2	87.9	92.1

Table 1: Characteristics of internet users (any location) for personal use. Statistics Canada Table 358-0130. Internet access from any location includes use from home, school, work, public library or other, and counts an individual only once, regardless of use from multiple locations. For more information on the calculation of income quartiles see http://www40.statcan.gc.ca/l01/cst01/comm35a-eng.htm (Statistics Canada 2010). Note that the 2005 survey included data from those 18 years of age or above, from 2007 onwards, from 16 years of age or above.

Internet users at home—(used the Internet from home in the past twelve months.)	2005 (%)	2007 (%)	2009 (%)
E-mail	91.3	92.0	93.0
Participating in chat groups or using a messenger	37.9	..	..
Use an instant messenger	..	49.9	44.8
Searching for information on Canadian municipal / F/T/P	52.0	51.4	56.5
Communicating with Canadian municipal/F/T/P	22.6	25.5	26.9
Searching for medical or health related information	**57.9**	**58.6**	**69.9**
Education, training or school work	42.9	49.5	50.3
Researching investments	26.2	25.5	27.1
Playing games	38.7	38.7	42.1
Obtaining or saving music	36.6	44.5	46.5
Obtaining or saving software	31.8	32.5	35.0
Viewing the news or sports	61.7	63.7	67.7

Obtaining weather reports or road conditions	66.6	69.8	74.6
Listening to the radio over the Internet	26.1	28.1	31.8
Downloading or watching television	8.5	15.7	24.7
Downloading or watching a movie	8.3	12.5	19.8
Researching community events	42.3	44.3	50.0
General browsing (surfing)	84.0	76.0	77.7

Table 2: Abridged Statistics Canada Table 358-0130. Individual Internet Users at Home
The target population for the Canadian Internet Use Survey has changed from individuals 18 years of age and older in 2005 to individuals 16 years of age and older in 2007.

Appendix 2: Social Media Platforms

Platform	Descriptions
Blog ("weblog")	A website that contains regularly updated entries displayed in reverse chronological order
Microblog	A form of blogging that allows users to send brief text updates or micromedia to be viewed by the public or a restricted group.
Social Networking Website	Online communities that share interests and/or activities
Wiki	A website that enables the easy creation and editing of interlinking Web pages
Social News and Bookmarking	Social bookmarking enables users to save and share links to Web pages organized by metadata (eg, ''tags,'' or keywords). Social news sites often enable users to vote on links to news, bringing the most popular stories to the top.
User Reviews	A website or site feature on which people can post opinions about people, businesses, products, or services
Photo/Video Sharing	A website that enables the publishing of a users' digital photos or video clips online, facilitating sharing with others
Virtual Worlds	A simulated environment in which users can interact with one another and with the environment
News Aggregators	A website that collects, collates, and organizes syndicated web content, creating a customized site where all desired content is centralized.
Widgets/Gadgets/Badges/Buttons	A small, portable stand-alone application that can be easily shared and embedded in another website.

Figure 1: Description of Social Media Platforms Adapted from (11).

Appendix 3: Analysis of Included Articles

First Au	Year	Title	Source Type	Source	Thematic Domain	Research Methods	Brief Des / Case of Social Media in Public Health / Social Media Campaign discussed	Relevance
Keelan	2007	Youtube as a source of information about immunization	ORA	JAMA	PA / CUSM	CS / CA	Immunization information on YouTube	High
Khan	2007	Healthy Harlem: empowering health consumers through social networking, tailoring, and web 2.0 technologies	REPORT	AMIA	PA / CUSM		Discussion of healthy weight initiatives in Harlem.	Low
Norman	2007	Engaging Youth in eHealth Promotion: Lessons Learned from a Decade of TeenNet	REPORT	Adolesc Medicine : State of the Art Reviews	PA		TeenNet smoking cessation: not explicitly social media	Low

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Research Methods: IS=intervention study; OS=observational study; SREV=systematic article review; CS=Case study; PS=pilot testing of technologies; ES=Environmental Scan or Needs Assessment; CA=content analysis; CT=Controlled trial; SURV=survey; SNA=social network analysis.

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First Au	Year	Title	Source Type	Source	Thematic Domain	Research Methods	Brief Des / Case of Social Media in Public Health / Social Media Campaign discussed	Relevance
Freeman	2008	Gone viral? Heard the buzz? A guide for public health practitioners and researchers on how Web 2.0 can subvert advertising restrictions and spread health information	ORA / REV	Journal of Epi Comm Health	PA / CUSM / ADV SUB	CS	Cigarette companies use of YouTube and "open source marketing," in which consumers play a role in contributing to cigarette branding and promotion.	Medium
Kamel Boulos	2008	Web GIS in practice VI: a demo playlist of geo-mashups for public health neogeographers	COMM / ORA	Internet Journal of Health Geographics	PA / IFD / TECH ADV	PS	Prospectus of novel applications of mashup technology for public health disease surveillance and knowledge-exchange.	Medium

