

Social media and sexual health – New arenas for information on sexually transmitted infections and promotion of healthy sexual behavior

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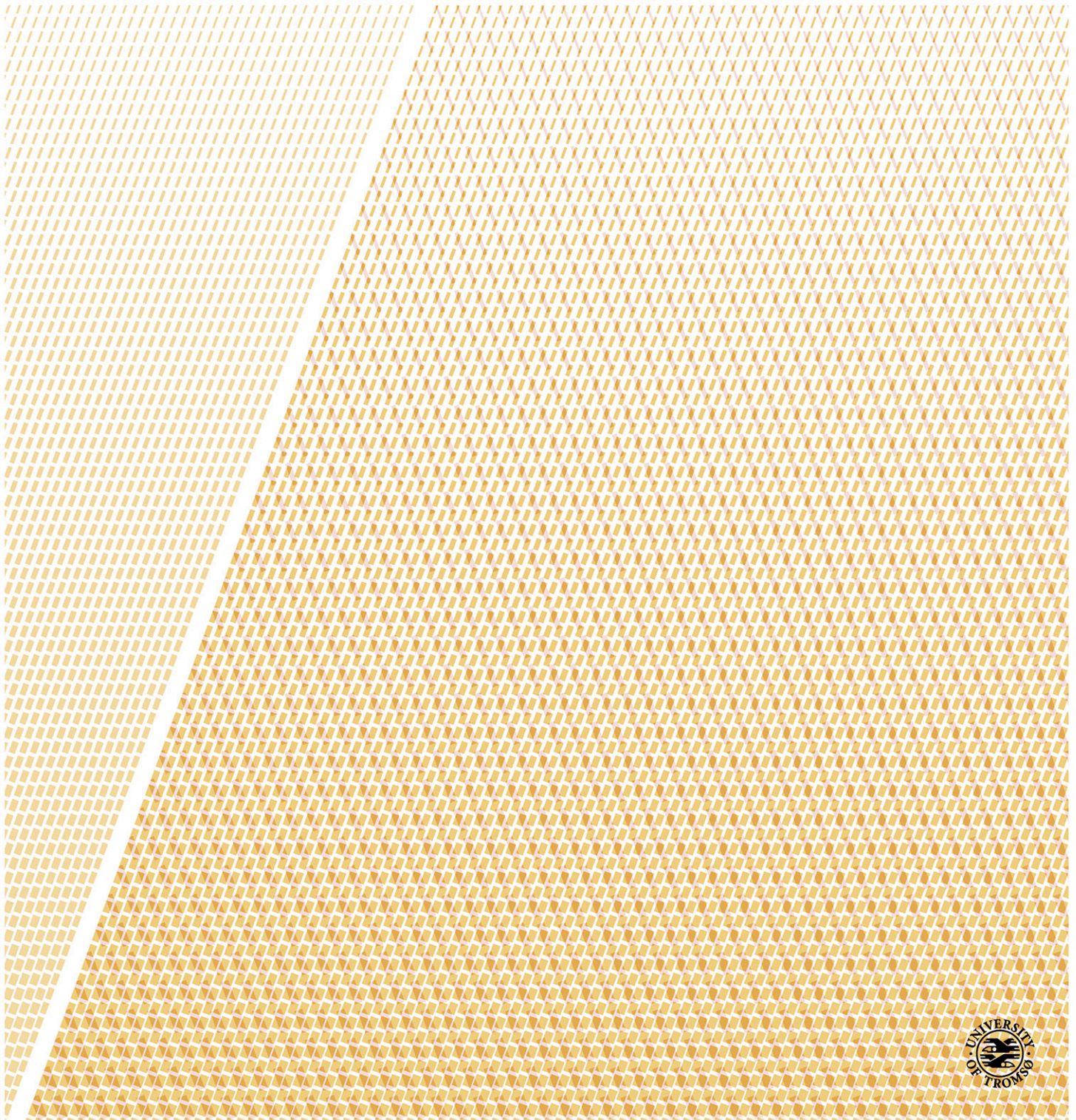


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Summary

Objectives

The objectives of this thesis are to investigate the use of social media for health promotion dealing with sexually transmitted infections, their value for improving health and increasing the promotion reach, and to provide examples on how social media users retrieve information about sexually- transmitted infections from these media. I want to investigate the nature of the information in a sample of messages that are shared on social media about sexually transmitted infections, the actors involved, and the patterns of online sexual health information-seeking.

Methods

The objectives were addressed in four separate studies, which used different methodologies: a scoping review, an intervention case study, and two observational studies.

Results

In the review it can be seen that the evidence supporting the use of social media for sexual health promotion is still insufficient. There are few publications with strong study designs using social media for this purpose; however, promising results regarding increasing promotion reach and improving health are found. The intervention case study is an example of how online social media can be used for promoting educational sites on sexual health.

In one of the observational studies it can be seen how online social media users tweet about sexually transmitted infections, and that information posted online spreads rapidly, reaching a huge number of people. The other study shows that people search for information about sexually- transmitted infections, and that searches for this information on social media appears to follow a weekly pattern.

Conclusions

Although more studies of higher quality are needed before stronger claims can be made, the research literature and the results of the present investigation suggest that social media might be relevant resources for sexual health promotion and education purposes. The observation of behaviours on social media offers the possibility of identifying sexual health concerns, interests, misinformation, attitudes, or information-seeking patterns in an online community, with the possibility of using this information for subsequent health promotion purposes.

The widespread acceptance of online social media, their potential for reaching a huge number of people in a very short time, and users' interest in sexual health topics, suggest that these networks can be valuable in promoting sexual health.

List of articles

- Paper 1. Gabarron E, Wynn R. Use of social media for sexual health promotion; a scoping review. *Global Health Action* 2016;9:32193.
- Paper 2. Gabarron E, Fernández-Luque L, Schopf T, Lau AYS, Armayones M, Wynn R, Serrano JA. Impact of Facebook ads for sexual health promotion via an educational web app: A case study. Submitted to *International Journal of E-Health and Medical Communications*; Under review
- Paper 3. Gabarron E, Serrano JA, Wynn R, Lau AYS. Tweet content related to sexually transmitted diseases: No joking matter. *J Med Internet Res* 2014;16(10):e228.
- Paper 4. Gabarron E, Lau AYS, Wynn R. Is there a weekly pattern for Health Searches on Wikipedia and Is the Pattern Unique to Health Topics? *J Med Internet Res* 2015;17(12):e286.

Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
CI	Confidence Interval
HIV	Human Immunodeficiency Virus
HPV	Human Papillomavirus
ICT	Information and Communication Technologies
IT	Information Technologies
LGBT	Lesbian, Gay, Bisexual, and/or Transgender
MSM	Men who have sex with men
QR code	Quick Response code
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection

Introduction

1. Sexually transmitted infections

Sexually transmitted infections (STIs) are considered a global epidemic (1), and a major public health problem (2). The World Health Organization estimates that there are 357 millions of new cases of curable STIs every year worldwide, or almost 1 million new infections every day, among people aged between 15 and 49 years (3). Chlamydia, trichomoniasis, gonorrhoea, and syphilis are the more prevalent curable STIs (1, 3). In 2012, it was estimated that there was between 128 and 130 million cases of chlamydia worldwide (1, 4), 63% of these cases were located in the Western Pacific region and the Americas (1). Trichomoniasis could affect from 55 to 101 million people worldwide (1, 4); 78% of all these cases could be in the Western Pacific region, Africa, and the Americas (1). Between 27 and 74 million people could be infected with gonorrhoea (1, 4), about 58% of these cases would be in South-East Asia and the Western Pacific region (1). And syphilis would affect about 18 million of people worldwide, 42% of them living in Africa (1).

The prevalence of viral STIs seems to be even higher. In 2012, it was estimated that 417 million people were infected with herpes simplex type 2 (3); 291 million women were infected with HPV (3); and in 2014 there were about 37 million people living with HIV (5). Over 95% of people infected with HIV live in the developing countries, and about two-thirds of these live in sub-Saharan Africa (6).

STIs have an intense impact for the affected people, and it represents a high burden for society in general (3, 4). For example, syphilis is considered one of the main causes of fetal and neonatal deaths worldwide (7) and increases the risk of early death (3). *Trichomonas vaginalis* in pregnancy is related to a higher risk of preterm births (3, 8). HPV is the cause of 530,000 cervical cancer cases, and 264,000 deaths every year (3). Gonorrhoea and chlamydia are main causes of infertility worldwide (3). STIs co-infections are common, and the presence of a STI increases by two or three times the risk of acquiring HIV (3).

Primary, secondary and tertiary preventive measures have been pointed out as essential in order to reduce morbidity and mortality related to STIs, prevent serious complications, adverse pregnancy outcomes, and reduce HIV infection (2). Within these preventive measures, the need for educating and empowering people about sexual health, aiming to change behaviour, is emphasized (2). Health promotion is defined by the World Health Organization as *“the process of enabling people to increase control over, and to improve, their health”* (9). In the sexual health field, health promotion aims to raise STIs awareness, strengthen safer sexual behaviour, and increase early health-seeking behaviour (2). Different theories, models or frameworks can be considered for sexual health education and sexual health promotion.

2. Health promotion and STIs prevention theories, models and approaches

Several theories, models, frameworks and approaches have been the basis for sexual health education programs and interventions on STIs prevention (10-12). Some of the most cited approaches that have been linked with positive effects within the sexual health promotion field are: the Social Marketing approach (13); the Peer education or Peer-delivered intervention model (14, 15); the Transtheoretical model (16, 17); Social Cognitive theory (18); Kelly's Popular Opinion Leader model (19-22); and Pender's Health Promotion Model (23-25), among others.

