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Social Media and Public Health Research

Working Paper / Technical Report

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Preface

This working paper is a technical report of the first phase in a new research programme on social media in health and medical science communication, led by professor Thomas Söderqvist, Medical Museion.

Research assistant Nina Bjerglund Andersen has performed the survey and analysis of the social media landscape in the field of public health science. Her work was supported by a strategic grant from the Department of Public Health, University of Copenhagen.

We are grateful to hundreds of individuals, who have engaged in discussions online (and occasionally face-to-face). Special thanks to Daniel Noesgaard, Adrian Bertoli, Louise Whiteley, Adam Bencard, Karin Tybjerg, Mette Madsen and others for comments and suggestions.

True to the spirit of the basic idea of this report, many of the preliminary analyses and recommendations have been pre-published on the Public Health Science Communication 2.0 blog (http://publichealth2point0.com). We are looking forward to further critical comments and suggestions for future work – on the PHSC 2.0 blog or by means of personal communication with us.

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Abstract

Ten years after its introduction, web and mobile based social media have become an integral part of modern society. The point of departure for this report is that social media will also play an increasingly important role for public health researchers.

One obvious use of social media is for communication between scientists and the public. In contrast to traditional one-way dissemination, social media can foster a more intense, engaging and democratic discussion about public health problems between researchers, public health officers, general practitioners, and the general public.

By providing platforms for knowledge sharing and scientific discussions, social media also offers great opportunities for public health science networking. The cross-disciplinary and community-oriented features of social media make it ideally suited for informal and rapid communication among public health researchers globally. In addition, social media can also be utilised for data collection and data sharing and as a tool in public health teaching programmes.

Like all other modes of communication, social media has its advantages and problems. Its major strength – the rapid, informal and open structure of communication – also opens up for potential misuse and lack of quality control. Another perceived problem is that social media allegedly takes time away from research; however, as this report points out, social media, when properly used, can be yet another support tool for research.

The report ends with an overview of research topics that can help foster a deeper understanding of how social media can facilitate public health research and public communication.

The thrust of this report is that public health research communication goes beyond the mission and capacity of university communication departments; that science communication is a continuous component of the entire research process; and that public science communication is a task for individual researchers as well.

1. Introduction

1.1 Science communication and social media

Within the last decade, social networking sites like Facebook, LinkedIn, Wikipedia and Twitter have fundamentally changed the way people communicate and share information [1]. Approximately 900 million people around the world are active Facebook users [2]. 140 million Twitter users generate over 340 millions tweets and make more than 1.6 billion search queries daily [3]. Social media has become an integral part of modern culture.

Social media – understood as online platforms for user-generation of content, for instant distribution of information, for the establishment of networking communities and for open-access, two-way dialogue – are also gaining importance in public health. Patients are increasingly online, where they consult Wikipedia, online doctors and patient forums to get answers to their questions and discuss their own and their family's health and wellbeing [4]. Smartphone apps for the health system is a rapidly growing sector. The private health sector is using social media for marketing purposes, and the press has taken on social media as a major source for health communication [5]. Neglecting social media for public health science communication would be naïve.

In this report, we highlight some of the current uses of social media in public health research and communication. We discuss the strengths and weaknesses and make a number of recommendations for how public health departments and research institutions can implement social media in their work. Finally, we recommend a number of topics for future research that academic departments of public health can undertake in order to make use of the potential of social media.

Communication is a vital component of all scientific research [6]. The publication of research results to other specialists is a *sine qua non* for science. Communication with the public is also a key component. All universities today see communication to the wider society as one of their basic aims along research and teaching, and most research funding agencies emphasise the importance of public communication of science [7].

Public science communication in universities is often reduced to the dissemination of research results, and often left to specialised communication departments, which also have institutional branding and identity formation on their agenda. The thrust of this report is that science communication goes beyond the mission and capacity of university communication departments; that science communication is a continuous component of the entire research process; and that public science communication is a task for individual researchers as well. Researchers too need communication skills and have to learn be comfortable with using a wider spectrum of communication channels than scientific journal articles and conference/poster presentations.

