

# ePublic Health: Fresh Approaches to Infection Prevention and Control

## Social media in public health

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**Abstract** - Prevention and control of infectious diseases suffer from deficient compliance with preventive measures or guidelines of both professionals and general audience. This poses a threat to public health. Current approaches to prevent risk behavior are in need of innovation. Fresh approaches to education, information and communication are needed. In this study five social media tools i.e., (micro-)blogs, social networks, podcasts, mobile applications, RSS feeds, are (re)designed and operated with regard to four areas of infection prevention and control. They are evaluated according to their impact on public and professional adherence, compliance rate and other indices. Here we present outcomes of the first part of the study; a literature review of social media use in public health, specifically in the Netherlands. Empirical studies are scarce. However anecdotic studies, practices and experiences are reported that imply a range of innovative possibilities and potential impact of social media in the field of prevention and control of infectious diseases, as well as in public health at large.

**Keywords** - Information technology, Social media, ePublic Health, Participatory health care, Adherence, Infectious diseases

### I. INTRODUCTION

Prevention and control of infectious diseases, in particular during large-scale epidemics or incidental high risk outbreaks, increasingly suffer from deficient compliance with preventive measures or guidelines of both professionals and general public. Examples are the no-show rate among the general audience after receiving a personal appeal to obtain an influenza or a human papillomavirus (HPV) - vaccination, or similar low compliance among health care workers with preventive measures such as wearing protective gear (like masks, gowns and protection glasses) during professional care for potentially infectious patients [1]. This is worrisome especially in view of recent developments of infectious diseases in the Dutch population and abroad. Antimicrobial resistance is increasingly observed in the

Netherlands, particularly in hospitals. Antibiotic resistance poses a potentially growing threat to public health because it is more difficult to treat infections with resistant pathogens. Compliance with preventive measures would make a difference. In the Netherlands, the use of antimicrobials is low in human health care, but high in the veterinary sector. This high level of antibiotic use may bring risks to humans, as resistant bacteria can spread from animals to humans. In addition, the emergence of ESBL (Extended Spectrum Bèta Lactamase) producing bacteria and enterobacteria resistant to multiple classes of antibiotics is a major threat to patient health care. It is anticipated that the use of antibiotics will increase in the future due to aging of the population, which will contribute to further increasing of resistance pathogens. It is therefore important to keep the use of antimicrobials as low as possible in the future. Cautious surveillance is a tool to identify and monitor resistant pathogens. But prevention and control are equally essential [2].

The Dutch RIVM Centre for Infectious Disease Control (CIb) has an executive and coordinating task in the national prevention and control of a wide range of infectious diseases manifesting themselves in incidental outbreaks of mixed origin, scale and risk level, as well as in various epidemics. This is one of RIVM's most important and most visible statutory public assignments.

In order to be able to effectively implement the national infection prevention and control policy in the near future it is of strategic interest to counter the abovementioned public health risks. From health sciences we know what psychological, social and cultural factors influence non-compliance. We also know that current approaches to collective prevention of risk behavior need innovative ways for education, information and communication [3].

Fresh approaches are needed. We find these in eHealth marketing; a sub domain of social marketing. eHealth marketing concerns public health practice. It draws from

traditional marketing theories and principles, and adds evidence-based strategies to prevention, communication, health promotion and health protection. It provides a framework of theories, strategies and techniques that can be used to guide work in public health research, interventions, and communication campaigns. eHealth marketing typically uses emerging technologies and 'new media' to improve the impact of health marketing and communication. Web-based and mobile technologies offer tools that are cheap, ubiquitous, interactive, real-time, many-to-many and that are participative in nature. They can be put to action for RIVM's objectives to make content, tools and services available when, where and how users want them. This we call ePublic health.

The present paper depicts a strategic research enterprise to study social media in public health. First it describes the background of emerging technologies and the five social media under study. Then it explains their relevance for public health i.c. infectious diseases. After stating the specific objectives of the study and the methodological design the outcomes are presented of the first part of the study; the assessment of current approaches in ePublic health via a literature review, with specific consideration for the Dutch situation.