The Social Marketing approach involves the use of commercial and marketing techniques to promote public health (13, 26-28). The idea of broadening marketing techniques to the health arena was proposed by Kotler and Levy in 1969 (28). Under this approach, the recipient of the health promotion intervention is viewed as the consumer, therefore all the techniques aim at targeting their needs, wishes, and perceived barriers (11, 13, 26, 28). Social marketing interventions promote voluntary behaviour change through persuasion, and the main components of this model are known as the "5 p": 1) Price (i.e., if is easy to access for the customers); 2) Product, refers to the aims of the promotion intervention (i.e., using condoms); 3) Place or channel used for the promotion; 4) Promotion, that includes educational materials, publicity or any action to catch the attention of customers and persuade customers; and 5) Placement, referring to the place where the product, in this case, the aims of the promotion, will occupy under the recipients' eyes when it will be compared to previous knowledge (i.e., using condoms will be perceived as better strategy to prevent STIs) (11, 13, 26, 28). Review studies have reported that health promotion interventions drawing on the Social marketing approach have had a significant impact on STIs testing uptake (29, 30).

Peer education or Peer-delivered intervention is another relevant approach that has been used for health promotion (14, 15). The concept of peer education is not linked to a unique theory (14). The idea of peer education has been coined by several authors from the 80's (31). The basic assumption of peer education is that a small group of peer representatives can inform and influence a bigger group (14, 15). Peer education interventions have been positioned as successful approaches for STIs risk reduction (32, 33). Peer-delivered interventions for sexual health education and STIs prevention through social media have also reported positive results (34-36).

The Transtheoretical model was proposed by Prochaska and Diclemente at the beginning of the 80's (16, 17). The main idea of this model is that behaviour can cross through five different phases: 1) Precontemplation; referring to the period when the individual is not aware that there is a problem or issue he or she should care about, therefore the individual has no intentions of changing that behaviour within the next 6 months; 2) the Contemplation phase would be the point when the individual starts getting aware of potential sexual health risks. Although a decision on changing behaviour still has not been taken, this could happen within the next 6 months; 3) the Preparation phase occurs when the individual decides to do something to deal with the potential sexual health issue. It is expected that individuals in this phase will start changing behaviour within the next 30 days; 4) the Action phase is when the individual does what he or she decided in the previous phase. The Action phase lasts

about 6 months; and 5) the Maintenance phase occurs when the new behaviour has been performed for over 6 months, therefore it can be considered that the behaviour is established, and it has become a habit. In addition to the phases of change, the model recognizes other factors influencing a behaviour change (i.e., motivation; levels of change; individuals' decision balance; and individuals' assessment of their own self-confidence or self-efficacy) (16, 17). Due to the different phases in which an individual can be, the authors of this model suggest tailoring interventions aiming at changing behaviour. Studies based on this model have reported positive results regarding increases in use of condoms and STIs testing (37-41).

The Social Cognitive Theory was published by Bandura in 1986 (18). This theory explains the processes to acquire behaviours and to maintain these behaviours. Behaviour change depends on behaviour in itself, but also on environmental factors, and personal factors (cognitive, affective and biological events). Self-efficacy is considered one of the main factors affecting health behaviour change (10-12, 18). Social Cognitive Theory suggests strategies for increasing self-efficacy, such as goal setting, behavioural contract, or self-monitoring of behaviour, among others (10-12, 18). Further personal factors considered in this theory are capabilities, expectations, expectancies, observational learning, reinforcements, and emotional coping responses, etc. Health promotion interventions based on Social cognitive theory seem promising for sexual health promotion. A systematic review of studies promoting condom use among sex workers based on Social cognitive theory reported significantly reduced STIs incidences (42).

Another remarkable approach used for sexual health promotion and STIs prevention has been Kelly's Popular Opinion Leader model. This theory-based approach, specifically developed for HIV risk reduction, was published in 1991 (19-22). The main idea is that popular opinion leaders of specific groups or populations can serve as behaviour change endorsers (20). This approach has been tested for sexual health interventions delivered through online social media, and has obtained positive results regarding increases in intention to test, and to use condoms (43).

A descendant of Social cognitive theory is Pender's Health Promotion Model. This model, developed at the end of the eighties and revised in 1996 (23-25), identifies complex biopsychological processes that interact with the environment and motivate individuals to improve their health and quality of life. Health promotion aims directly at improving well-being and quality of life, and assisting clients to achieve a healthy lifestyle (24). Pender's model has been the foundation of a social media intervention aimed at reducing chlamydia rates that reported positive results (44).

Some of these models, theories or approaches have already been considered for sexual health education or sexual health promotion interventions carried out through new information and communication technologies (ICTs).

3. STIs information on the Internet and ICTs

The Internet and the ICTs are now pervasive and ubiquitous. By the end of 2015, the Internet had been used by 3.2 billion people, 2 billion of them from developing

countries (45). In developed countries, such as the United States of America, or the United Kingdom, about 84%-86% of adults have already adopted these technologies (46, 47), and 92% of teens use them every day (24% declare being online almost constantly) (48). In developing countries, it has been estimated that between 35.3% and 44% of the population have Internet access (45, 49), and 66% of these users go online daily (49). The percentage of households with any kind of Internet access was 81.3% and 34.1% for developed and developing countries respectively (45). The percentage of mobile broadband subscriptions is even higher, being 86.7% in developed countries, and 39.1% in developing nations (45). Smartphones are becoming increasingly important for Internet access, especially in many developing countries (50-52).

Nowadays, with the advent of the Internet and the ICTs, citizens are exposed to enormous amounts of all kind of information, including health information. Some of these new technologies have been specifically designed for health purposes, and provide reliable information (53). These technologies have helped to increase health awareness, patient safety, and have become key for patients' and health consumers' empowerment (53). Besides, its users find it natural to communicate through them to get support (54). These technologies have also been used for sexual health promotion, and their benefits have been demonstrated in various meta-analyses (55-58) and systematic reviews (59-63). We have identified only one meta-analysis assessing the use of digital games for sexual health promotion that did not find significant effects on behaviour (64). Interventions using computer-based technologies to promote sexual health have mostly proved to significantly increase condom use rates (55-58); increase STI testing rates (55, 62, 63); augment sexual health knowledge (57, 59-61) and safer-sex intentions (59, 60) and reduce sexual risk behaviour (59, 60, 62). Behaviour changes have been observed regarding the frequency of sexual behaviour, number of partners, and incidence of sexually transmitted diseases (56). The most recent meta-analysis also suggested that computer-based technologies are more effective when they include interactive components, such as social media (55). However, is not yet clear how this interactivity of social media can be used to enhance the benefits of sexual health promotions.

4. Use of social media for sexual health promotion

The social media are continuously evolving and several definitions are used. However, it is generally accepted that social media refers to democratized web-based or Internet-based services that allow their users to generate contents (65), to create a profile, and to connect and interact with other users (65-67). Social media include online networking platforms such as Facebook, YouTube, Instagram and other file-sharing sites; blogs and microblogging (i.e., Twitter); and wikis (i.e., Wikipedia) (68).

The history of online social media probably started in 1997, when SixDegrees.com was launched. This site was created by an American private company, and reached 3.5 million registered members by 1999 (66, 69). Since the creation of this first online social network, the number of individuals registered on social media has grown exponentially year after year, surpassing the first billion of users worldwide in 2011

(70), and passing the second billion by January 2016 (71). More than half of the total of the social media users are registered on Facebook (71).

The ubiquity of social media and their great potential to engage and communicate with people (72-74) suggests that these channels could be valuable to educate users on general health topics (75-77), including sensitive subjects, such as sexual health (78).

The opportunity of customization offered by the social networks make these media useful resources for reaching specific target audiences, such as particular age groups (79-85); populations with a sexual preference other than heterosexual (34, 43, 86-90); people interested in a specific sexual health topic (91-95); people from a precise location (96, 97), or other specific groups (85).

Health education enables people to increase their knowledge and improve their health (9), and it is assumed that the more health education an individual or community has, or the more empowered it is, the more likely it will take measures to preserve or improve health (98). Some reviews analyzing the effects of different health promotion interventions delivered through social media have reported a small (99) to moderate (100) effect on certain behaviour changes. Some pilot studies have shown positive effects on self-reported outcomes (101). Although the importance of empowerment in health promotion is underlined (66), many health promotion efforts have nevertheless followed a traditional and paternalistic top-down approach. From the perspective of empowerment, it can be seen as beneficial that social media that are democratic environments, where all users, in principle, are treated as equals, are used for health promotion purposes (102). However is not well known if the use of social media for sexual health education could result in better health outcomes.

4.1. Use of social media for promoting sexual health: benefits

Social media provide their users with an easy way to access any kind of information, including health information. Millions of social media users have daily access to sexual health contents, whether they explicitly seek for this content or find it accidentally. These channels have high usability and are very easy to reach through smartphones, tablets, and computers. Social media are accessible at any time, most of them are free of charge, and they are by some perceived as valid sources of health information (103, 104), which have been found to be relevant features for information seekers (105, 106). The Internet and some of the popular social media can also provide the desired anonymity for accessing sensitive information, such as sexual health information (107). At the moment, some channels allow their users to create profiles that make it difficult to identify the person behind the user, or interact anonymously, such as Twitter, Instagram, or Wikipedia.

People demonstrate their interest in sexual health topics by searching for sexual health information on social media, sharing contents, and engaging in the online debate. Those who actively seek for sexual health information in order to become better informed about sexual health may be characterized as “information seekers”. And, these online information-seeking behaviours may contribute to a better health (108). Several theoretical approaches have been reported in studies analysing health

information seeking behaviour (109), including the Health Beliefs Model (110); The Technology Acceptance Model (111); or the Behavioural Model of Information seeking (112).

Hochbaum, Rosenstock and Kegels proposed the Health Beliefs Model in the 50's as an approach to understand and predict preventive health behaviour (110). The assumption of this model is basically that an individual will take a health-related action if he or she thinks that a negative condition is avoidable, expects avoiding the negative health condition by following a recommended action, and believes that he or she is able to take that action successfully (110).