1.2 An overview of social media

With social media, an additional array of communication platforms and practices has emerged to support the communication needs of individual researchers. A rapidly increasing number of research scientists are using social media to communicate their work, their results, and their work procedures [8]. Through blogs they write about their current research work, papers they have read, and other issues relevant to their academic work, including professional relation and science policy issues. They use Twitter to share news and survey new ideas [9], LinkedIn to 'market' their work and career moves, Mendeley or ResearchGate to share references and data, and Facebook to tell their friends and former colleagues that science and private life is often indistinguishable.

Table 1 summarises some of the most widely used social media platforms most relevant for public health science communication.

Table 1 – An overview of social media

Social media group	Use	Examples
Microblogging	• Short text-based posts of up to 140 characters • Often used to share links to webpages, articles and events	Twitter
Social networking sites	• Profile pages with personal descriptions and "walls" to share links, statements etc. • Readers may post comments and questions and rate the content • Users may also join common-interest user groups	Facebook, LinkedIn, Google+
Scientific social networking sites	• Social networks targeted researchers and scientists • Functionalities are similar to popular social networks, but many include e.g. data sharing services	Mendeley, Research Gate, Academia.edu
Blogs	• An internet site consisting of posts displayed in reverse chronological order • Combines text, images, and links to other webpages • Often themed on a single subject • Allow readers to comment • Derived from the words *web log*	Scienceblogs.com ResearchBlogging.org
Wikis	• Online, free-content collaborative internet encyclopaedia	Wikipedia
Media sharing services	• Services that allow the users to upload and share various media such as pictures and video • Most services have additional social features such as profiles, commenting, etc.	Flickr, YouTube, Pinterest

2. How social media are used in public health science communication

In this section, we describe different uses of social media for public health science communication with examples from university departments, public health institutions, and individual initiatives.

2.1 Research dissemination

Scientific journals, conference abstracts and posters are traditional channels through which individual researchers can disseminate their research. With social media yet another tool for disseminating research results and for drawing attention to research projects and publications has emerged.

By providing links to articles, abstracts, and PowerPoint presentations, social networking sites can help individual researchers and research groups create a wider awareness of their work. Studies have shown that using social media for marketing scientific articles can increase downloads and citations and thereby increase impact [10, 11]. Many high-impact journals are already using social media and several journals encourage their authors to explore social media for announcing their articles [12].

In principle, the university's professional communication officers could provide such linking. But in practice, this is better and more accurately done by the researchers themselves. Researchers can easily expand their already established network of peers into a larger social media-linked network. Also, the personal dimension of social media makes it better suited for sharing new articles, abstracts and poster presentations than the more anonymous mediation done by a communication officer.

In addition to sharing links and recommendations to already published articles, social media provides an opportunity to share informal background information, which cannot easily be published elsewhere. Researchers can induce a wider interest in a recently published research article by writing, for example, blog posts that reflect on the work involved or provide less formalised and more explicit first-person

comments on the research field. The blog format gives researchers an opportunity to go beyond the ritualised peer-reviewed journal format and tell 'the true story' about the project, which, in turn, can strengthen informal contacts with researchers.

Box 1 - Best practices: Social media and peer-reviewed journals

BMJ and PLoS journals

The *British Medical Journal (BMJ)* has a strong blog presence. With a total of 18 blogs in categories ranging from "Disease in Childhood" over "Tobacco control" to "Medical Ethics" several public health topics are covered [13]. Similarly, *PLoS journals* have a number of issue specific blogs and individual researchers blogs [14]. The objective of the BMJ and PLoS blogs range from providing platforms for discussion to highlighting articles from other journals. Both journals also have a strong presence on Twitter with several issue-specific Twitter accounts.

The International Public Health Journal

The *International Journal of Public Health (IJPH)* and the Swiss School of Public Health + have joined forces in running a blog [15], which aims to promote debate around current public health issues and articles published in IJPH and to bring together public health research and clinical practice. Parallel to the blog, the journal tweets about its own articles and other relevant research and runs a Facebook page.

SAGE publishing

SAGE, the world's 5th largest journal publisher, with several major public health related journals, encourages its contributors to use social media and offers guidance on how to use different kinds of social media for dissemination and marketing [12]. SAGE is of course also on Twitter and Facebook.