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Khanna	2008	IcYou: How social media is the new resource for online health information	COMM	Medscape J Med	PA / CUSM		Report on new social media platform for sharing health information.	Medium
Freeman	2008	web 2.0 and chronic illness: new horizons, new opportunities	COMM	Healthcare Quarterly	PA / CUSM		Discussion of novel uses of social media for chronic disease: esp. self-monitoring, patient activiation and empowerment.	High
Taubenheim	2008	Using Social Media and Internet Marketing to Reach Women with The Heart Truth	ORA	Social Marketing Quarterly	PA / UofSM	CS	Heart Truth Campaign's use of social media strategies to promote the "Red Dress Collection" fashion show and "National Wear Red Day."	High

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Thackery	2008	Enhancing Promotional Strategies Within Social Marketing Programs: Use of Web 2.0 Social Media	ORA	Health Promotion Practice	PA / CUSM	CS	Powerful bones, Powerful Girls (CDC) / APHA's Facebook page: "Mom2Mom" / Jade Ribbon Campaign	High
Timka	2008	Web 2.0 systems supporting childhood chronic disease management: A pattern language representation of a general architecture	ORA	BMC Medical Informatics and Decision	PA	ES	Development of an interactive website for diabetes management support targeting young people. Discusses issues of "apomediation" in delivery of online health content.	High
Freeman	2009	Open source marketing: Camel cigarette brand marketing in the Web 2.0 world	ORA	Tobacco Control	PA / ADSUB	CS	R.J. Reynolds New Flavours package design contest	High

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Beard	2009	A Survey of Health-Related Activities on Second Life	ORA	Journal of Internet Medical Research	PA / CUSM	SYSREV ; CA	Survey of a range of health-related activities on Second Life including novel experiential simulations/applications for public health communication.	Medium
Bennet	2009	The Delivery of Public Health Interventions via the Internet: Actualizing their potential	ORA	Ann Rev Pub Health	PA / CUSM	SYSREV	Systematic review of internet interventions (Web 1.0) and behavioural change. Discussion of potential applications of social media.	Medium
Keelan	2009	An analysis of the Human Papilloma Virus Vaccine Debate on MySpace	ORA	Vaccine	PA / CUSM / IFD	CS ; CA	Case study examining the HPV vaccine debate on MySpace and potential applications of social media for infodemiology.	High
Mark	2009	Twittering Healthcare: Social Media and Medicine	REVIEW	Teleme dicine journal and e-health	PA / CUSM		Discussion of current and potential applications of Twitter	Medium
Wilson	2009	Coping with Public Health 2.0	COMM	CMAJ	PA / CUSM		Commentary on potentail utility of social media for public health.	Medium

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Reitmeijer	2009	Web 2.0 and beyond: risks for sexually transmitted infections and opportunities for prevention	REVIEW	Current Opinion in Infectious Diseases 2009	PA		A review of communication tools for STI transmission and prevention, looking at the internet as both a risk environment and as a venue for public health interventions. Potential is "yet untapped and the providers of these services are considerably lagging behind their target audience in the creative and innovative uses of the new medium."	High
DeBar	2009	Using a website to build community and enhance outcomes in a group, multi-component intervention promoting healthy diet and exercise in Adolescents	ORA	Journal of Pediatric Psychology	UofSM	CT	Social media component small arm of larger RCT aiming to improve exercise and diet in girls at risk for osteoporosis	Medium

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Hesse	2009	Enhancing consumer involvement in health care	REVIEW	Health Communications in the New Media Landscape	PA / CUSM		This chapter describes the move away from push to pull communication strategies in health care. While the author does touch on opportunities for public health in some of the case examples, the chapter focuses more broadly on health care and clinical experiences.	High

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Lupianez Villaneuva	2009	Opportunities and challenges of Web 2.0 care systems: an empirical exploration	ORA	Informatics for Health & Social Care	PA / CUSM	CA ; SURV	Identifies potential new web 2.0 applications for health but a survey and content analysis of health-related internet pages indicates that the internet is "still a content platform and not a communication or social space."	High
McNabb	2009	What social media offers to health professionals and citizens	REPORT	Bull World Health Organ	PA / CUSM		Commentary briefly surveys current social media platforms and discusses opportunities for health communication and health promotion. Discusses potential of mobile-phone based applications in the developing world, where internet access is limited.	High

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Montgomery	2009	Interactive Food and Beverage Marketing: Targeting Adolescents in the Digital Age	ORA	Journal of Adolescent Health	CUSM / ADSUB	CS / REV	Discusses big brand food social marketing targeting children and youth. RedBull Facebook campaign; SIPS Facebook Campaign	High
O'Grady	2009	Measuring the Impact of a Moving Target: Towards a Dynamic Framework for Evaluating Collaborative Adaptive Interactive Technologies.	ORA	Journal of Medical internet research	CUSM / EVAL	SYSREV	A systematic review of evluation frameworks for social media campaigns found no comprehensive evaluative tools. They propose a framework for its development.	High
Orsini	2009	Jump into social media with a successful home care blog	REVIEW	Caring: National association for Home Care Magazine	PA / HOW TO		This is a very practical overview describing the utility & rationale for setting up an institutional blog, reaching audiences, and some guideline for how to do so.	Medium