## II. EPUBLIC HEALTH

### A. Emerging technologies

The utilization of information technologies, the Internet (Web 2.0) and communication technology could meet the need for improvements in infection prevention and control and other vital public health issues. Web 2.0 is a term that refers to a) improved communication and collaboration between people via social-networking technologies, b) improved communication between separate software applications via open Web standards for describing and accessing data, and c) improved Web interfaces that mimic the real-time responsiveness of desktop applications within a browser window.

These technologies, tools and services have already shown to influence behavioral and motivational compliance with preventive measures [4, 5, 6]. It is expected that these developments and approaches will profoundly affect the health information economy, public and professional engagement in health and health care, as well as biomedical research itself [7]. After the e-citizens, the Dutch e-patient is taking shape [8]. Gradually, the use of 2.0 technologies as well as semantic web (3.0) tools increase to facilitate social networking, participation, apomediation, collaboration, and openness within and between these user groups

Availability and accessibility of these technologies is evidently a condition sine qua non. Recent figures reaffirm high use of Internet by the Dutch population. In the

year 2005 a total of 78% of Dutch households had an internet connection. In 2010 that number has grown to 91% of all Dutch households. Over 75% of users use the Internet (almost) every day. Among younger people (<25y) this is 90%. [9, 10, 11]. Top of the list in broadband penetration - 38.1 broadband subscribers on every 100 inhabitants [10] - Dutch cell phone use is even higher, beyond the 100% mark.

Social media use continues to grow in popularity accordingly. From a global survey in 2010 [12] it appears to be the fourth most popular use of the internet, next to searching for information, emailing and checking the news. In the US, 57% of all 14-75 year olds use social networking sites like Facebook [13]. Furthermore, 10% of 14-17 year olds, 13% of 44-62 year olds and 17% of 63-75 year olds maintain a Twitter account [14]. Podcasting is slightly less popular, but still 25% of Americans age 12 and up have listened to or watched a podcast at least once [15].

In The Netherlands 70% of adults use social media. Mostly in their roles as 'spectator' or 'joiner' and mainly in the age of 18-44 years (Table 1) [16]. An estimated third of chronically ill people make use of on line communities for information and sharing. Young people use social media not so much for health information but mostly for other reasons [17a].

### B. Social media

The present study examines five tools with regard to four distinct and limited public health issues. These five social media tools are selected for piloting because of their expected cost-efficiency, feasibility, operability. The selection may be adapted as a consequence of previous study outcomes. The developmental process will be guided by exemplary questions added below. Selected for piloting are:

- a) Blogs. A blog is a regularly updated online journal that anyone with an Internet connection can access. Some target a small audience, others boast a national readership. Microblogs, also known as 'tweets', are disseminated through Twitter.com and comprise short text messaging. Over 14% of Dutch internet users blog about health issues [17]. What can we learn from experiences in the health 'blogosphere' where e.g., bloggers and twitterers share information or communication techniques to prevent and control lice infestation or where on line seminars (webinars) are held for 'parent bloggers' to discuss basic information on RSV-infection and share research on key messages that have been proven to motivate people to take preventive measures?
- b) Social networks. Social networks are interactive websites in which users create a profile that may

contain photos, blogs, music, messages from friends, and other information. The high use of sites like MySpace, Hyves or Facebook [16] has been well documented. Many smaller sites for professionals, patients, parents, teachers or citizens have emerged, offering a targeted approach to increase reach. These networks are quickly becoming a mainstream format for information exchange, relationship building and knowledge sharing. Increasing amounts of Dutch Internet users participate in social networks while more and more patients make choices in healthcare after consulting friends and relatives in stead of medical professionals. Could we employ social networks to engage users in health topics (i.c. scabies) and empower stakeholders to comply with preventive measures at home, in (nursing) homes and risk settings?