Wikipedia, a collaboratively written web-based encyclopaedia, is one of the most used sources of information online. It is usually among the top results of search engine queries, also when it comes to seeking medical information [16]. By contributing new research results to existing or new Wikipedia articles, with links to the original sources, researchers have an opportunity to disseminate their research to other professionals [12].

Box 2 - Best practices: Wikipedia and health

Wikiproject Medicine
Wikiproject Medicine is an initiative to encourage medical researchers to share their knowledge and contribute to creating a comprehensive medical encyclopaedia. The project is a response to the fact that many clinicians due to time constraints turn to quick sources like Wikipedia to quickly access evidenced based information [17]. From the contributors' perspective this can help increase awareness of research findings and increase citations.

Flue Wiki Forum
Flue Wiki Forum was established in response to the H1N1 epidemic. By pooling and sharing knowledge form experts in the field it is the objective to help local communities prepare for and perhaps cope with a possible influenza pandemic [18].

2.2 Scientific discussions and networking

The open and two-way-communication-based characteristics of social media make them excellent tools for public health researchers to discuss their field with colleagues. Different social media platforms offer different options for communication and it is often a matter of personal preference which social media is the most appropriate.

Depending on preferences and skills, *blogs* can be shaped to fit the needs of the individual researcher. There are no rules for what can go on a blog. Reflections, background stories to a research project, questions to or comments on others' research are examples of what science blogs are used for. One of the advantages of the blog format is that immediate responses from other researchers or public health practitioners. Blogs can also be used a research diaries and as extended CVs to explain how one's work has developed over time [19, 20].

Box 3 - Best practices: Science blogging

RRResearch
Rosie Redfield, an associate professor at the University of British Colombia, Canada has since 2006 been running the blog *RRResearch* where she writes about her research and what goes on in the lab as she tries to understand how and why bacteria take up DNA [21]. The blog has become one of the most well known examples on how social media can impact on scientific discussions among academics.

The Pump Handle
The Pump Handle is a blog run by two public health university researchers. Blog content is primarily recent news within their research field (environmental and occupational health). The blog is part of Scienceblogs.com — a network of more than 130 science blogs on topics ranging from biology to medicine to the environment [22].

Cancer Research UK – Science Update Blog
Cancer Research UK – Science Update Blog is run by the UK Cancer research charity. It covers the latest cancer research including that funded by the charity. The objective is to share knowledge, debunking myths and media scares, and providing links to other helpful resources [23]. The blog is one of the highest-ranking health blogs and also part of Scienceblogs.com.

Aggregated science blogs
Researchblogging.org is a so-called blog aggregator that collects posts from several different blogs, but limited to blogs about serious peer-reviewed research [24].

Within the last couple of years, *micro-blogging*, especially Twitter, has become an important social media for research dialogue and discussion. Formalised discussion forums, such as journal clubs or groups with moderators, are examples of the use of Twitter for public health science communication. The forums are usually assigned special hash-tags (#) and all interested are free to join the discussion. The advantage of these discussions forums is that they allow for people to connect despite different geographical location or institutional affiliation. In addition to the scientific discussion, micro-blogging is instrumental in expanding networks, in identifying relevant contacts and potential cooperation partners, and in crowd-sourcing ideas of information [25].

Twitter is also becoming an increasingly common tool in conferences and seminars. It is used both for *live-tweeting* about what happens at the conference and for parallel discussions which both attendees and non-attendees can participate in. Using Twitter in conferences greatly enhances networking and enables the attendees to establish contact to many more people than usual. The Twitter stream can also function as a tool for referring back to the conference afterwards. Several services, such as Storify [26], have been developed to aggregate tweets so that they are available also after the conference or discussion is over.

Box 4 - Best practices: Scientific discussions on Twitter

Public Health Twitter Journal Club
In public health sciences, an example of the use of Twitter for scientific discussions is the *Public Health Twitter Journal Club*. Building on the format and objective of a traditional journal club it uses a 'Twitter chat' as its platform to discuss public health related articles in peer-reviewed journals. The discussions are time-limited and hosted by a moderator [27].