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Rooney	2009	Consumer-Driven Healthcare Marketing: Using the Web to Get up Close and Personal	COMM	Journal of Healthcare Management	PA / CUSM		This is a brief overview of social marketing techniques currently utilized by US hospitals and clinics to attract patients (i.e., patient testimonials). There is very little relevant to public health communication.	Low
Thackery	2009	A Multidirectional Communication Model: Implications for Social Marketing Practice	COMM	Health Promot Pract	PA		Outlines broad changes in the media environment, focusing particularly on the transition to a multi-directional communication model. Discusses possibilities for making use of new media and points to U.S. dept of Health and Human Services guidelines for maximizing usability in web design.	Medium

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Turnbull	2009	Fostering Wisdom-BasedAction Through Web 2.0 Communities of Practice An Example of the Early Childhood Family Support Community of Practice	ORA	Infants & Young Children	UofSM	CS	Describes lessons learned from efforts to launch and maintenance of a community of practice focused on early childhood family support.	Medium
Vance	2009	Social internet sites as a source for public health information	ORA	Dermatologic Clinics	CUSM	CS / CA / REV	Small study of YouTube content related to accutane and botox	Low
Waters	2009	What Is My Cancer Risk? How Internet-Based Cancer Risk Assessment Tools Communicate Individualized Risk Estimates to the Public: Content Analysis	REVIEW	Journal of Medical internet research	PA	CA	Content analysis study evaluating quality of online cancer risk assessment tools.	Low

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Chou	2009	Social Media Use in the United States: Implications for Health Communication	ORA	Journal of Medical Internet Research	CUSM	SURV	Extracting data from a national survey, this study explored i) the reach and impact of social media; ii) described the user characteristics of 3 different social media and used standard demographics (age, sex, race, education) along with experiences with cancer & overall health status measures to help identify the socio-demographic and health-related predictors of the use of these three forms of social media.	High
Augustson	2010	Women.Smokefree.Gov: Exploring Emerging Technologies and Social Media for Behavior Chance	ORA	Abstract-Conference Proceedings	CUSM	*No results stated	A brief abstract outlining the roll out of a Facebook and Twitter component of the NIH/NCI Smoke Free Women campaign. No results are given or are available on these intitiatives.	Low

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Corley	2010	Text and structural data mining of Influenza Mentions in Web and Social Media	ORA	Int. J. Enviorn. Res Pub Health	UofSM / IFD	CS / SNA	Exploration of network and group analysis for social media infoveillance: sentiment and content analysis related to influenza.	Medium
Hachinski	2010	Stroke: working toward a prioritized agenda	REPORT	Stroke Synergium Report	PA		*Report outlining recommendations for using social media	Low
Lancie	2010	Tweeting to Save the Planet: The Roles and Limits to Social Media	COMM	www.econtentmag.com	PA		Bay Area: Spare the Air Day Campaign	Medium
Lo	2010	YouTube: A gauge of public perception and awareness surrounding epilepsy	ORA	Epilepsy and Behavior	CUSM	CA / CS	YouTube depictions of epilepsy and community response.	High

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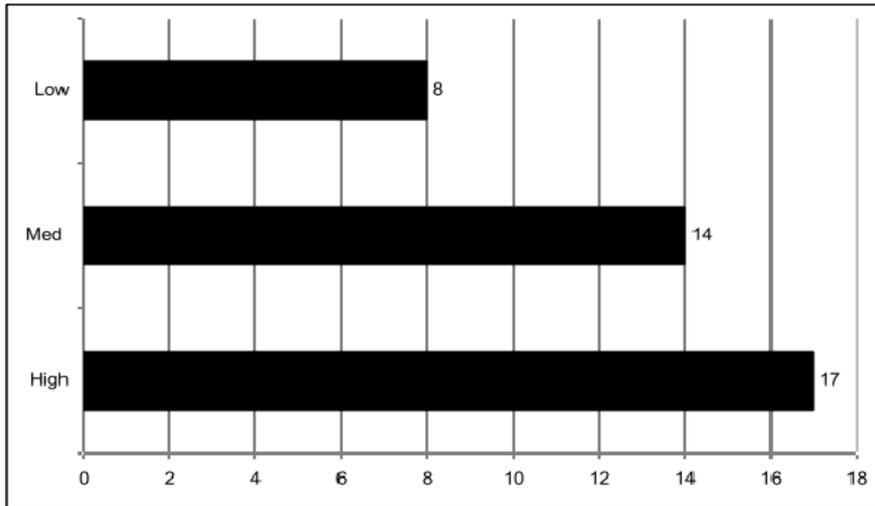
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Marcus	2010	Lessons Learned From the Application of Systems Science to Tobacco Control at National Cancer Institute	COMM	Am. J. Pub Health	IFD		Commentary on the importance of NIH program to research how social network analysis can be used to better understand health problems -- focus on tobacco control.	Low
Mills	2010	Virtual reality: Welcome to my world	COMM	Occupational Health Mag	PA		Discussion of potential applications of virtual worlds for health promotion: discusses pilot study using SecondLife for weight loss	Medium
Orsini	2010	Social media meets home care? Take a look at social media marketing	COMM	Caring: National association for Home Care Magazine	PA		Commentary on the potential applications of social media for home care providers	Medium

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Scanfield	2010	Dissemination of health information through social networks: Twitter and antibiotics	ORA	Am J Infect Control	PA / IFD	CA / CS	Content analysis of twitter updates related to antibiotic use to explore evidence of misuse and misunderstanding of antibiotics.	High
Tian	2010	Organ donation on Web 2.0: Content and Audience Analysis of Organ Donation Videos on YouTube	ORA	Health Communication	CUSM		This paper analyses the framing of organ donation on YouTube as compared with traditional media (print & television).	High