- c) Podcasts. A podcast is a digital audio or video file that is episodic, downloadable, program-driven, mainly with a host and/or theme, and convenient, usually via an automated feed with computer software. Is podcasting for RIVM an opportunity to share information on *Pediculus humanus* infestation in an enjoyable way while allowing listeners to select topics relevant to them? Should RIVM develop a podcast library for the general public or for health care workers or their own staff (e.g., vodcasting conference proceedings)?
- d) Mobile applications. The ubiquity of mobile devices makes them an ideal medium for health messaging and promotion. Cell phones and other mobile devices have the potential to revolutionize public health communication. Research on how these devices can be used to provide immediate access to reliable just-in-time health information is rising; end 2009 the penetration of mobile internet is ca. 20%, while just under 2.8 people use their cell phone for internet access [17]. What innovative ways of exchanging vital information or technology to promote healthy and safe behaviors via mobile platforms could be envisioned e.g., for responding to sudden outbreaks of infectious diseases?
- e) RSS feeds. Internet users often subscribe to RSS (Really Simple Syndication) feeds of frequently read websites in order to receive notification of content updates. These feeds may empower individuals (teachers, parents, health care workers) to access and utilize the health information they view as most valuable. RSS feeds capitalize on this personalization of information by allowing users to select the topics that are most interesting to them. Will the impact

of RIVM's output increase by ensuring that timely and relevant health information is delivered to users when, where, and how they want it? Should we provide professionals and citizens with the opportunity to subscribe to RSS feeds for thematic website pages e.g., on lice prevention notifying subscribers whenever updates are made?

To create awareness, to encourage and to persuade the users to comply with prevention and control guidelines these tools are developed through participatory healthcare design and business modeling, explicitly engaging users and stakeholders from the start [18, 19].

### C. Infestations and infectious diseases

The tools will accordingly be put into operation with regard to four distinct and limited public health issues:

1. Prevention and control of the common human lice (*Pediculus humanus capitis*) infestation among children (3-12y) in family and primary school settings;
2. Prevention and control of seasonal RSV-infection (respiratory syncytial virus) among young children (0-4 y) in 'crowded' kindergarten and pre-school settings. It is epidemic in that its incidence is circa 413 in every 100.000 children; resulting in 209 hospital admissions (0-4y) [20];
3. Prevention and control of scabies (*Sarcoptes scabiei*) in nursing homes and homes for the elderly. Prevalence among particular populations is estimated to amount to 30% [20];
4. Control of incidental, sudden outbreaks or explosions among limited populations e.g., at dance festivals, scouting jamborees or other mass gatherings.

All of these public health issues belong to the competence and responsibility of RIVM C1b. For 1-3 professional and public guidelines are in force and many different stakeholders (children, parents, teachers, kindergarten, schools, staff, residents, police, health authorities etc.) are directly involved. Though having relatively high prevalence and incidences figures in the Netherlands, they do not generally cause severe, primary and secondary health problems, rendering this a relatively safe area for exploration and study.

### D. Objective and deliverables

The study's objectives recapitulated:

1. To develop five social media tools using participatory health care design method;
2. To operate these tools with regard to four areas of infection prevention and control;

3. To evaluate their impact on public and professional adherence, compliance rate and other indices;
4. To integrate 1-3 into a models/scenarios for development and operationalization of social media for health and risk communication and for disease prevention and control.

From this explorative and evaluative research we derive a) a *specific* model for development and application of mobile and web-based media for infection prevention and control; b) a *generic* model for development and application of mobile and web-based media interventions for safe, swift, effective and efficient health and risk communication and response; and c) an scientific evaluation tool to measure the effects of new media interventions.

### III. METHODOLOGY

The present study uses principles of human centred design [19, 21-23] and a mixed model of quantitative and qualitative methods. In chronological order the following methods will be used to advance the project.