The Technology Acceptance Model was proposed by Davis in the 80's (111). This model explains user acceptance processes and predicts the adoption of a new technology, basically based on the perceived utility, perceived ease of use, and attitudes towards using it (111). In later revisions, Davis included behavioural intentions to use the technology as additional factor for predicting technology use (113).

The Behavioural Model of Information seeking was described by Ellis in the late 80's (112). The model, based on the observations on how social scientists behave when they search for information, explains information seeking patterns in different steps: 1) Starting (when the user starts seeking for information); 2) Chaining (when the new source brings the user forward or backward); 3) Browsing (when information is grouped); 4) Differentiating (when the user scans and select sources); 5) Monitoring (checking a specific area regularly); 6) Extracting (racting systematically to identify the information of interest); 7) Verifying (verifying the quality of information); and 8) Ending (when the search process is finished) (112).

These theoretical approaches may explain why or how individuals search for information, however the temporal factor of these information seeking behaviours, or when they happen, is not considered. The emergence of the Internet has allowed us to realize that people tend to seek sexual health information following specific time patterns. Some studies have found that people tend to seek for advice or sexual health information at the beginning of the week (114-116), just after the weekends (when sexual risk behaviours may occur) (114, 117). And therefore, these information-seeking behaviours are understood as signs of health concerns (114-116). The peaks in health information-seeking behaviours at the beginning of the week have also been found in other health areas, and have been interpreted as "healthy new starts" (118, 119) or "fresh starts" (120).

In order to use social media for sexual heath education or sexual health promotion, it is of interest to know when users seem to be more aware of these topics, and seek for sexual health information or STIs on social media. In addition to those who actively search for health information, there is a group of social media users that are not intentionally searching for health information, but who accidentally find such information. These "information discoverers" as social media users, would likely respond as individuals in a precontemplation phase, as described by the Transtheoretical model (16, 17). It would be of great interest to understand more about the audience, i.e., who the actors involved in online conversations about

sexually transmitted diseases are. It would also be interesting to know more about to which extent these messages have a serious content.

Health promoters, whose first aim is to carry out public actions for disease prevention (102) might see social media as a unique opportunity to communicate with large populations and disseminate health information. These media allow health promoters to easily reach both active health information-seekers and also accidental information discoverers, at a low cost, and potentially improve the cost-effectiveness and quality of health promotion interventions (121, 122). While dealing appropriately with ethical and moral challenges linked to social media use, healthcare professionals and health authorities might benefit from its use for spreading trustable sexual health information in general situations, and as a response to acute events (123). And by being present on social media, they might also benefit from a better reputation and image, as they can be seen by the public as more responsible, transparent, and reachable (123).

4.2. Use of social media for promoting sexual health: challenges

Before carrying out sexual health promotion through social media, health promoters and researchers carrying out health promotion interventions have to consider the possible ethical issues linked to the use of these media. Although official guidelines on the ethics of social media use for health promotion are not available yet (124, 125), as in other public health interventions, some of the main objectives must be the protection of the privacy, confidentiality, and anonymity of the target audience (102, 124, 125). Keeping privacy, confidentiality, and anonymity is especially relevant when the audience is youth, and topics are very sensitive, such as sexual health (124, 126). Youth seem to have concerns regarding their own health information on social media (127), or accessing this kind of sensitive information on these channels (128). Some studies have confirmed users' concerns about receiving sexual health education through social media, due to worries about privacy issues and stigma (126, 129). Furthermore, on the online social media, privacy policies might change at any time, so what was private at a given moment may cease to be so, and sensitive information could be spread (124). And it is also important to take into account that some recipients of the sexual health promotion may present themselves with a false identity or wrong age (124).

Besides ethical considerations, using social media for sexual health promotion in an environment where anyone can publish, there is a risk of misinformation, misuse or misinterpretation of health information by the consumers, which can be challenging. Social networks might contain appropriate health information, but also misinformation, and intentionally or not intentionally distorted, inappropriate, or stigmatizing information (130-132), which under extreme conditions could even led to deaths (51). In the sexual health field, the social networks have also been reported to potentially become "risk environments" where sexual risk behaviours and STIs may be promoted (96, 122). An early study on young people's behaviour on social media found that more than 50% were disclosing risk behaviour on their public profiles (133). Another study reported that 15.8% of the users displayed risky sexual behaviours on teens' dating websites (134), with potential unwanted consequences, such as cyberbullying, or attracting sexual predators (135). Social networks also represent spaces to meet partners potentially infected with STIs (136, 137).

Healthcare professionals' concerns about using social media can also be attributed to the potential risk of infringing on patients' privacy and confidentiality, fears of breaking standard procedures, or being involved in online debates containing distorted information (67). Protecting their own privacy is also relevant, as healthcare professionals can face the risk of damage to their online and offline reputation, by being judged by other healthcare professionals or disciplined for an unethical post on social media (138).

Other concerns professionals have about using social media may be the fact that being active on these channels requires a lot of effort, is time-consuming, and in most of the cases, is not paid. The use of social media is not usually taught at medical or nursing schools, which may cause uncertainty on how to act on these media, or if it is appropriate to do so at all. The American Council of Residency Directors Social Media Task Force has already asked for the inclusion in the residency programs of guidance and education on the use of social media (139). The inclusion of use of social media in healthcare curricula may result in better communication between health professionals and patients, or society in general, and could potentially lead to better health care (124, 138). In order to advise healthcare professionals on how they should use social media while avoiding risks, major health professionals associations such as the American Medical Association (140) and the British Medical Association (141) have proposed guidelines.

Although social media are linked to potential risks, it cannot be ignored that the popularity of these media is growing exponentially. Therefore, by dealing with the ethical challenges, they might be considered as potentially useful channels to promote sexual health. However, it is necessary to increase the knowledge about how the population is using these media for sexual health purposes, who are involved in the online debates, what their interests are, and if there are specific moments when this online interaction happens.

5. Observation of STIs related online behaviour on social media

The arise of the online technologies, including social media, has provided health professionals and researchers with an unprecedented opportunity to observe online behaviours related to health that might be a reflection of offline behaviours.

The observation and monitoring of online behaviours on social media can provide complimentary information that can be useful for health surveillance programs of infectious diseases (142-145). In the sexual health field, there is emerging evidence on how social media can be used for STIs surveillance, as exemplified with two studies monitoring syphilis outbreaks on social media, which allowed carrying out preventive actions (146, 147).

In addition to the surveillance of STIs outbreaks, the observation and monitoring of online behaviours also offers the possibility of identifying the sexual health concerns, interests, misinformation, or attitudes in a community (148), with the possibility of taking health promotion actions accordingly.

However, some ethical considerations should be taken into account before extracting and analyzing data from these online channels, and even more so when these data are on sexually transmitted diseases (125, 149). Although the information published on social media is generally considered public domain (150), one can discuss if the posted information really should be considered public or if it should be considered to belong only to the person who posted the information (151, 152). The possibility of obtaining informed consent has to be considered, especially in those cases where individuals can be identified from the information that is retrieved (149, 151, 152). Privacy and confidentiality must also be considered. The privacy of social media users discussing health topics must be taken into consideration (124, 125, 149-152). As mentioned above, although individuals' privacy settings on social media could be perceived as impenetrable, privacy settings on these channels can change without notice, which make this consideration especially challenging (124, 150). To avoid privacy risks, it is recommended to not extract information from social media that will identify individuals (149, 152). If information that can identify an individual is needed, informed consent should be obtained, and the information that could identify the user should be anonymized for the data analysis (149, 152). Further ethical issues might apply in specific social media channels (149).

Despite the possibility of accessing new information regarding the needs, interests, doubts, or attitudes, or other online behaviours related to STIs that are displayed or can be tracked on social media, there is not much evidence on how people behave with regard to sexually transmitted diseases on these channels. More observational studies analyzing online behaviours (i.e., the nature of the information that is shared on social media on STIs; the actors involved in these online debates; and the information-seeking preferences of social media users) are needed in order to increase the knowledge of sexual health promotions' target audiences.

Objectives

With this PhD thesis, I want to increase knowledge about the potential of social media for sexual health promotion. In order to increase this knowledge, I set two main objectives:

1. To investigate literature on the use of online social media for sexual health promotion, and the existing evidence on outcomes of such use as presented in the research literature.
2. To investigate examples of how social media users post or retrieve information about sexually transmitted infections on some of these channels.

Research Questions

To know more about this topic, it is necessary to understand how social media have been used in research studies and also how non-academic sectors have used social media for sexual health promotion. It is also necessary to understand what its reported value is, and how and when social media users typically interact with information about sexually- transmitted infections on these channels.

Two main groups of research questions were formulated in order to address the two objectives, and the studies were designed accordingly. The first group of research questions deals with the use and reported value of social media in health promotion studies and projects lead by healthcare professionals in academic and non-academic settings. Research questions 1 and 2 are addressed in Paper 1.

RQ1: How have social media been used for sexual health promotion and sexual health education?

RQ2: What are the reported outcomes of social media use for sexual health promotion and sexual health education?

Research question 3 is addressed in Paper 2:

RQ3: Can a Facebook campaign be used to increase the number of visitors to a web-page with a sexual health promotion intervention?

A second group of research questions are on the nature and authorship of sexually transmitted diseases' information on social media that can be found by active information-seekers or accidental "information discoverers" (RQ4, RQ5, and RQ6). Research questions 4 and 5 are addressed in Paper 3 and research question 6 is addressed in Paper 4.

RQ4: What can be understood about the nature of information on two different STIs available on Twitter, by examining a sample of tweets?

RQ5: What can we learn about the actors involved in the online debate about two different STIs on Twitter, by examining a sample of tweets?