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Appendix 3: Analysis of Included Articles

Figure 1: Included article rankings for relevance from Low to High, n=39
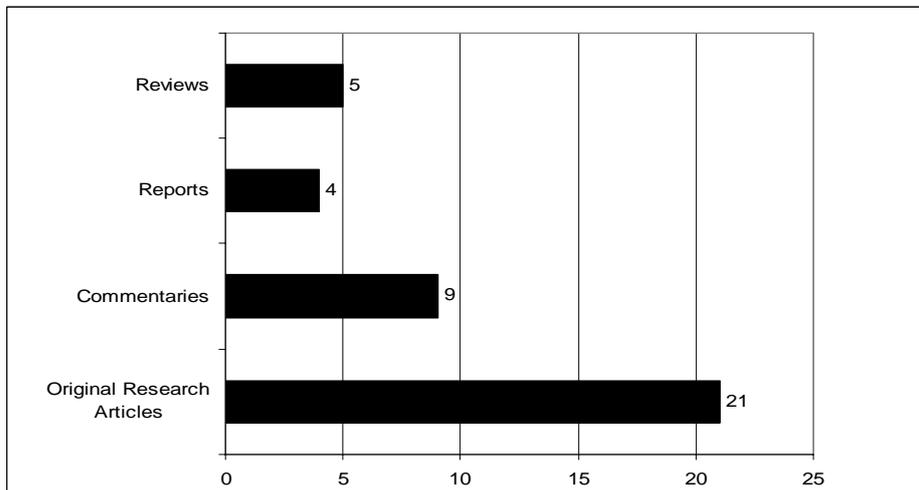
Figure 2: Types of articles included in the systematic review

Appendix 4: Case Studies

Centers for Disease Control and Prevention: H1N1 Campaign

> *The Centers for Disease Control and Prevention has become the star of the Government 2.0 movement recently, as the agency has been wildly successful in deploying social media to raise awareness of recent public health crises, including the peanut butter/salmonella outbreak and the recent swine flu scare* (58)*.*

The U.S. Centers for Disease Control (CDC) has been at the forefront of innovation in the use of social media for public health communication, developing a social media strategy that makes use of nearly all available platforms and outlining a comprehensive rationale for their integration into public health practice. A CDC slide deck (59) outlines the impetus behind the CDC's adoption of social media and describes how such platforms have been harnessed to advance public health aims. In the recent H1N1 scare, the CDC made use of a variety of social media platforms to share information about the flu, monitor public concerns, and enhance the CDC's profile as a trusted and accessible public resource.

The CDC offers a succinct and comprehensive rationale for its social media strategy. First, in order to be effective, the CDC must go where people are, and increasingly, people are spending time online and engaged in social networking activities. The CDC aims to increase its presence in these online arenas in order to increase the dissemination and potential impact of its science. New platforms offer novel ways to reach people, allowing for more tailored messaging and enhancing capacities to reach diverse audience. Finally, the interactive character of these platforms enables a higher degree of engagement, fostering community relationships and helping people to feel empowered to make decisions that are safer and healthier. These advantages were of particular relevance in the context of the H1N1 outbreak, which demanded not only a rapid initial response, but the capacity to update information, evaluate and respond to the concerns and understandings of the public, and respond continuously to changing conditions (59).

> *"…the recent outbreak of H1N1 is the kind of situation where the value that social media…– the ability to engage immediately, in real time, and communicate directly with your target audiences – can be realized."* David Avitabile, President of JFK Communications (59, p.10).

The CDC's H1N1 campaign employed a wide variety of social networking platforms and took advantage of platform inter-operability. In fact, CDC information about H1N1 was delivered

using virtually every major type of social media platform. Part of what made the CDC's strategy so comprehensive was that it did not make use of social media only as a way of driving traffic to the CDC website, but effectively used new platforms to disperse CDC materials across the web and into users' habitual mobile/internet pathways. For instance, CDC "buttons" (badges) and widgets were made available to organizations and individuals to embed in their webpages, social bookmarking capability was added to CDC sites, and YouTube videos could be posted and linked to in a variety of locations. Similarly, the material presented on the CDC's Facebook and MySpace pages was available for other users to post on their profiles, thus distributing materials within individual users' online networks. These networks already foster a significant amount of health-information seeking behaviours (citation re: number of health sites on Facebook/MySpace); thus the CDC was able to establish a presence within a venue already established as a familiar and trusted space to seek answers to health questions. Twitter subscribers were able to follow CDC updates in real time, and the CDC was thus able to respond to changing circumstances in a way that maximized, rather than undermined, public perceptions of the organization's transparency and trustworthiness (59).

Figure 1: Slide from Aiken 2009 illustrating the range of social media applications utilized during the CDC's H1N1 campaign.

The CDC's social media strategy during the H1N1 was highly successful in terms of reach and

engagement, and the Harvard School of Public Health reported that a high percentage of the public (88%) felt satisfied with the information they received about the H1N1 outbreak. Those members of the public who made use of one or more social media tools were more satisfied than those who did not. The CDC website attracted high traffic volume, logging nearly 8 million page views on one day during the outbreak, and many more people encountered CDC information on other sites and platforms (Figure 2) The CDC also reports some data suggesting that they were able to affect behaviour change during the outbreak (increasing hand-washing), though this increase cannot be definitely attributed to the social media strategy.