#### A. Assessment of current approaches

Prior to developing new tools an assessment will be done to establish the nature and the extent of social media use in current public health practices in the Netherlands and abroad.

Firstly, a literature review will be carried out to assess knowledge, practices and experiences with social media in public health as reported in peer-reviewed journals. Results of the latter are presented sub IV. of this paper. Secondly a consultation of (foreign) organizations takes place driven by the question of what underpins the choice of these media and what are the perceived benefits and shortcomings in current health and risk communication? The assessment is done by desk study and interviews of stakeholders and communication experts.

#### B. Reviewing new media use for infection control

A content analysis of social media like Twitter, Facebook, weblogs, wikis with respect to (seasonal) infections (i.c. RSV), infestations (i.c. lice and scabies) and outbreaks (unknown) is carried out over a period of time. Trends in communication, opinions and attitudes will be electronically monitored, analysed and reported. The outcomes provide input for the development of specific social media tools in the next stage.

#### C. Participatory design of social media

The tools are designed and developed through participatory health care design in order to use them in an effective, safe and efficient manner. Participatory health

care design is a human-centered design approach. It aims to engage all stakeholders (e.g., employees, partners, customers, citizens, patients, end users) in the design process to help ensure that the product designed meets their needs and is usable, thereby increasing chances for acceptance, adoption and adherence [21-23]. It relates to concepts of Health 2.0 and collaborative medicine where creating (virtual) environments that are more responsive and appropriate to their users' cultural, emotional and practical needs, is vital. The focus is on processes and procedures of design, not on design style. These processes are research in themselves, the outcomes of which will feed the production of 'persuasive' tools in order to put them to work in real life.

#### D. Knowledge to action

Once developed and constructed the tools will be put into practice with regard to four distinct and limited public health areas c.q. infectious disease prevention and control (sub II-C.). They have been selected to provide a safe test bed for the project since: i) no serious individual and public health damage is involved; ii) relatively high prevalence/incidence; iii) many stakeholders are directly involved; iv) preventive measures and/or guidelines are in force and available; and v) they belong to the competence and responsibility of RIVM Clb. The results will be used for RIVM's mission with regard to public health.

#### E. Evaluation

By webanalytic methodology we quantify, analyze and evaluate parameters of participation (rate, range et al.) and social media use by the stakeholders. Eysenbach [24] developed a set of useful 'infodemiological' methods to search and analyze communication behavior on the Internet and social media that will be used in the present evaluation. On line surveys, on-site focus groups and interviews with stakeholders will be used to collect qualitative data among the respective target groups (parents, teachers, health care workers, staff, nurses, kindergarten staff, police et al.). These methods are distinctly applied to the public health areas under study: lice, RSV, scabies and sudden outbreaks. For every area the effect of the five social media is systematically and longitudinally assessed in terms of knowledge, information needs, attitude, adherence (use, willingness-to-return, attrition), motivation (to comply with preventive measures), health behaviour (self-report), impact (perceived significance) and other social psychological indices. Special attention is given to the added value of the tools with respect to both traditional media (TV, radio, brochures) and convergent/cross-media use. Via analysis of reputation rate the image of RIVM as a credible and reliable source of information is observed.

#### F. Modelling scenarios

The outcomes of the developmental stage, the operational stage and the evaluation stage are used to

construct a practical model for immediate use in a wider public health context. Results and practical experience provide building blocks for a specific, evidence-based scenario to develop and operate evidence-based mobile and web-based media for infection prevention and control. The application of participatory design principles generates persuasive and motivational tools that allow for optimal adherence to prevention and control measures among professional and the general public. Once this succeeds the specific scenario is extended to a generic model to develop and operate persuasive mobile and web-based media interventions for evidence-based, safe, swift, effective and valid health and risk communication and response.