RQ6: What can we learn about the temporal pattern of information searching regarding STIs by examining a sample of searches on Wikipedia?

Materials and Methods

1. Paper 1 (Scoping Review)

1.1. Aims

To update the knowledge on how online social media have been used for sexual health promotion in research studies, and also in non-academic environments. This review includes publications until the end of October 2015.

1.2. Design and measures

In order to identify the existing evidence on social media use for sexual health promotion, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method (153). A thorough electronic search strategy pursuing academic publications and grey literature was performed across the following sources (see Table 1):

Table 1. Overview of the search sources (Paper 1)

Databases containing academic peer-reviewed publications	<ul style="list-style-type: none"> ▪ Embase ▪ Pubmed (MeSH terms and text word) ▪ PsycINFO ▪ Applied Social Sciences Index and Abstracts (ASSIA) ▪ ProQuest Health and Medical Complete ▪ British Nursing Index ▪ Computer and Information System Abstracts ▪ MEDLINE (Ovid) 	
Grey literature	Databases	<ul style="list-style-type: none"> ▪ African Journals Online (AJOL) ▪ COS Conference Papers Index ▪ Directory of Open Access Journals (DOAJ) ▪ ClinicalTrials.gov
	Conference proceedings published in a selection of relevant	<ul style="list-style-type: none"> ▪ Sexually Transmitted Diseases ▪ Sexually Transmitted Infections ▪ International Journal of STD & AIDS

	journals (period: 2012-2015)	
	A selection of non-governmental organizations (NGOs)	<ul style="list-style-type: none"> ▪ International Planned Parenthood Federation (IPPF) ▪ Population Council ▪ World Health Organization (WHO) ▪ United Nations Population Fund (UNFPA) ▪ Youth Leading the HIV & Hep C Movement (YouthCO) ▪ FHI360 ▪ Phoenix PLUS and menZDRAV Foundation ▪ The Initiative for Equal Rights (TIER)

The search included publications with the terms “sexual health education” or “sexual health promotion” jointly with “social media”, “social networking”, or any of the most popular social media channels: “Facebook”, “Twitter”, “YouTube”, “Instagram”, and “Snapchat”. The search on Pubmed was carried out also for the MeSH terms “Social Media”, “Social Networking”, and “Sex Education”.

Inclusion criteria were: 1) empirical studies including results; 2) social media used for sexual health education or sexual health promotion; and 3) published in English.

All the studies published until the end of October 2015 were extracted. After removing duplicates, the abstracts were screened and considered against the inclusion criteria by one reviewer (EG). Uncertainties regarding whether inclusion criteria were met in specific cases were discussed with a second reviewer (RW). The full texts of the papers meeting the inclusion criteria described above were downloaded. These publications were analyzed and classified according to their study designs, aim of their promotion, audience, sexual preference, and how social media were used.

1.3. Analysis

This is a scoping review study. Scientific and medical databases and grey literature were scanned. Selected publications were analyzed in detail. Descriptive data on the number and percentage of studies in each category was analyzed. Information on the theoretical model on which the intervention was based, specific social media channels used, and country of origin of the intervention were also reported.

2. Paper 2 (Case study – Facebook campaign)

2.1. Aims

This study aims to use a Facebook campaign as a tool supporting a sexual health promotion on a website, and to examine the success of the tool in terms of website visits.

2.2. Design and measures

This was a sexual health promotion intervention study. The sexual health promotion intervention was based on a Social marketing approach (26, 27) and Social constructivist learning theory (154). The educational site called “sjekkdeg.no” (“check yourself” in English) addressed general sexual health topics, and included information about chlamydia, gonorrhoea, and other STIs. The site was promoted along all of 2013 (155). The site is in Norwegian and it targets Norwegian youngsters, especially from North-Norway, where the highest rates of chlamydia in Norway were reported in 2012 (156). To disseminate the educational contents from this website, a promotion strategy was agreed between healthcare professionals and the University Hospital of North Norway’s Communication Department. The planned strategy included the use of a Facebook fan page, a Facebook advertisements campaign, and posters.

The Facebook fan page posted news at least once a week. All the contents published on the fan page were reviewed and approved by doctors and nurses who were experts in venereology and who had experience in teaching. A Facebook advertisements campaign was also carried out from 4th April, and until the 3rd May, 2013. The advertisement suggested visiting the website “sjekkdeg.no” to check a movie that shows what happens during an orgasm, and also to like the fan page. The advertisement was requested to be shown to young people (13-25 years old) from all the villages and towns from North Norway. A total amount of 3000 NOK was allocated to the advertisements campaign. The posters were distributed among all the secondary schools, public libraries and health stations for youth in all the municipalities in North-Norway, and included QR codes linking to the educational site “sjekkdeg.no”. One of these posters was distributed during the arctic daylight period (June-July) and the second one during the arctic night (November-December).

The impact of the three promotion activities was assessed by the web site use, which was monitored with the popular web analytics tool, Google Analytics. Google Analytics interface is customizable, and it provides detailed information and statistics about the users and their interactivity on a website or app (157).

The study protocol on this project was presented for assessment to the Norwegian Regional Ethics Committee North (REK-Nord). The protocol was declared exempt (Reference code: 406678) (See Appendix 5).

2.3. Analysis

This is an example of a sexual health promotion intervention study. The quantitative analysis was descriptive, and based on data provided by Google Analytics and Facebook statistics. Absolute numbers, percentages and 95% confidence interval values were reported on the website audience for the whole year, and during the Facebook advertisements campaign. Descriptive data on the Facebook fan page reach were also reported.

3. Paper 3 (on Twitter)

3.1. Aims

The objective of this paper was to analyze the information posted during a specific time period on Twitter about one curable and one non-curable sexually transmitted infection (i.e., chlamydia and HIV), to examine how seriously the topics were being treated, and who posted the tweets.

3.2. Design and measures

All the messages posted worldwide on Twitter during the first week of August 2013 and the first week of September 2013, and containing the word “chlamydia” or “HIV”, or the hashtag “#chlamydia” or “#HIV” were downloaded, and also the profile information of the tweet emitter. Two independent reviewers classified every tweet emitter according to their avatar on Twitter (person, logo image, or fantasy image), identification nature according to the text information included in their profile (identifiable, semi-identifiable, non-identifiable), and their nature (private company, general communication media, scientific media, non-governmental organization, individual account, academic institution, government department, or undefined). The content of the tweets were also classified, according to their tone (serious or jokes), and their nature (factual or personal experience).

3.3. Analysis

The inter-rater reliability among the reviewers on the tweets classification was calculated. The quantitative analysis was descriptive: absolute numbers and percentages were reported per categories, and Chi-squared tests were used to determine association between categorical variables.

4. Paper 4 (Wikipedia)

4.1. Aims

The objective was to corroborate the existence of information seeking patterns related to sexual health and other health topics on the most popular wiki: Wikipedia. The study also aimed at checking if information-seeking patterns could also be found for non-health related topics.

4.2. Design and measures

Wikipedia is an online collaborative encyclopaedia that has been chosen for this study because it has become one of the main sources of information on the Internet nowadays (158), also for health-related topics (159). For the study, the number of searches of ten articles in Norwegian language were extracted from the Wikipedia article traffic statistics website (<http://stats.grok.se>). The number of searches per day was tracked for 911 days, from 1st January 2013 and until 30th June 2015.

Five sexual health-related articles were tracked (chlamydia, gonorrhoea, HIV, syphilis, and herpes). Additionally, five more articles were tracked: three on other health topics (influenza, diabetes, and menopause), and as examples of non-health related topics, two articles about two celebrities (Justin Bieber and Lionel Messi) were randomly selected.

The dates were classified according to the day of the week. Public holidays in Norway, and days after public holidays were also identified.

4.3. Analysis

The number of searches per day per article was summarized using descriptive statistics, mean, and 95% confidence intervals. To analyze differences on the number of searches per day of the week, ANOVA tests were used, and p-values were reported. Non-parametric Mann-Whitney U tests were used to compare the number of searches performed during public holidays, and the days after that.

Results

1. Results Paper 1 (Scoping Review)

We identified 9,462 articles. After removing duplicates, 4,294 abstracts were screened, and 4,229 of those were rejected for not meeting the inclusion criteria. The full texts of the remaining 65 articles were assessed for eligibility, and 14 of these papers were excluded (12 articles were rejected for presenting only the study protocol and no results and 2 papers were rejected because the intervention did not refer to online social networks). A total of 51 articles were included in this review.

Study designs

The publications were classified according to their study methodology. Four studies were intervention studies using randomization; sixteen studies were intervention studies without randomization; and seven studies were qualitative. See Table 2.

Table 2. Summary of the included papers (Paper 1)

Method	Number of studies	Main results
Randomized Interventions	4	<ul style="list-style-type: none"> Two studies belonging to the HOPE project randomized participants to receive peer-delivered information on HIV or to general health information, through Facebook during 12 weeks. These studies found that peer-leaders felt comfortable discussing sexual health on social media and that participants in the HIV information group were more likely to test for HIV (34, 35). A study randomized participants either to a Facebook page on health information for youth, or to a general news page. After 2 months intervention, participants in the health information group had a higher tendency to use condoms, but the effects were not found at 6 months (80). One study randomized health centres to a reminders service to increase HPV-vaccination completion (including Facebook private messages) or to routine follow-up. No advantage was found on the reminders group (160). Only the two studies of the HOPE project referred to the framework used, in this case they used a social network intervention model, and specifically a peer-delivered intervention (34, 35).
Non-Randomized Interventions	39	<ul style="list-style-type: none"> Diversity of methods and reported results. About half of the publications reported results on the online project reach, such as number of website visitors, time spent, etc. (43, 82, 86, 161-176) and some of those also showed users' opinions (36, 43, 168, 170, 177-184). Around a quarter of the studies reported results regarding STI incidence and testing (44, 81, 146, 185-191). One study found that individualized interaction with users, encouraging interaction, and celebrity involvement were the strategies used by successful profiles from Facebook and Twitter promoting sexual health (192). Five of these studies mentioned the theoretical framework used (36, 43, 44, 172, 179). The used models were: Game-

		based learning with a participatory design approach, Kelly's popular opinion leader model, Peer education models, Pender's health promotion model; and community engagement model.
Observational studies	8	<ul style="list-style-type: none"> • Five studies assessed the views of young people on the use of social media for sexual health promotion. Participants reported being positive (83-85, 193, 194). • In the studies with adults, concerns with privacy, stigma, social norms (195, 196), and links to social media profiles (197) were reported. • None of these studies referred to any theoretical approach.