13th World Congress on Public Health
During the *13th World Congress on Public Health* in Addis Ababa, Ethiopia in April 2012 [28] Twitter was an integrated element of the conference. Through the assigned hash-tag #13wcph a parallel discussion took place with the active involvement of both attendees and non-attendees at the conference. Relevant links were shared and questions asked.

2.3 Engaging the public

The widespread distribution of social media to all corners of the world and all segments of society make them useful for engaging the broader public in public health sciences. Using social media platforms such as Facebook provide the opportunity for, e.g., public health research institutions and the individual researcher to reach audiences outside the research community, which do not necessarily read scientific articles or attend conferences or at difficult to reach for geographical reasons. Institutional Facebook pages can be used to share health-related research of relevance to the public, but also to give the public a chance to respond and asking questions. Especially on the North American subcontinent are there several examples of public health

institutions that successfully communicate public health sciences through social media [29].

Box 5 - Best practices: Public Health Institutions on social media

Centers for Disease Control and Prevention (CDC)
The Centers for Disease Control and Prevention are very active users of social networks. Through Twitter, YouTube and Facebook they share recent research, gives advice on current public health matters and enter into dialogue with the population. The CDC also run a number of blogs, for example Public Health Matters, which focuses on current topics in preventing and controlling infectious diseases [29].

ECDC experts blog on immunization in EU
The European Centers for Disease Control and Prevention (ECDC) have used blogs as part of the European Immunization week. Here a selection of vaccine-preventable disease experts blog about different aspects and challenges of immunization in the EU [30].

Another way to connect with the public is by rethinking the standard newsletter genre. The ubiquitous newsletter is based on a one-way dissemination approach. Social media, on the other hand, open up for new ways to share news from the scientific world. Using a blog format it becomes possible to interact with the readers and to share news when they are new and not when the next newsletter is set for publication. Several heads of schools of public health have embraced the blog format and now run official blogs where they share the latest news from the department or reflect on present events. In addition, many North American universities rely heavily on Facebook pages, Twitter and YouTube accounts to share news of recent publications, new research projects etc.

Box 6 - Best practices: Universities on social media

A blogging dean
Professor Antoine Flahaut, dean of the French *Ecole des Hautes Etudes en Santé Publique* runs the blog Antoine Flahaut's blog under the umbrella of the University. The blog reflects different aspects of public health, which Antoine Flahaut encounters both as Dean and as a public health professional. The posts are comments to current publications and events, they encourage discussions and provide an indirect window into where the Dean believes a school of public health should be heading [31].

Johns Hopkins Bloomberg School of Public Health on Facebook
Johns Hopkins School of Public Health shares news via an open Facebook page. It includes advertisement of new initiatives, promotion of recent reports and research findings. Also, stories from the press considered relevant to public health science are shared, inviting readers to express their views or reactions in comments [32]. The school also has a strong presence on Twitter and YouTube.

2.4 Academic teaching

Communicating science to public health students presents another aspect of public health science communication. Because of its flexibility and diversity there are several opportunities to integrate social media into academic teaching. Twitter has been used during lectures for larger groups of people as a way to facilitate discussions and reflection among the students [33]. Several universities have also started experimenting with using blogs to give assignments and encourage scientific discussion among the students [34]. Finally, social media have been used to strengthen student's science communication skills [35].

Box 7 - Best practices: Blogging and tweeting in the classroom

Twitter during lectures
At Ecole des Hautes Etudes en Santé Publique professor and Dean Antoine Flahaut have experimented with using used Twitter in his lectures in epidemiology. By inviting his students to tweet and comment during the lectures he has encouraged more active participation [33].

Student blogs
The University of Michigan's School of Public Health have successfully used the Mind the Science Gap blog to develop the students' communication skills and abilities to translate research to a broader audience.The students blog about areas of interest within public health and receive feedback from their readers, both on content and form and have received comments from interested parties, experienced bloggers etc. [34].

Assessment of student performance
At University of British Colombia's School of Population and Public Health social media is used to assess the students performance. This includes students demonstrating skills in using Twitter, blogs and Wikipedia for public health science purposes [35].