H1N1 Social Media Stats

Key H1N1 Social Media Stats:	Daily (July 19)	Total (Apr 22 – July 19)
RSS: Views of H1N1 Flu Related Feeds	131,774	13.77 M
YouTube: Views of H1N1 Flu Related Videos	6,745	1.87 M
Widgets: Views of H1N1 Flu Related Widgets	2,682	3.21 M
Podcasts: Views of H1N1 Flu Related Podcasts	1,670	651,464
Twitter: Clickthroughs from H1N1 Flu Tweets	291	402,547
Twitter: Followers of CDC's Twitters Accounts	6,165	591,071
Content Syndication: Views of H1N1 Flu Content	72	138,496
CDC-TV: Views of H1N1 Flu Related Videos	92	102,382
Mobile: Views of H1N1 Flu Related Pages	297	64,163
Buttons: Clickthroughs from H1N1 Flu Buttons	246	49,461
eCards: Number of H1N1 Flu eCards Viewed	34	21,132
eCards: Number of H1N1 Flu eCards Sent	38	8,917
Facebook: Fans/Friends	124	13,875
Flickr: Photo Views of H1N1 Flu Related Images	83	10,662

Figure 2: CDC reported social media statistics during the H1N1 campaign (59, p.6)

Ontario's 2009 MMR catch-up campaign

In January of 2009, a mumps outbreak in several Canadian provinces prompted the Ontario Ministry of Health and Long Term Care to recommend a "catch-up" dose of mumps vaccine for those born between 1970 and 1995 (60,61,62). People born in this time-frame were determined to be imperfectly protected because they were part of a cohort that only received a single dose of the Measles Mumps and Rubella vaccine (MMR). The Ministry of Health and Long Term Care (MOHLTC) launched an awareness campaign in order to reach those particularly at risk, and this included the hard-to-reach teens and the university student population. Two social media platforms were integrated features of this campaign: a Facebook page and two YouTube videos.

Print, radio and email campaigns pulled viewers to the website, which contained links to both YouTube videos. A Facebook widget allowed a one-click posting to the users' homepage (the item showed up as an embedded link to the YouTube videos) and thus became visible to the social network of the user. This pushed the message through users' social networks, encouraging them to virally spread the videos (60). Additionally, an interactive Facebook application allowed users to have one of their photo's "mumpified" such that their face would be distorted with swollen lymph nodes (65).
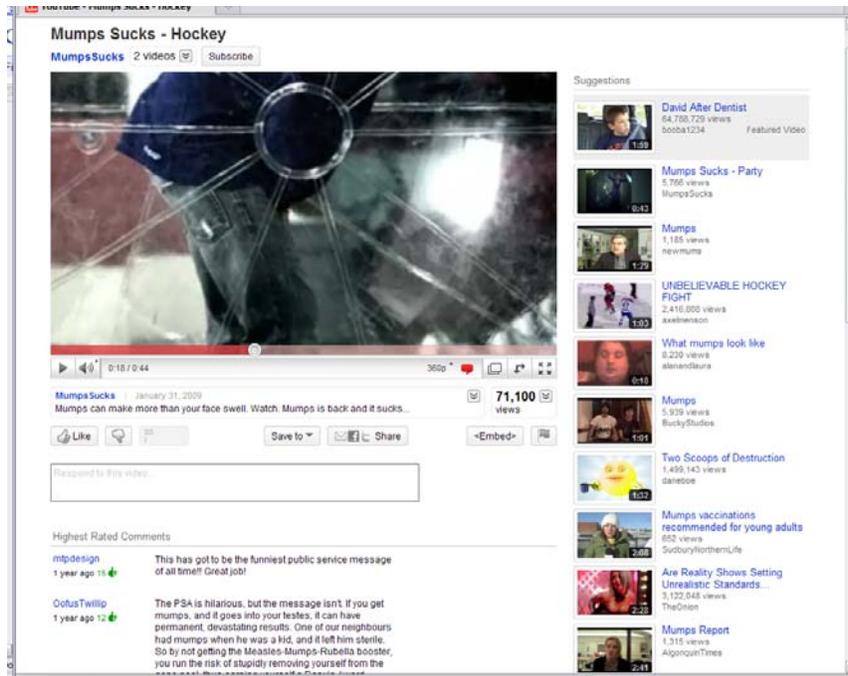
Figure 3: Humorous YouTube video showing the unpleasant side-effects of mumps infections (targeting teenage boys). A teenager's friends are horrified by their friend's orchitis caused by mumps.
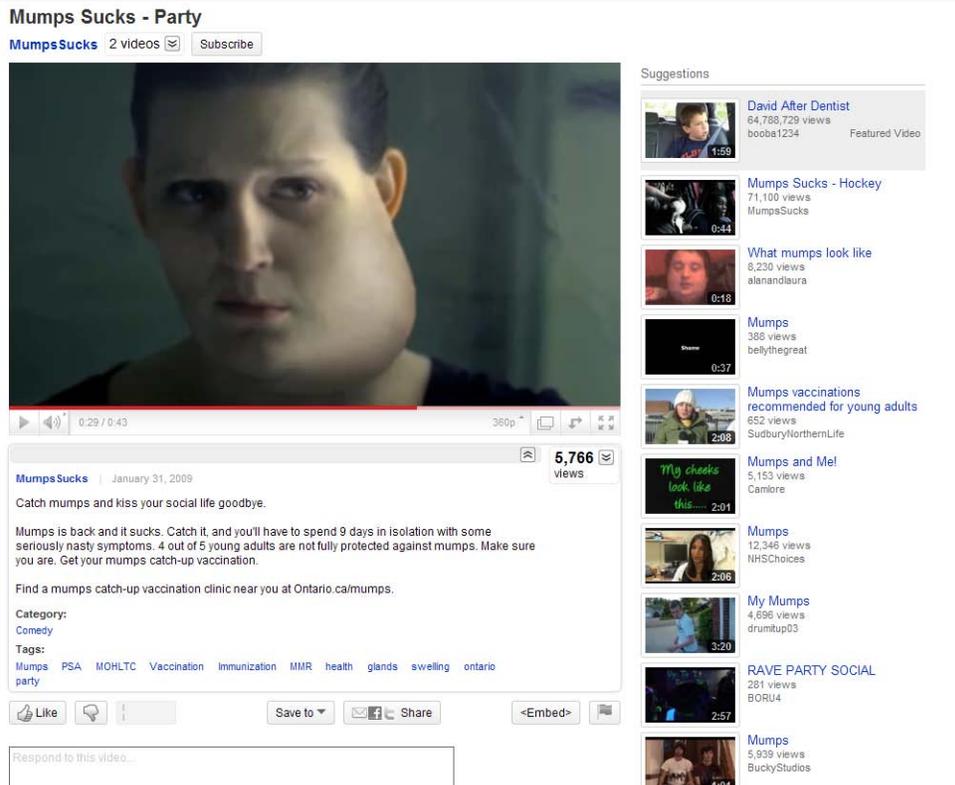
Figure 4: Humourous YouTube video showing the unpleasant side-effects of mumps infections (targeting girls). A teenager's friends are horrified by facial disfigurement caused by mumps.