Aim of the promotion and targeting audience

The objective in most of the research projects was sexual health promotion in general or to increase STI testing (29 of the 51 included publications; 56.9%). Among the 22 remaining studies, 15 (29.4%) focused on HIV and the other 7 on chlamydia, syphilis, gonorrhoea or HPV.

Thirty (58.8%) of the 51 included publications targeted specifically youth or young people within the range of 11 to 29 years. Eleven (21.6%) studies promoted sexual health among adults older than 18 years old, and ten (19.6%) studies had a general audience, or the age group was not specified.

Regarding the location of the sexual health promotion studies, 21 (41.2%) were carried out in North-America, 13 (25.5%) in Europe, 6 (11.8%) in Australia and New Zealand, 4 (7.8%) in Africa, 4 (7.8%) in Asia and 1 (2%) in South-America. Only 2 (3.9%) studies referred to several countries on more than one continent.

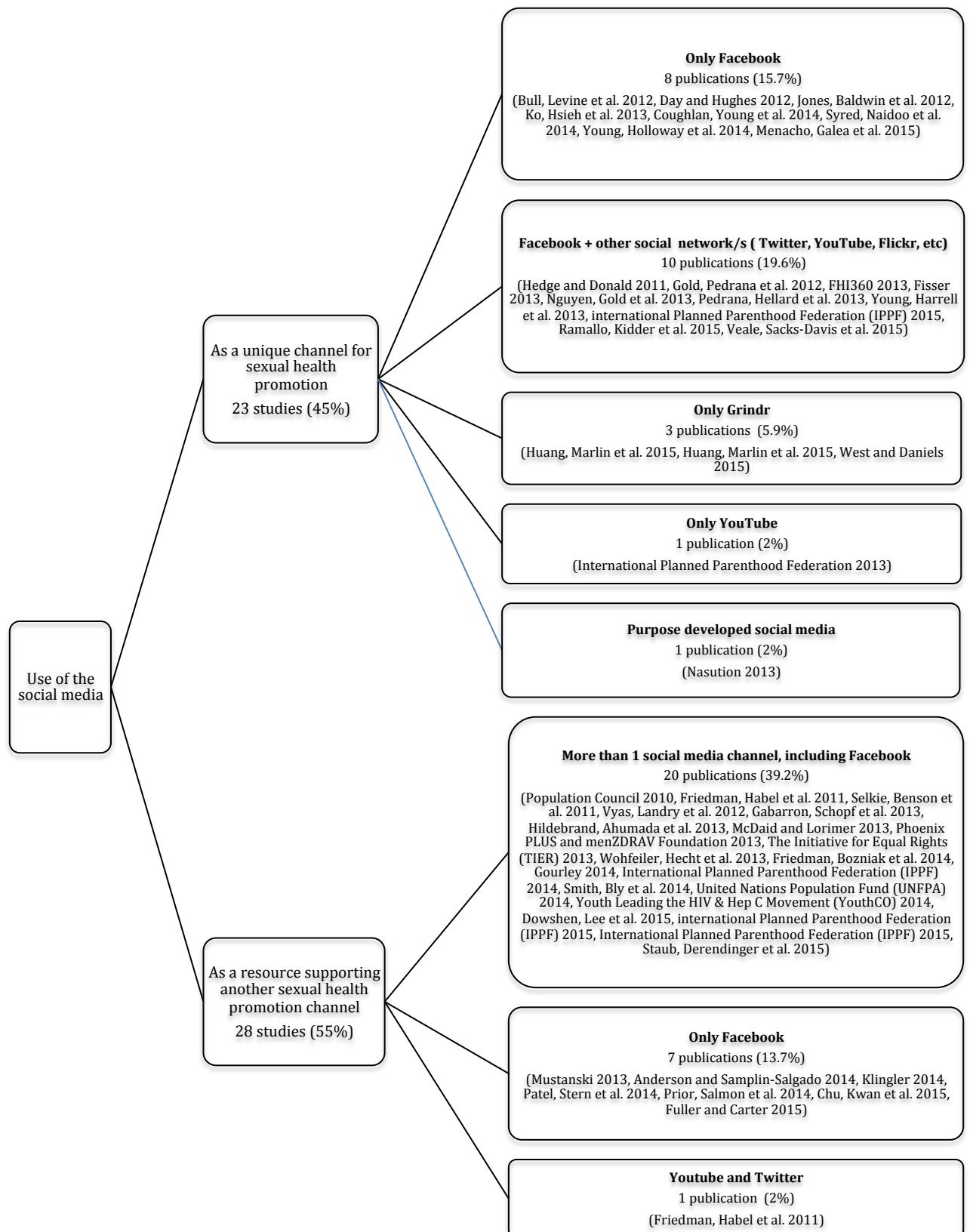
Social media usage

Twenty-three studies used social media as the main channel for the sexual health promotion, eight (34.8%) of these reported an effect on behaviour, in these cases the recipients of the intervention increased their condom use, more often attended health services, increased their intention to test for STIs, and more often requested STIs tests (34, 35, 43, 44, 80, 186, 188, 189).

In twenty-eight studies, social media were considered as a tool to enhance the promotion. Six (21.4%) of these twenty-eight studies reported an effect on behaviour. Reported effects among promotion recipients were increases in condom use, increased attendance at health services, increased STI testing, and reduced number of STIs cases (81, 168, 170, 185, 190, 191).

Figure 1 summarizes how social media have been used in these studies.

Figure 1. How have social media been used for sexual health promotion (Paper 1)



2. Results Paper 2 (Case Study – Facebook campaign)

The impact of the three strategies used in 2013 for promoting the educational web app on sexual health “sjekkdeg.no” was analysed through data provided by Google Analytics and Facebook statistics.

Educational sexual health web app use: Google Analytics

In 2013, Google Analytics registered a total of 3670 website visitors, which represents 10.1 visitors per day (95% CI 8.7-11.4). The website visitors checked an average of 20.6 pages each, and they spent 5 minutes and 2 seconds on the site. The 64.9% of these visitors (n=2381) were new users, meaning that the remaining 35.1% (n=1289) were returning visitors. Google Analytics identified a total of 671 visitors (18.3%) referred by Facebook.

A total of 1263 visitors (34.4%) reached the website during the 1-month Facebook advertisements campaign. The website had a mean of 42.1 visitors per day (95% CI 37.3-46.9) in this 1-month period. During the advertisements campaign, the visitors, on average, checked 15.8 pages each, and they were connected to the site for 3 minutes and 44 seconds. 71.3% of these visitors (n=901) were new website users, and the remaining 28.7% (n=362) were returning visitors. Google Analytics identified a total of 505 visitors (40%) referred by Facebook.

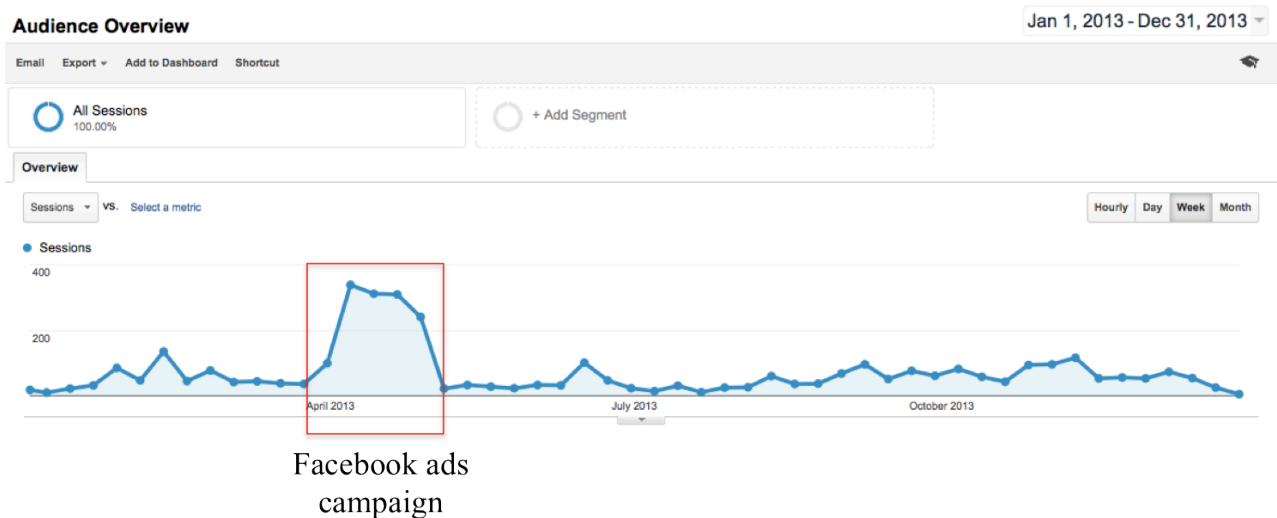
Table 3 summarizes the website audience during all of the year, and during the 1-month Facebook ads campaign. The audience overview during 2013 tracked by Google Analytics is summarized in the Figure 2.