2.5 Research and data collection

In addition to its function as a dissemination and communication tool, social media may also be used in the research process. Especially in a data-oriented field like public health sciences have social media proven useful for data collection [36]. Through social media, the public is producing data about their health and wellbeing, which, if handled correctly, can be useful for public health research. For example, data gathering through social networking sites like Facebook and Twitter can be used in epidemiological studies of influenzas [37], while blogs and discussion forum provides arenas for qualitative research, e.g. patient networks etc. [36].

Using social media as a site for data collection may (if relevant for the particular research study) be closely combined with communication of the research, either with the informants or with fellow researchers.

Box 8 - Best practices: Twitter used in epidemiological studies

Epidemiological research
Alessio Signorini and colleagues examined the use of information embedded in the Twitter stream to track rapidly evolving public sentiment with respect to H1N1 (swine flu), and to track and measure actual disease activity. The results showed that estimates of influenza-like illness derived from Twitter chatter accurately could track reported disease levels [37].

Qualitative research
Natalie Armstrong and colleague used online peer-to-peer discussions in a UK-based diabetes 'Virtual Clinic' online community. Through the analysis of data from the discussions they tried to understand the rhetorical nature and content of exchanges over a period of six months from the community's inception [38].

3. Discussion

In this section we discuss some of the strengths and weaknesses of social media for public health science communication.

3.1 Strengths

In comparison with traditional media, social media are characterised by a number of features, which make them specifically useful for public health science communication. Some of these features relate to key functionalities of social media, such as openness, flexibility and open, two-way communication and to a number of shared characteristics between public health sciences and social media.

3.1.1 Empowering the researcher to communicate

Social media set no rules for who can communicate, and thereby give scientists the opportunity to become communicators independently of journalists or university communication officers. Social media can provide new opportunities for the researchers to connect with audiences outside their own fields, especially in relation to non-research communities, where professional communicators traditionally have handled the communication.

Also in exchanging knowledge with other researchers does social media provide an empowering platform which lets scientists be in control of their communication and put their knowledge into play with the larger society. Empowering the researcher in this respect may lower the risk of potential conflicts between communication officers and scientists when research findings are translated into press releases. In addition, science communication through social media typically adds a personal dimension to the communication and opens up for establishing a direct relationship between scientist and lay audiences to the benefit of both and ultimately also to the outcome of the research.

3.1.2 Open, two-way communication

In comparison with journals and reports, social media gives researchers the opportunity to connect and interact directly with the reader or listener. Similar to what happens at conferences, the audience (whether academics, public health practitioners or general public) can ask questions directly to the scientist, and comment or express their views

– and the scientist can respond directly. The comment function on bligs and *re-tweeting* (forwarding tweets) on Twitter are examples of this open, two-way communication principle. Seen from a theoretical science communication point of view, these features make social media a central platform for moving science communication from being a response to the public's deficit of scientific knowledge to a dialogue-based communication of science.

3.1.3 Network building

The use of social media multiplies the opportunities for researchers to interact with colleagues, other scientists, and the public in ways that widens the traditional meeting/workshop/conference framework. Just like attending conferences is beneficial for extending and sustaining scientific networks, the same goes for social media. In contrast to physical meetings and conferences, however, networking through social media can be continuous, and the network is potentially much bigger and isn't limited to those who have the time or the means to travel. Thus social media help researchers overcome geographical and institutional isolation.

3.1.4 Flexible and free

Social media are flexible. Users create content and new functionalities are continuously developed in response to user demands. Blogs can easily be customised to meet the requirements of individual users. Wikipedia postings are continuously updated with new information. Social media's flexibility in regard to language settings may also be beneficial for science communication; information can easily be made available in multiple languages and adjusted to the characteristics of the relevant target group. This makes social media a useful tool in a globalised world of science where contributions from the new economies is increasingly important.

In addition, most social media platforms so far incur no cost, neither for the researchers and their research institutions nor for the readers. In comparison with traditional media outlets, like journals, social media make science easily accessible to wider audiences. The low-cost aspect of social media also makes it an excellent tool when collaborating with researchers in low-resource institutional settings.