Evaluating the impact of this campaign from available data is difficult. Our analysis of YouTube comments (to date) suggests that the videos were extremely well received and, unlike most vaccination discussions on YouTube, there was little evidence of vaccine critical sentiment, though the number of views and comments were small in comparison with popular YouTube videos. On the other hand this suggests that viewers who clicked through government advertising for additional content may have been predisposed to agree with the messages presented (preaching to the choir effect). Regional health units also engaged in separate communications initiatives, which makes it difficult to disentangle the impact of different components of the provincial campaign and the local campaigns on the key outcome measured (number of catch-up immunizations or bump in immunizations). Usage analytics reported by the Ministry revealed 62,125 site visits, 1,100 Facebook fans, 69,214 video views and ultimately the campaign resulted in 30,000 immunizations (60).

Ontario MOHLTC Social Media Marketing during the H1N1 pandemic (MOHLTC 2010)

The Ontario Ministry of Health and Long-Term Care (MOHLTC) initiated an innovative social media communications strategy during the H1N1 pandemic (60). Their approach took advantage

of "word of mouth advertising" techniques to steer public conversation to give Ontarians the most accurate and up-to-date information to stay well and to encourage immunization. They employed a 5 - prong process. Unlike a traditionally staged or stepwise processes to develop, test, release than evaluate a communications campaign, the MOHLTC took advantage of key features of social media applications that allow for relatively timely and low cost continuous monitoring and campaign modification, using the philosophy "test, measure, repeat".

The MOHLTC 5-Prong Approach included the following processes:

1. Listening, e.g., What are people saying about H1N1?
2. Refining (tailoring of messages, identify gaps, tailor useful messages to diverse publics) What do people need to know about H1N1?
3. Leveraging Word of Mouth (identify opinion leaders and recruit them to spread good quality information)
4. Provide customized, relevant messaging
5. Inviting User Generated Content

Using infoveillance tools, they identified online discussions about H1N1, public attitudes and sentiment and followed their activity and traffic on Twitter, blogs, online media and video sites. This info-surveillance exercise led to four communication strategies: an outreach campaign targeting "mom bloggers"; a youth engagement plan; modifications of their website; and actions to improve the flow of traffic from search engines to their campaign sites (60).

They received good buy in from leading mom bloggers they contacted, many of whom who expressed their interest in good quality and timely information to pass along to their followers/readers. In their youth outreach campaign, they targeted 17-24 year olds with a tailored "Join the Resistance Campaign". Using university email lists and popular youth social media, movies and music sites, they pulled youth to a youth-customized section of their flu website and once there pushed messages related to prevention and immunization. Site usage analytics allowed them to closely track site visits (which numbered over 4,000) and to understand where youth were being pulled from, e.g., google searches, the email campaign, or paid ads etc. Significantly, they reported that traffic to the site increased ten times in October 2009 and the campaign generated fifty times more traffic than experienced in a typical flu season. To measure engagement, they monitored how long people spent on the site, and how many were first versus repeat visits (60).