Table 3. Educational sexual health web app visitors (Adapted from Paper 2)

	All year (01/01/2013 - 31/12/2013)	All year except 1-month Facebook ads campaign (01/01/2013 to 03/04/2013 and from 04/05/2013 to 31/12/2013)	1-month Facebook ads campaign (04/04/2013 - 03/05/2013)
Total number of visitors	3670	2407	1263
Average number visitors/day (95% confidence interval)	10.1 (95% CI 8.7-11.4)	7.2 (95% CI 6.5-7.9)	42.1 (95% CI 37.3-46.9)
Average pages/visit	20.6	18.3	15.8
Average time/visit	05:02 min	05:43 min	03:44 min
% visits referred by Facebook	18.3%	6.9%	40%

Data from Google Analytics

Figure 2. Sjekkedeg audience overview in 2013 (data from Google Analytics) (Paper 2)



Social media activity: Facebook statistics

The Facebook statistics dashboard registered a total of 67 “likes” on the Facebook fan page during all the year. And 35 of these “likes” (52%) were obtained during the 1-month Facebook advertisements period.

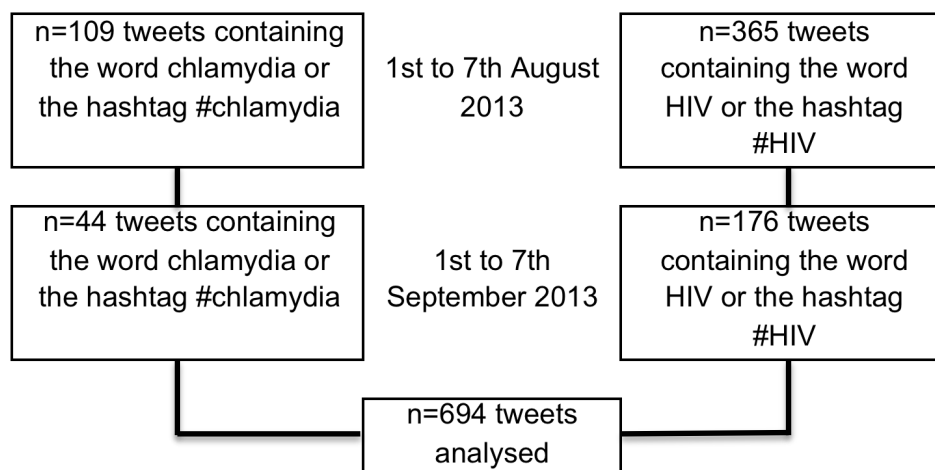
Facebook statistics also reported that the advertisements were visible for 51200 people, among the 68360 existing Facebook accounts in the targeted age range and in the selected area. Among these 51200 Facebook users to whom the advertisements were shown, 1295 clicked on the advertisement (2.5%).

3. Results Paper 3 (on Twitter)

During the first seven days of August and first seven days of September 2013, 426 different users posted 694 messages on Twitter using the words or hashtags “chlamydia” and/or “HIV”. Three hundred twenty-two users posted messages on Twitter about HIV, and seventy-nine about chlamydia. The summary of extracted tweets per term can be found in Figure 3.

Tweets were classified by two independent reviewers, according to whether they were understood as jokes/serious, whether they reflected personal experience or factual content, and according to the source of information. The inter-rater reliability among the reviewers for the jokes/serious category was found to be Kappa=0.8393, i.e. almost perfect (198). The inter-raters agreement was Kappa=0.667, i.e. substantial (198) for the personal experience or fact classification; and Kappa=0.729, i.e. substantial (198), for the source of information category.

Figure 3. Tweets on HIV and chlamydia: search and data extraction (Paper 3)



Extracting a sample of tweets on two sexually transmitted diseases posted during two weeks (in our case, the first seven days of August 2013, and first seven days of September 2013) represents a technique that can be used to obtain an impression of the nature of the relevant messages that were shared on this channel, as well as of the authors of these posts during the two weeks. In this study, we found that most of the information posted on Twitter on STIs was of a serious tone and factual nature. However, some jokes were also identified, and three quarters of these jokes were on chlamydia.

Among the 426 different users posting about STIs on Twitter, only 76.1% had an identifiable profile; 1.4% were considered semi-identifiable; and 22.5% non-identifiable. The users' avatars were logos (51.6%); human images (38.0%); and fantasy avatars (10.3%). A third of all tweet-messages were posted by individuals, and 19% more by the general media. Government departments, non-governmental organizations, scientific media, private companies, and academic institutions had only a slight presence among the tweeters (16.4%, 13%, 7.9%, 2.7% and 1.7%, respectively). The nature of the emitter was not identified in 5.9% of the tweets.

The number and percentage of tweets according to their tone and nature and their origin users' avatars, types of accounts, tweets emitters, and STI topics are summarized in Table 4.

Table 4. Tone and Nature of the tweets (Paper 3)

Tone and Nature of the tweet	Joke / Fun n=74 (10.7%)	Serious n=620 (89.3%)	Fact n=555 (80%)	Personal experience n=139 (20%)	Total n=694 (100%)
User image (avatar) *					
Human	60 (81.1%)	134 (21.6%)	98 (17.7%)	96 (69.1%)	194 (28.0%)
Fantasy	9 (12.2%)	71 (11.5%)	66 (11.9%)	14 (10.1%)	80 (11.5%)
Logo	5 (6.8%)	415 (66.9%)	391 (70.5%)	29 (20.9%)	420 (60.5%)
Type of account user *					
Identifiable	21 (28.4%)	528 (85.2%)	483 (87.0%)	66 (47.5%)	549 (79.1%)
Semi-identifiable	0 (0%)	15 (2.4)	13 (2.3%)	2 (1.4)	15 (2.2%)
Non-identifiable	53 (71.6%)	77 (12.4%)	59 (10.6%)	71 (51.1%)	130 (18.7%)
Tweet emitter *					
Individual	66 (89.2%)	165 (26.6%)	125 (22.5%)	106 (76.3%)	231 (33.3%)
General media	4 (5.4%)	128 (20.6%)	118 (21.3%)	14 (10.1%)	187 (26.9%)
Scientific media	0 (0%)	55 (8.9%)	55 (9.9%)	0 (0%)	12 (1.7%)
Government department	0 (0%)	12 (1.9%)	111 (20.0%)	3 (2.2%)	90 (13.0%)
Non-governmental	0 (0%)	90 (14.5%)	81 (14.6%)	9 (6.5%)	41 (5.9%)
Undefined	3 (4.1%)	38 (6.1%)	35 (6.3%)	6 (4.3%)	19 (2.7%)
Private company	1 (1.4%)	18 (2.9%)	18 (3.2%)	1 (0.7%)	12 (1.7%)
Academic institution	0 (0%)	12 (1.9%)	12 (2.2%)	0 (0%)	102 (14.7%)
STI *					
HIV	18 (24.3%)	523 (84.4%)	461 (83.1%)	80 (57.6%)	541 (78.0%)
Chlamydia	56 (75.7%)	97 (15.6%)	94 (16.9%)	59 (42.4%)	153 (22.0%)
STI search *					
Word HIV	18 (24.3%)	451 (72.7%)	395 (71.2%)	74 (53.2%)	469 (67.6%)
Hashtag #HIV	0 (0%)	72 (11.6%)	66 (11.9%)	6 (4.3%)	72 (10.4%)
Word chlamydia	41 (55.4%)	10 (1.6%)	8 (1.4%)	43 (90.9%)	51 (7.3%)
Hashtag #chlamydia	15 (20.3%)	87 (14.0%)	86 (15.5%)	16 (11.5%)	102 (14.7%)

* Chi-Square, p<.001

Examples of unsuitable tweets on the STIs were: “If it weren't an STD, I would consider naming my daughter Chlamydia #pretty”, or “What's the most positive thing in Africa? ? HIV”

Among the 694 tweets, 104 were re-tweeted corresponding to 68 unique tweets. Twenty-eight messages were re-tweeted once; two tweets had two re-tweets each (“Protect yourself: all sexually-active women age 25 & under should request a #chlamydia test each year; <http://go.usa.gov/DYyR> #STD”; and “Sexually-active #women age 25 & under should be screened annually for #chlamydia> Why? <http://go.usa.gov/jQ4J>); one tweet had 4 re-tweets (“#Chlamydia rates highest among African American women age 15-24. Let?s change this for the better <http://go.usa.gov/jUsD>”); and one tweet was re-tweeted 32 times (“#Chlamydia infects more than 1,210,523! See #symptoms in men <http://bit.ly/dVNbJJ>”)

The numbers and percentages of the re-tweeted messages, according the tweet emitter profiles are summarized in Table 5.

Table 5. Features of the 68 re-tweeted messages (Paper 3)

	Chlamydia 10 (14.7%)	HIV 58 (85.3%)
User image *		
Logo	1 (10%)	0 (0%)
Human	1 (10%)	8 (13.8%)
Fantasy	8 (80%)	50 (86.2%)
Type of account user *		
Identifiable	9 (90%)	56 (96.6%)
Semi-identifiable	0 (0%)	0 (0%)
Non-identifiable	1 (10%)	2 (3.4%)
Tweet emitter *		
Individual	1 (10%)	8 (13.8%)
General media	2 (20%)	11 (19%)
Scientific media	1 (10%)	8 (13.8%)
Government department	6 (60%)	12 (20.7%)
Non-governmental	0 (0%)	15 (25.9%)
Undefined	0 (0%)	1 (1.7%)
Private company	0 (0%)	3 (5.2%)
Academic institution	0 (0%)	0 (0%)
Tone of the message *		
Joke / Funny	1 (10%)	0 (0%)
Serious	9 (90%)	58 (100%)
Nature of the message *		
Fact	9 (90%)	52 (89.7%)
Personal experience	1 (10%)	6 (10.3%)

* Chi-Square, $p < .001$

4. Results Paper 4 (Wikipedia)

Analysing the number of searches performed day by day, during 911 days, regarding sexually transmitted diseases on an online source that can be tracked, such as Wikipedia, may help to increase the evidence regarding the existence of online information-seeking patterns. In Study 4, it was shown that the searches of the Wikipedia tracked articles followed a significant weekly pattern. The information-seeking weekly pattern typically had its highest peaks on Tuesdays, and its lowest peaks on Saturdays.