3.1.5 Rapid distribution

Publishing in scientific journals can be a long and time-consuming process, which means that when the study is eventually published, other researchers may already have entered the field and data may even be out-dated. Social media allow for much more rapid distribution of results. Immediate comments, reactions and contributions from colleagues and other recipient audiences during the research process can contribute positively to the research process. In addition, the timely sharing of generated knowledge, new findings and ideas can quickly be spread to the relevant audiences and stakeholders and is not dependent on time-consuming clearing processes.

3.1.6 Community-oriented

Social media and public health both have people and communities as a cornerstone. Public health is about people. It's about observing and asking them, collecting data about them, comparing and testing them, exchanging information etc. It is through the aggregated contribution of each individual that general health trends and patterns in larger communities are developed, discovered and responded to.

Social media is also about people. It's about large-scale exchanges of information between people, about communities and individuals' relation to communities, about large population groups, subgroups, trends, patterns and interactions. Its content is generated and owned (at least in theory) by the public. This bottom-up, decentralised structure means that social media provide arenas for all segments of the public, and that through the combined input and contribution from each individual, general trends and patterns are developed.

The central role of the community in both public health and social media make the two intuitively compatible for communicating science. Social media can act as a tool to connect different communities (e.g. research communities with health practitioners, patients, students and general citizens) and as a tool for the communication of public health research to these communities.

3.1.7 Interdisciplinary

Public health science is an interdisciplinary science. It draws upon research from fields as different as biostatistics, epidemiology, sociology, psychology, economics, medicine, pharmacology and several

others disciplines and is dependent on effective communication between researcher and actors within and between disciplines.

Similarly, social media go beyond disciplines, beyond communities, sectors and countries. It is not limited or defined according to a single discipline and segment. Rather, its flexibility implies that each medium can be adjusted to the individual's or project's preferences and needs, and thus easily reach across disciplines.

The interdisciplinary profile of public health sciences and the interaction with non-research oriented communities puts high demands on effective communication between researchers and between researchers and public health practioners. Social media provide a tool for developing such cross-cutting communication platform.

3.1.8 Data oriented

Public health research is a data-oriented discipline. The collection, analysis and description of qualitative and quantitative data characterise much research in public health. Furthermore, the heavy reliance of public health research on quantitative statistical techniques emphasises representative samples and datasets.

Social media is essentially all about data. Through interaction, communication and sharing of information, it constitutes one big collection of data, divided into many sub-collections. It is through the broadness and amount of data that trends and patterns are identified and information is spread. It can sometimes even go viral (a good old health-related word!) and information and data is spread with exponential speed.

Due to their focus on data, public health researchers are highly dependent on and trained in using information and communication technologies (ICT). The exact same tools are the cornerstone of social media. Introducing social media into public health sciences is thus not an entirely foreign element, but an extended use of already familiar tools. The common central role of data and ICT in public health research and social media makes the two intuitively compatible. For example, social media can be instrumental in hypothesis generation, and even integrated in some qualitative and quantitative studies (e.g. surveillance studies) if relevant for the particular area of research.

3.2 Weaknesses

Despite several strengths of social media for science communication, they also have weaknesses. If acknowledged and addressed most of the weaknesses described below can probably be overcome without diminishing the relevance of social media for public health science communication.

3.2.1 Lack of control?

Opening up science for others to comment on also opens up for potential criticism. Due to its interactive nature, social media are prone to several negative effects, such as scooping of research findings, false accusations, and irrelevant (or perhaps harmful) communication and criticism of the researchers or their work. For these reasons many research institutions have social media policies setting out rules for what kind of media can be used, by whom, and for which purposes. Some of these policies are quite strict and leaves it to the communication departments to be in control of what is sent out via social media. Avoiding situations of scooping or misconduct on social media depends primarily on the users' knowledge of the media and their responsible behaviour when using it for professional purposes. This requires proper guidance and introduction on how to use it.

The open nature of social media can however also be of benefit to research. It opens up not only for the researcher to be criticised, but also for the researchers themselves to criticise and respond to critic. Social media can enhance the transparency of research and help document how the issues were addressed and taken into consideration.