Interestingly, when they observed website traffic slowing, they added a user-generated content section in the form of a moderated "flu testimonial" section where viewers could post their experiences with flu and with the vaccine.
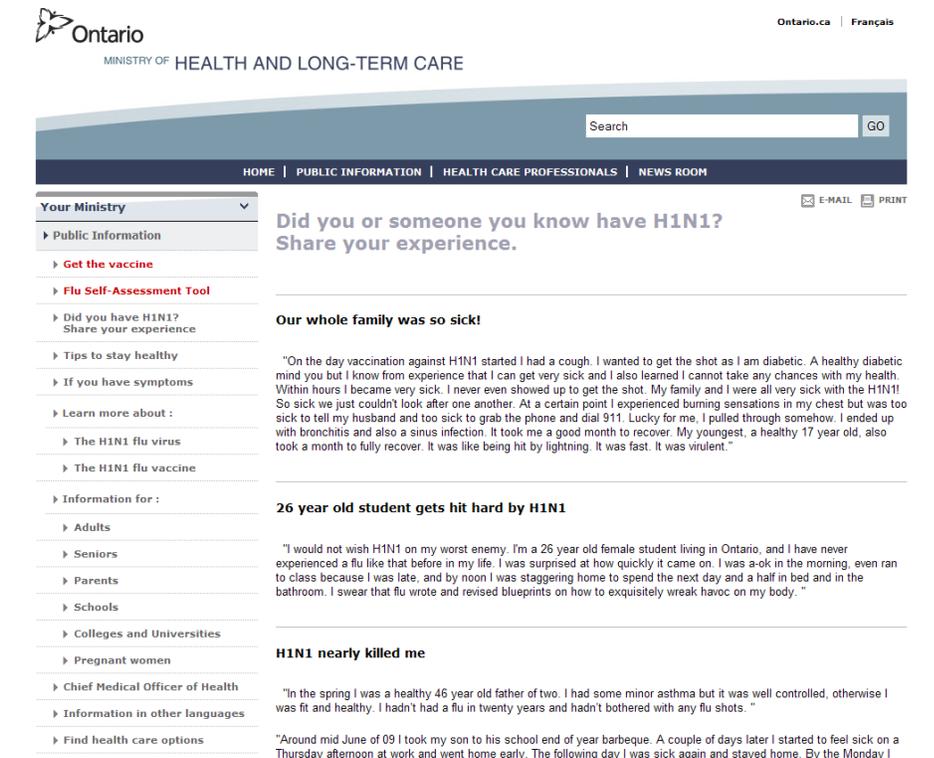
Figure 5: Moderated user feedback page used by the MOHLTC to increase traffic through user-generated content and user engagement (64).

The MOHLTC social media campaign provides compelling support for the assertion that social media improves reach and engagement. However, the actual uptake of the H1N1 vaccine was less than 40% overall. Poor uptake was blamed on conflicting F/T/P messaging, difficulties in providing access and the public's overall lack of concern about the risks/severity of catching the H1N1 virus (65).

"The Heart Truth" Campaign

The Heart Truth campaign, a national awareness-raising effort focusing on women and heart disease, was among the early innovators in the use of social media and other web 2.0 platforms as part of its health communication strategy. Taubenheim et al (2008) describe a pilot project developed by The National Heart, Lung, and Blood Institute (NHLBI) in 2007 to maximize the reach and profile of two key awareness-raising events, held annually during American Heart Month in February: National Wear Red Day (NWRD) and the Red Dress Collection (RDC) fashion show (9). The pilot, carried out in 2007-8, was intended to further the campaign's overall

health communications objectives: raising awareness about heart disease among its target audience, women 40-60; raising awareness about risk factors that can lead to heart disease; and encouraging women to discuss risk factors with their health professionals and take steps to reduce them (9).

The rationale for focusing on social media was twofold: first, the organizers recognized that more and more of the campaign's target audience were actively engaged in online communities, and that if awareness levels were to continue to increase, the campaign would have to follow the communication habits of its target audience; and second, NHLBI recognized the potential to reach more women with very little marginal increase in the cost of the campaign (9, p.59). The immediate goal was to use social media to drive traffic to *The Heart Truth*'s webpage, where users would find information and activities associated with NWRD and the RDC fashion show.

The pilot project was contracted to Ogilvy Public Relations Worldwide, which has expertise in social media marketing. Ogilvy also partnered with staff from the American Institutes of Research, along with the NHLBI's project director, web-designer, and communications director.

The campaign used a variety of tactics to push traffic to *The Heart Truth* website, including a number of strategies: pay-per-click ads, paid public service banners, and e-mailers. Below are outlined key social media elements of the campaign.

a) Blogging: In addition to mass e-mailings of the NHLBI newsletter, the campaign conducted outreach to 130 message boards, social networks, and blogs related to fashion, entertainment, women, motherhood, and health. Identifying and recruiting high-influence bloggers turned out to be a key to increasing the reach of the campaign. Targeted outreach to bloggers yielded high numbers of blog posts mentioning the NWRD and RDC events: 40 contacted bloggers yielded 300 blog posts in 2007, and 137 bloggers led to 536 blog posts in 2008 (9, p. 62)

b) Video- / Photo-sharing and Social Bookmarking

Images and videos from the RDC fashion show were posted on YouTube, Flickr, and Facebook. The YouTube video succeeded in "going viral," garnering more than 90,000 views in 2008. The Flickr photo album was viewed 12,320, and 60 people became fans of *The Heart Truth* Facebook page. A profile on del.icio.us, a social bookmarking site, led to tags referencing the campaign on 97 websites and 50 blogs (9).

c) Widgets

The campaign designed badges and widgets that could be propagated and embedded in other web contexts. For example, a count-down widget marking the date of National Wear Red Day was embedded on over 350 sites and viewed 125,000 times.