These models/scenarios may form part of RIVM 'toolkits' as offered to professional partners for disease prevention and health education or be disseminated in different ways. In the process the last product to be delivered is an evaluation tool that allows for measuring the effects of social media interventions on health information behavior

#### IV. OUTCOMES

In this paper, we present outcomes of the first part of the study c.q. III.A *Assessment of current approaches*. What kinds of social media are currently used in (international) infectious disease control to create awareness, to motivate or to persuade the public and health care workers to 'do the right thing' in risk situations?

##### A. Literature review

We have searched the databases Science direct, Scopus, PsychInfo, Picarta, PubMed, Google Scholar and Web of Science. We developed a search syntax composed of terms such as: infection prevention, infection control, social media, outbreak control, implementation, social networking, Netherlands, Twitter, new media and FaceBook, health communication, disease, web 2.0. and Dutch synonyms of these. The search was conducted during September-October 2010 and was limited to studies in English and Dutch published between 1990-2010.

If allowed by advanced search options adaptations to the syntax were made. Wildcards were used to account for differences in spelling of search terms or term endings. Identified 'key references' have been traced until saturation was reached (no new articles were identified). Excluded were advisory reports and articles that did not (also) treat the use of media. In this way we found 43 articles.

##### B. Results

Papers generally depict the authors' view (whether or not based on scientific theory) on how social media should be used rather than presenting empirical evidence. A minority describe the way social media are actually used and implemented for infection prevention and outbreak control, very few report on social, behavioral or health effects.

Both international and Dutch articles on social media use in public health may be grouped into five more or less distinct categories that indicate the primary objective; 1) distribution of health information, 2) delivery and promotion of health services or products, 3) peer-support, 4) education and training of professionals, and finally 5) research.

With regard to distributing *health information* we found promising outcomes e.g., in HIV/AIDS prevention information via chat sessions [25] or sharing health information via social networks [26]. Reynolds [27] describes how U.S. Centres for Disease Control and Prevention (CDC) use social media such as Twitter, Facebook, podcasts, YouTube and RSS feeds to inform the general public e.g with regard to the A/H1N1 epidemic in 2009. This resulted in an increase of visits to their websites and an improvement of CDC's trustworthiness in public perception. CDC's 'i know' campaign also uses Twitter, YouTube and Facebook for prevention of HIV/AIDS among African-American youngsters. The campaign employs social networks to reduce stigmatizing and taboo and to encourage participation in the campaign [28]. Murray et al. [29] describe several ways in which podcasts can be used in health-related settings.

Hivatlas.org is a social media initiative that aims "to collect, collate, classify and disseminate the information on HIV, TB & Malaria so that people living with HIV and the people working in the field can be on top of the information generating from more than 700 online and offline resources".

Anecdotic examples of social media use to disseminate information are an individual dermatologist using Twitter to share information about skin and skin care with her followers [30]; Medpedia, a wiki launched in 2009 by medical specialists on health information [31]; lay people disseminating medical news and information via blogs [32]; medical professionals blogging about medical news and knowledge [33]; ICYou, a site for sharing video material about experiences on treatments and disease or sites using RSS feeds to inform on pre-selected subjects [34]. Although such outcomes are interesting no empirical studies have been found with regard to the effectiveness

of social media use with regard to the distribution of health information.

With regard to *delivering and promotion of health services* it can be noted that anno 2010 in the UK social media, mainly Twitter, are used by 40% of health organizations for prevention [35]. Many American hospitals use social media for marketing & communication [30, 36]. They send general messages referring to their official home page via Facebook e.g., announcing an Open Day via Twitter, or an operation on YouTube for educational purposes or even release real-time progress reports via Twitter during surgery.

A survey by Beard et al. [37] reveals a wide range of health-related activities in the on line virtual world of Second Life. Agencies, companies and private groups apparently have chosen to integrate (features of) Second Life into their Web 2.0 communication strategies.