3.2.2 No formalised peer-review

Unlike traditional scientific journals, social media have so far not used formal peer-review. The democratic nature and the rapid distribution means that incorrect knowledge can be produced and shared and claimed to be scientific findings by everyone. It can be difficult for the reader to assess the scientific quality of the content. The lack of formal peer-review doesn't mean that peer-review is absent from the sphere of social media. Researchers can comment on and criticise each others' work, and thereby provide fast and publicly available critique. Post-peer-review is already a common phenomenon on many traditional scientific journal websites.

3.2.3 A waste of time?

The prospect of using social media in daily research practice gives rise to worries among many researchers and scientists. Social media is often considered a very time-consuming activity, which drowns the researcher in insignificant streams of information. It is true that getting acquainted with social media for scientific purposes and building up an online presence and network requires time, especially in the beginning. The fear of wasting precious time for research is also enforced by an anxiety that engagement in social media on the work-place can be judged by superiours as irrelevant and non-scientific behaviour.

Proper introduction and basic training in using social media for academic purposes could overcome such fears. Ultimately, social media can potentially save time; for example following a conference through Twitter rather than being physically present saves both time and money.

3.2.4 Removing focus from science?

Few people would be outraged by a scientific discussion among mathematicians, but public health is a different story. Like in the social sciences, public health research is done in a political and social context where values, opinions, and ethical considerations play a major role. In addition, health and well-being is relevant to all people, not only medical specialists, and laypeople often have strong opinions and personal feelings about health issue. Public health research findings can easily turn into public debates influenced by various stakeholders and non-scientific arguments. Social media provide platforms for such debates and invite all segments of the population to participate. Such debates can be time-consuming, which is problematic, both politically and scientifically, and in the end they will benefit neither the scientific process nor the researcher. The use of social media also raises questions about how to deal with individual comments from vulnerable people (for example, severely ill patients and relatives).

It is important, however, to remember that (whether the researchers like it or not) social media is used by the public to discuss health and if the scientists' perspective is not present in social media, then others will be. And just as social media invite non-scientists to express their views and knowledge, so do they allow scientists to contribute and correct misunderstandings and misconceptions and to get in touch with the population, which they study or aim to help. Proper editing and

management, for example approving comments before they are posted online, may overcome many of these weaknesses.

3.3 Summary of strengths and weaknesses

Using the principles of a classic SWOT (strengths, weaknesses, opportunities and threats) analysis, table 2 provides an overview of strengths, weaknesses, threats and opportunities in social media for public health science communication.

Table 2 – Strengths, weaknesses, opportunities and threats of social media for public health science communication

Strengths	**Weaknesses**
• Community oriented • Interdisciplinary • Data-oriented • Open two-way communication • Free • Flexible • Fast distribution • Wide audience • Based on familiar tools for PH researchers (ICT)	• Lack of control • Open to misuse • No formalised peer-review • Time consuming (requires capacity building)
Opportunities	**Threats**
• Research dissemination and increase impact of scientific articles and reports • Expansion of academic networks • Collaboration with non-scientific communities • Parallel discussions at conferences • Engagement of the public in sciences • Empowers researchers to communicate • Transparency of research • Document research processes	• Exposure to criticism • Risk of non-productive discussions • Perception by peers as non-scientific • Confrontation of past statements

4. Recommendations

An increasing number of universities are using social media for science communication. Especially North American schools and departments of public health sciences have integrated social media into their communication practices. The implementation of social media in research environments has been slower in Europe. In this section we present some general practical recommendations for how social media can be integrated into a public health research and teaching institution.

4.1 Improve science communication teaching at the undergraduate and graduate levels

Undergraduate and graduate courses
Offer undergraduate and graduate courses in public health science communication to introduce the central importance of communication in public health research and to give students knowledge of and practical skills in mastering different communication practices, including social media.

Bachelor and Master's theses
Integrate a required communication element in the requirements for bachelor and master's thesis of public health science. The students should be required to reflect on and give suggestions of how their thesis could be communicated to relevant audiences, including professional and lay groups.

4.2 Integrate social media in peer-to-peer communication

From discontinuous newsletter to continuous blog format
Replace the department/school's newsletter to a blog-based news portal, perhaps supported by a monthly aggregated version distributed through email. This will enable continuous communication and will provide an opportunity for researchers in other department and universities to comment, raise questions and interact.