The social media pilot project of *The Heart Truth* campaign aimed to drive traffic to its existing website. Taubenheim's report does not provide a baseline to compare traffic before and after the development of a social media campaign, but the authors suggest that the use of social media did increase direct visits to the site. When taking into account the expanded presence of *Heart Truth* campaign materials on other sites -- whether through the propagation of widgets across the web, on the Facebook page, or on YouTube and Flickr -- the positive impact of the social media strategy is more clearly measurable, with total page views increasing by roughly 200,000 or 28% from 2007 to 2008 (9, p.64).

NHLBI was encouraged by the success of its pilot project in contributing to raising the profile of National Wear Red Day and the Red Dress Collection Fashion shows, both key elements of *The Heart Truth* campaign. In addition, the authors note that NHLBI was able to enhance its web presence, producing thousands of hits for its events on search engines, at very minimal cost. Taubenheim notes: "The viral impact of key campaign message placement on blogs in 2008 provided *The Heart Truth* tremendous opportunities to extend promotion of the campaign and its key February events and reach far more people than would have been possible through ''traditional'' channels alone (9, p.65).

Search engines produced thousands of hits for The Heart Truth, National Wear Red Day, and Red Dress Collection Fashion Show, both in 2007 and 2008. Clearly, the project pilot tactics encouraged people throughout the country to recognize and celebrate NWRD and created significant online buzz about the RDC fashion shows. 9, p.65)

Appendix 5: Competing with vaccine-critical messaging

Figure 1: Screen captures from the re-broadcast of a Minnesota State Committee Hearing on the safety of vaccines. Note the poster's annotation in yellow (right view) asserting a vaccine-critical viewpoint and also the viewer response disputing this viewpoint (see comment from 'FightPrejudice')

Figure 2: Youtube search by authors for "flu vaccine". First page results were all critical of vaccine.

Appendix 6: Infoveillance / Infodemiology: "Who Is Sick"

The creators of "Who is Sick" describe its origins this way:

"The genesis of the idea for Who Is Sick was actually from an acute need that our founder had when his wife started experiencing severe stomach pain while they were on vacation. With no way of knowing whether the pain was from appendicitis, food poisoning, or some other stomach illness, our vacationing couple went to the emergency room and waited for 4 hours (BTW - this was from 11pm until 3am) to be seen by a doctor...only to be told that there was a stomach flu going around and that if the pain didn't go away in 24 hours, to come back. Wow. 4 hours wait for that...in the middle of the night... (of course the doctor did check to see if it was appendicitis so they weren't all bad...).

Our founder thought, "if only there were a website that had current AND local sickness information, maybe we could have avoided the long wait." Needless to say, this started the wheels spinning and a couple of months later, Who Is Sick was born.

Our inspiration for the design of the site came from Craigslist and HousingMaps (57)."
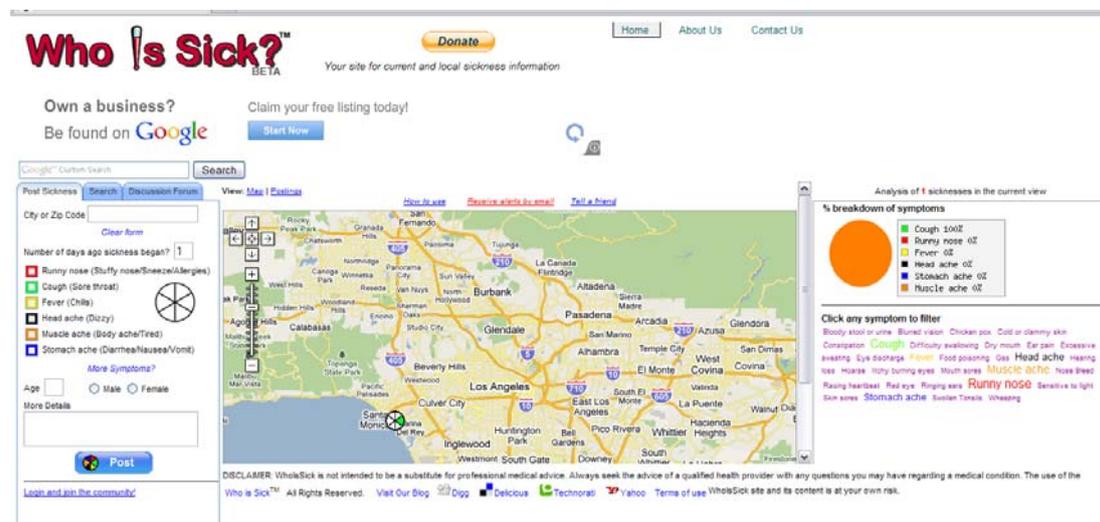
Figure 1: Who is Sick? Mapping tool