In spite of such findings no empirical studies have been found concerning the effectiveness of social media use with regard to the delivery of health services. In a randomised trial Lester et al. [38] find that mobile phones may be effective tools to improve patient outcomes in low-resource settings. Kenyan patients receiving SMS support had significantly improved antiretroviral therapy adherence and rates of viral suppression compared with individuals in the control group.

*Peer-support* was already a noticeable objective of internet activity before the dawn of Web 2.0. On line communities for support, comparison, advice and communication have grown and diversified. Murray et al. [29] also describe the use of blogs and wiki's in health contexts and Hardey [39] mentions user reviews of health services. Patientslikeme.com is a successful American social network site, sponsored by pharmaceutical industries, for chronically ill people with over 65.000 members. Patients follow new developments for their specific disease and have access to user generated information, tools and experiences to manage their condition.

Launching social media for reasons of *education, consultation and training* for health care professionals is gradually increasing. Yensen [40] mentions successful use of RSS feeds to provide up-to-date health information. Though many initiatives have been taken to use social media for educational purposes no empirical evidence is reported as of yet.

Social media and the internet can be used as a *research* environment for the study of human behavior. Eysenbach [41, 42] started to analyse behaviour and content on the internet and later in social media use. He

was the first to show a correspondence between influenza-related searches on Google and influenza cases occurring in the following week in Canada, later to be extended to analysis of A/H1N1 communications on Twitter, a discipline he coined 'infodemiology' or 'infoveillance' [24]. Corley et al. [43] used data-mining techniques to establish a strong correlation between blogposts mentioning 'influenza' (and related terms) and data of the Centre for Disease Control (CDC) on the influenza virus.

### C. Social media and public health in the Netherlands

Reports on social media in all five categories can be found sparsely for the Netherlands. We generally find reports that advise public authorities to make use of social media (e.g. in infection prevention) or anecdotic studies. There are no empirical studies on the use of social media and its effects in this respect. Social media have not (yet) acquired an established position in public crisis communication, though some positive experiences have been reported [44, 45]. These have led Dutch ministries (Ministry of Economic Affairs, Agriculture and Innovation; Ministry of Health, Welfare and Sport; Ministry of Foreign affairs) to incorporate social media as instruments for crisis communication in a wider strategy. Especially micro-blogging (Twitter) seems to provide opportunities for authorities to communicate with citizens. In some instances it has been used for factual information on Q-fever and influenza. Some examples exist of training and education in social media for health professionals or civil servants. The latter have received guidelines on how to use social media responsibly and safely

In a wider health context there is more to be found. A remarkable case has been a Dutch private initiative (April 2010) to canvass new organ donors via social networking. Hyves-users received a question on their personal page if they would save someone's life. Consequently they could officially register for organ donation resulting in 25.000 new applicants, 80% of which became actual donors. In comparison; a large scale nationwide TV broadcast in 2007 resulted in 7300 new applicants. The Dutch Pink Ribbon campaign encourages people to actively take part and join in raising funds for breast cancer research (see: [twitter.com/pinkribbon\\_NL](http://twitter.com/pinkribbon_NL)).

Dutch hospitals increasingly use social media such as LinkedIn, Twitter or YouTube [46]. Use of LinkedIn rose from 2 % (Jan. 2010) to 53 % (Sep. 2010), and use of Twitter from 4,5% to 32,6%. Not so much for cooperation and dialogue with patients but rather for promotion and human resource management. Some have a Twitter account but never or rarely used it. Others send news-tweets about their hospitals, the consequences of budget cuts, or building activities. 26% of hospitals use YouTube

in ways that vary from uploading promotional corporate videos and material about special events to explanatory videos about daily routines or intake procedures. Approximately 21% use RSS, 15% Hyves (over 10 million users) while blogging is done from 6% of Dutch hospitals. Facebook - with over 2 million Dutch users - was not considered in the study.

Two Dutch general practitioners tentatively started a free primary care consultation service on Twitter in 2009 [47]. Their preliminary findings show that consultations via Twitter encompass all areas of regular primary care practice. About one thirds of the communication takes place on the public timeline, the other two thirds via the private Direct Message function.