Supportive environment

Create a supportive and explorative environment around the use of social media for science communication. This could include:

- Offer the staff courses and introductions to social media for academic use and provide technical support.
- Make a 'package guide' of already available instructions for the use of social media in public health sciences available to the staff
- express support and encourage the establishment of social media-based research activites, like Twitter journal clubs for Ph.D. students (perhaps in collaboration with other universities)
- establish a shared blog for heads of department and institute, to discuss current affairs in public health, research findings, etc.

4.3 Integrate social media in external communication

Social media presence on major social networks
Assess which social networking platforms would be most relevant for the department/school to be present on and develop a strategy for how it can be used. Encourage all staff to contribute to its content (e.g. share links to articles they find interesting, recommend conferences, advertise upcoming seminars).

Promote and support the use of Twitter as a backchannel in conferences and seminars and create common hashtags (#)for individual researchers / research groups / department.

Social media on the agenda
Put science communication and social media on the agenda when planning the coming year's activities. Plan introductions to staff how social media can be used in public health research and everyday communication.

5. Further research possibilities

In this section we present some preliminary suggestions for further research regarding public health science communication and social media.

How does social media bridge public health research and practice?

Much public health research is done in close collaboration between public health scientists in universities and public health practitioners; the precondition for this collaboration is efficient communication between researchers and practitioners, both in the research process and in the implementation of the findings.

→ *Research questions:*

- *How are social media used to overcome the challenges of 'translating' science into practice and practice into science?*
- *Which are the barriers against using social media among public health scientists and practitioners respectively?*
- *How are social media used for developing a shared professional language and shared experiences for evidence-based health promotion?*

How does social media contribute to epidemiological science communication?

Social media and epidemiology share many characteristics. The focus on data, trends and patterns makes social media a relevant tool for both data collection and for communicating epidemiological research, both for the communication between epidemiologist, with researcher from other fields and policy makers and with the general public.

→ *Research questions:*

- *What is the current use of social media within epidemiology? What are the experiences and best practices?*
- *Which measures can be used to evaluate the contribution of social media to epidemiological studies?*
- *Does the use of social media for collecting epidemiological data contribute to the public communication of epidemiology?*

- *Does social media contribute to multidisciplinarity in epidemiology?*

Communicating public health sciences in the making

A majority of public health research represented in the media is focused on results and findings, which is often simplified to short descriptions of the relation between an exposure and an effect. However, most public health problems are multicausal, and the dissemination of this insight to the public is important. Communicating how public health science is actually done (in-the-making), could help broaden the understanding of health risks and benefits.

→ *Research questions:*

- *How are social media used to communicate public health research in-the-making?*
- *Does the communication of the researcher's doubts and uncertainties (explorative questions, what one doesn't know etc.) make the public more engaged in public health science?*

Social media and public health risk communication

Much research in public health results in the identification of risk factors for disease. Often the conclusions are multicausal and associated with several uncertainties. Explaining multicausality, risk calculation and the uncertainties involved is a big challenge for public health communication. Discussions of health risks are already taking place on social media (e.g., in the widespread debate on vaccine safety), but the public health research community rarely participates actively. Social media could be a potent tool for addressing myths and misconceptions concerning health risks.

→ *Research questions:*

- *What are the barriers for the participation of public health researchers in public discussions about risk?*
- *How does social media increase / decrease myth and misconceptions about vaccine safety?*

The use of social media in European public health institutions

Whereas the Center for Disease Control and Prevention (CDC) has established a big online presence and integrated social media in their communication with the public, public health institutions in most

European countries have not yet taken on social media as part of their science communication strategy on broader scale.

→ *Research questions:*

- *How are social media used by public health institutions in the European countries to communicate public health messages?*
- *What role do public health researchers play in this communication?*

Social media as a research tool in public health sciences

Social media is already being used for epidemiological research (e.g. influenza studies), but also qualitative research is being conducted using social media. Public health research collected through social media (either through intervention or as pure observation) could be a new potential platform for data collection.

→ *Research questions:*

- *To what extent is social media already used for data collection in public health research?*
- *What are the constraints on combining social media with science communication?*

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