Wikipedia searches on sexual transmitted infections

For the five tracked Wikipedia articles on sexual health (chlamydia, gonorrhoea, herpes, HIV, and AIDS), the highest number of searches was found to be on Tuesdays, and the lowest on Saturdays, at $p < .001$ level for the five articles. ANOVA values were $[F(6,904) = 10.50, p=0.000]$ for chlamydia; gonorrhoea values were $[F(6,904) = 11.58, p=0.000]$; herpes $[F(6,904) = 3.88, p=0.001]$; HIV $[F(6,904) = 25.04, p=0.000]$; and AIDS $[F(6,904) = 14.32, p=0.000]$.

For the queries on chlamydia, the average number of searches decreased by 54.5% from Tuesday to Saturday. The reduction in the number of hits between searches

performed on Tuesdays versus Saturdays was 48.2% for searches on HIV; 46.9% for AIDS; 44.8% for herpes; and 42.1% for the article on gonorrhoea.

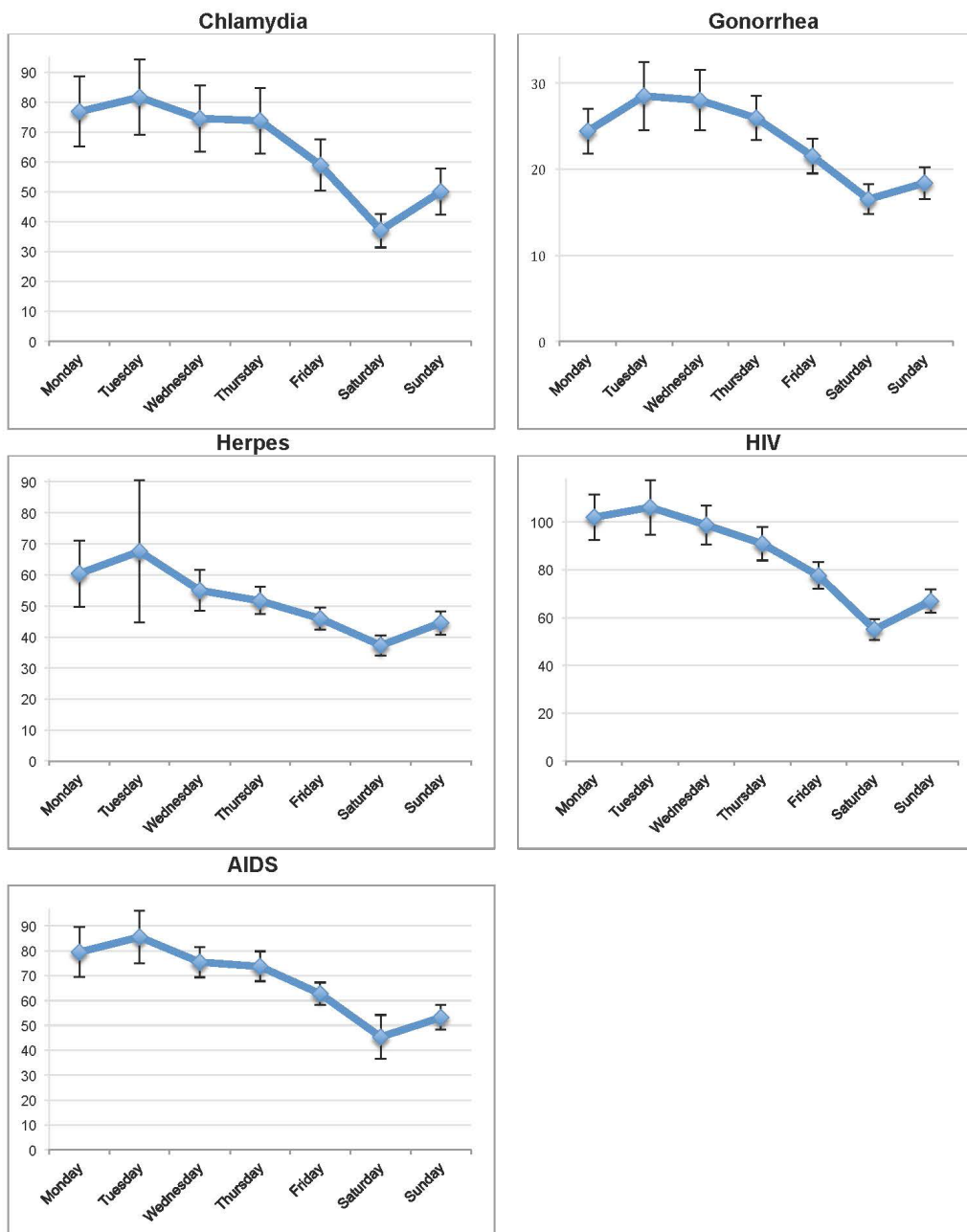
A summary of the daily searches for the Wikipedia articles on STIs can be found in Table 6 and Figure 4.

Table 6. Weekly Wikipedia traffic for articles on STIs (Paper 4)

	Chlamydia	Gonorrhoea	Herpes	HIV	AIDS
Monday	76.8 (65.2-88.5)	24.4 (21.8-27.0)	60.4 (49.7-71.1)	101.9 (92.4-111.3)	79.5 (69.6-89.5)
Tuesday	81.5 (69.0-94.0)	28.5 (24.5-32.4)	67.6 (44.7-90.5)	106.1 (94.7-117.4)	85.5 (74.9-96.2)
Wednesday	74.5 (63.4-85.6)	28.0 (24.5-31.5)	55.0 (48.4-61.7)	98.7 (90.5-106.9)	75.4 (69.3-81.5)
Thursday	73.8 (62.8-84.7)	25.9 (23.4-28.5)	51.7 (47.4-56.1)	90.9 (83.9-97.9)	73.8 (67.8-79.8)
Friday	58.9 (50.3-67.5)	21.5 (19.5-23.5)	46.0 (42.5-49.5)	77.5 (72.0-83.1)	62.8 (58.3-67.2)
Saturday	37.1 (31.4-42.7)	16.5 (14.8-18.3)	37.3 (34.1-40.5)	55.0 (50.7-59.3)	45.4 (36.5-54.3)
Sunday	50.1 (42.3-57.9)	18.4 (16.5-20.2)	44.5 (40.8-48.2)	66.9 (62.0-71.9)	53.2 (48.3-58.2)

Mean and 95 CI, ANOVA tests $p < .001$

Figure 4. Weekly Wikipedia traffic for articles on STIs (Paper 4)



Mean and 95 CI, ANOVA tests $p < .001$

Wikipedia searches on other health topics

For the three tracked Wikipedia articles on other health topics (influenza, diabetes, and menopause), a weekly information-seeking pattern was also found to be significant. Obtained ANOVA values were $[F(6,904) = 2.49, p=0.022]$ for influenza; $[F(6,904) = 31.36, p=0.000]$ for diabetes; and $[F(6,904) = 10.74, p=0.000]$ for menopause. The number of queries on influenza were highest from Mondays to Wednesdays, while the searches on diabetes were higher on Tuesdays and Wednesdays; and queries on menopause more frequent on Mondays and Tuesdays. In these three cases, Saturdays had the lowest numbers of searches.

There was a reduction on the average number of queries between the day with the highest number of searches, and the day with the lowest number of hits. In the case of the query on diabetes; the decrease was 57.2%; the search queries on influenza decreased 41.9%; and the queries on menopause were 29.9% lower.

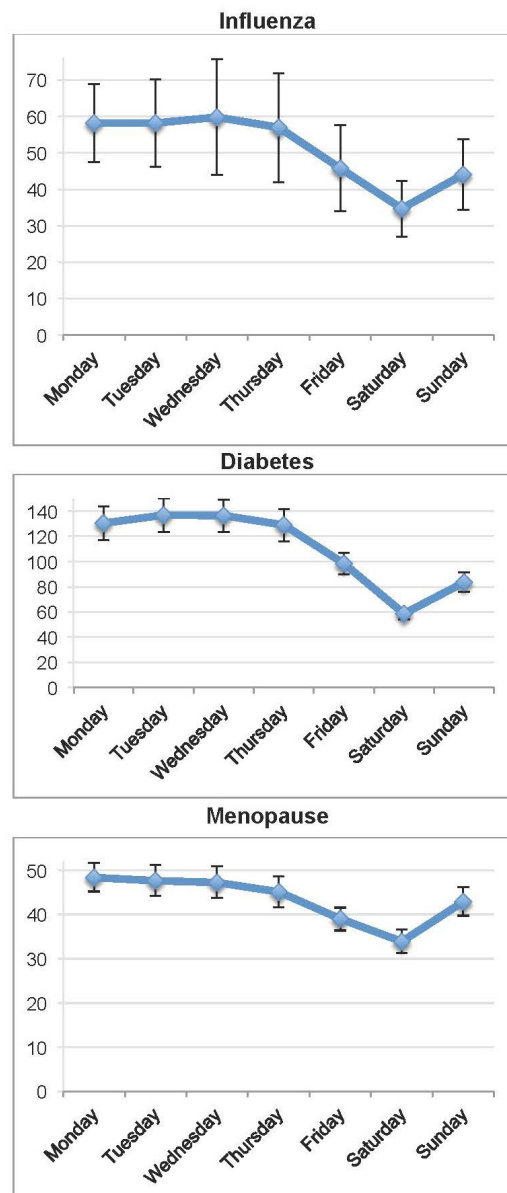
A summary of the daily searches for the Wikipedia articles on other health topics can be found in the Table 7 and Figure 5.