On line communities on health issues are pervasive and participation increases. Patients clearly benefit from actively taking part while possible detrimental effects are rarely reported [48].

In conclusion, we observe that in spite of the country's high use of web based and mobile technology very little empirical research has been done in the Netherlands. However the body of literature on the subject is growing and interestingly shows the possibilities of using social media for health communication, prevention and control of infectious diseases. Dutch public health organizations increasingly use social media; mainly for conventional, one-way marketing, communication and information purposes but increasingly so for encouraging participation and interaction.

Lessons for the Dutch may be learned from the American Centres for Disease Control (CDC) that are collecting experience and building knowledge about using social media in crisis and emergency-risk communication. CDC developed guidelines on how to use such tools which are relevant for the Dutch situation. The importance of trust for the relationship with the general audience is emphasized. To establish trust and credibility four elements of persuasive communication are vital: expressing empathy and caring, showing competence and expertise, remaining honest and open and being committed. According to CDC their work was worth the effort, since social media helped to go where people are, tailor health messages, empower people when making health decisions and facilitate interactive communication. CDC claims to have gained more trust and satisfaction with the use of social media [27]. However, this can only be achieved if professionals have the skills to use them. The typical collaborative nature of Web 2.0 is only useful if health professionals overtly participate and refrain from 'old school', one way communication [35, 49].

McNab [50] mentions some guidelines to use social media for health communication wherein such professional participation is critical: "Be strategic and choose wisely. Identify what needs to be said and why, to whom and when. Focus efforts on the specific social media tools relevant to the audience and use them consistently. A string of abandoned or infrequently tended social media accounts hurts credibility. Critically, health professionals need to use social media to engage in a conversation, not only to "pass down" information. The global social media community expects to be able to add value to the conversation, to help correct rumors or misinformation, provide feedback or offer personal experience." Guidelines are also proposed by medical professional organizations such as the American Medical Association who emphasizes the ethical and legal aspects of social media use by doctors.

Vance et al. [51] acknowledge some disadvantages such as unknown authors, unclear sources or opinions presented as facts. From the advent of the internet these have been addressed in discussions on how to look after the credibility of medical information. Ethical standards such as the international Health on the Net code (HONcode) apply to professional use of social media as well as to the internet.

Though we have anecdotic studies, practices and experiences rather than empirical studies the available material implies a range of innovative possibilities and potential impact of social media in the field of prevention and control of infectious diseases, as well as in public health at large for a growing population of both patients and professionals.

## V. DISCUSSION

Social media are popular sources for health information among (young people). Cheap, many-to-many, real time, ubiquitous and interactive as they are, social media offer many opportunities for much needed innovation in public health communication. They have changed the media landscape completely and the old 'trusted media' must relate to the new 'chaotic' media.

These can potentially connect the world of science, public authorities and the general public while maintaining balance between rational information c.q. education and irrational alarming is a responsibility for all party's involved.

Dutch health authorities have taken interesting initiatives in public health to improve health communication via social media. Though it seems sometimes, as a Dutch saying goes, that they "have heard the bell tolling but don't know where the tongue is hanging." The original 2.0

features make social media inherently suitable for peer-to-peer interaction on health issues, professional collaboration and education and health services delivery. Social media use can be studied as any human behaviour can be studied, and specific methods are currently being developed to obtain most of these data.

As is the case with other eHealth technologies [52] the lack of robust evidence prevents a clear assessment of the assumed benefits. More knowledge and practices are needed with regard to how social media could be successfully applied in public health to counter the never-ending threat of infectious disease. The actual experts in social media use are the users. Future research should focus on users and what works for them. Information from such studies should inspire effective social media use by organizations, and this in turn will increase the reach and impact of their public health message and contribute to close the science-practice gap [53].

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TABLE 1. Figures on social media use in the Netherlands, October 2010 [16].