Table 7. Weekly Wikipedia traffic for articles on other health topics (Paper 4)

	Influenza	Diabetes	Menopause
Monday	58.2 (47.5-68.9)	130.4 (117.2-143.5)	48.4 (45.2-51.7)
Tuesday	58.2 (46.2-70.1)	136.8 (123.4-150.1)	47.7 (44.2-51.2)
Wednesday	59.8 (43.9-75.7)	136.5 (123.7-149.2)	47.3 (43.8-50.9)
Thursday	56.9 (41.9-71.8)	128.9 (116.2-141.5)	45.1 (41.6-48.7)
Friday	45.7 (34.0-57.5)	98.4 (89.9-106.9)	39.0 (36.4-41.6)
Saturday	34.7 (27.0-42.3)	58.6 (54.2-63.0)	33.9 (31.3-36.6)
Sunday	44.0 (34.4-53.7)	83.6 (76.0-91.2)	42.9 (39.7-46.2)

Mean and 95 CI, ANOVA tests $p < .05$

Figure 5. Weekly Wikipedia traffic for articles on other health topics (Paper 4)



Mean and 95 CI, ANOVA tests $p < .05$

Wikipedia searches on non-health topics

The two Wikipedia articles on the celebrities Lionel Messi and Justin Bieber also had their lowest peaks on Saturdays and the highest peaks on Tuesdays (for Justin Bieber), and Tuesdays and Wednesdays (for Lionel Messi). Obtained ANOVA values were $[F(6,904) = 2.37, p=0.028]$ for Justin Bieber' article; and $[F(6,904) = 13.48, p=0.000]$ for Lionel Messi. There was a 45.6% reduction in the average number of queries between the day with the highest number of searches, and the day with the lowest hits, for the Lionel Messi article; and the decrease was 40.3% for the Wikipedia searches on Justin Bieber.

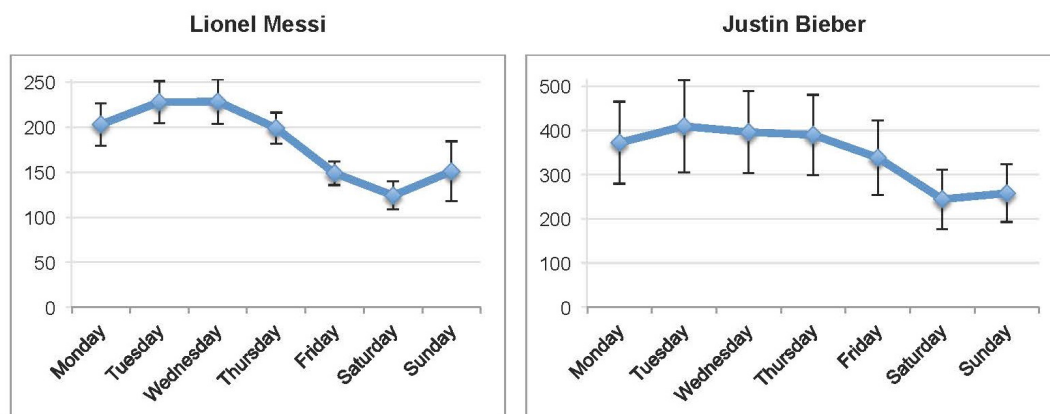
A summary of the daily searches for the two Wikipedia articles on non-health topics can be found in the Table 8 and Figure 6.

Table 8. Weekly Wikipedia traffic for articles on non-health topics (Paper 4)

	Lionel Messi	Justin Bieber
Monday	203.1 (179.3-226.5)	371.9 (279.3-464.6)
Tuesday	227.7 (204.5-250.9)	408.7 (304.5-512.9)
Wednesday	228.1 (203.4-252.9)	395.9 (303.1-488.7)
Thursday	199.1 (181.8-216.3)	389.8 (299.0-480.6)
Friday	148.8 (135.6-161.9)	337.8 (253.2-422.3)
Saturday	124.1 (108.4-139.9)	244.0 (176.8-311.2)
Sunday	151.0 (117.7-184.3)	258.1 (192.4-323.8)

Mean and 95 CI, ANOVA tests $p < .05$

Figure 6. Weekly Wikipedia traffic for articles on non-health related topics (Paper 4)



Mean and 95 CI, ANOVA tests $p < .05$

Additionally, significant differences were found on the average number of searches on Norwegian public holidays compared to the days after holidays, for HIV, AIDS, diabetes and Lionel Messi (Mann-Whitney U test, $p < .05$). Table 9 summarizes the mean and 95% CI of searches during public holidays and days after holidays.

Table 9. Wikipedia traffic on public holidays and days after public holidays (Paper 4)

	Public holidays n=37	Days after public holidays n=18	Mann-Whitney U test (2-tailed)
Sexual diseases			
Chlamydia	43.3 (29.3-57.3)	66.5 (31.9-101.1)	p=0.302
Gonorrhoea	17.7 (12.7-22.7)	22.1 (16.0-28.1)	p=1
Herpes	40.8 (33.5-48.1)	55.5 (37.3-73.7)	p=0.112
HIV	56.0 (47.8-64.2)	81.1 (63.0-99.2)	p=0.013
AIDS	41.4 (35.3-47.6)	61.2 (44.3-78.1)	p=0.028
Other health topics			
Influenza	41.4 (15.4-67.3)	81.9 (-17.6-184.5)	p=0.302
Diabetes	69.1 (58.8-79.3)	114.9 (78.0-151.9)	p=0.010
Menopause	38.2 (31.8-44.7)	44.5 (34.6-54.4)	p=0.240
Non health-related topics			
Lionel Messi	111.2 (85.1-137.3)	170.0 (118.6-221.4)	p=0.043
Justin Bieber	229.2 (123.1-335.3)	327.8 (134.3-521.4)	p=0.468

Mean and 95 CI, Mann-Whitney U test (2-tailed)

Discussion

1. Substantive issues

1.1. Paper 1 (Scoping Review)

RQ1: How have social media been used for sexual health promotion and sexual health education?

RQ2: What are the reported outcomes of social media use for sexual health promotion and sexual health education?

The Internet has been used for different purposes in the sexual health field for a long time (56, 199-210). The Internet and other ICTs have also been used for sexual health promotion, with beneficial results (55-64). Social media have an immense popularity worldwide (71). The benefits of social media have been demonstrated in some health fields (99), nevertheless, less is known about their potential for sexual health promotion. Some reviews have addressed this topic previously, however these reviews focused on specific groups or were performed when social media was still in its infancy, and none of the reviews in question included studies from non-governmental organizations (57, 59, 60, 62, 74, 78, 211).

Studies' methods and theoretical frameworks

Our literature review identified fifty-one sexual health promotion interventions carried out by healthcare professionals. These studies followed diverse methods, and most of them were classified as non-randomized intervention studies.

While some of the non-randomized studies only described the project reach and engagement in terms of visitors' rates or time spent by the users, some of the studies reported an effect on behaviour. The reported effects related to the sexual health promotion were increased intention to test or actual STIs testing, and other preventive behaviours, and even a reduction of STIs rates. The studies suggested that some people educated on sexual health through social media changed their behaviour. These results would support the idea that the more educated an individual or community is, the more likely it will take measures to preserve or improve health (98), and social media represent important channels to reach these individuals.

Four randomized studies, that could be considered as high-quality studies, also support the assumption that health education or health promotion through social media may benefit health outcomes. These randomized trials reported that participants assigned to intervention groups felt comfortable with sexual health topics on social media and were more likely to test for STIs (34, 35), or had a higher tendency to use condoms in the short term (80). However, other preventive behaviours, such as the completion of a HPV-vaccination schedule, did not benefit from reminders sent in several ways, including through social media channels (160).

Eight observational studies basically analysed the opinions of the study participants regarding the use of social media for sexual health promotion. These studies

reported mostly positive attitudes towards the use of social media, but also some concerns about stigmatization.

About a quarter of all these studies (n=14; 27.4%) reported an effect on behaviour as a consequence of the sexual health promotion. Although we might stipulate that all the included publications were carried out based on some sort of theoretical approach or model, only four of those studies referred explicitly to any theoretical framework. The Health Promotion Model, suggested by Pender at the end of the 80's (25), the Peer-delivered approach, also from the 80's (31), and Kelly's Opinion Leader model, proposed in 1991 (21), were the approaches explicitly reported in these publications. All these theoretical models were proposed about 20 years before the boom of the online social networks (70). It is necessary to reconsider whether the models that are being used, originally designed for an "offline" world, are still valid in the "online" sphere. Or, if the current digital society, with people that are actively involved in social media, responds similarly as the non-computerized society in which access to much health information was to a large extent restricted to doctors, nurses or other health professionals. New theoretical models on behavioural interventions through these new technologies should be formulated. It has been suggested that sexual health promotion interventions explicitly based on theoretical frameworks are related to better results (12, 212), therefore more studies explicitly using a theoretical framework (213), and also with more systematic methods, are needed. Existing theoretical frameworks that have demonstrated their usefulness in explaining behaviour in other medical fields with regard to the use of technology, such as the Social Cognitive Theory (18), could be validated for social media too, and specifically for sexual health education and STIs prevention. In order to further develop theory in the emerging field of sexual health promotion through social media, as in other research fields, it is necessary to have more studies explicitly reporting the models or theoretical approaches on which they are based.

Focus of the promotion and target population

Most of the publications included in this review targeted young people, and the nature of the sexual health promotion was typically general, or aiming to increase STI testing, which agrees with the higher rates of STIs among youth population (1, 2) and with the fact that young people are early adopters of new technologies (48, 214). In most of the studies targeting adults the main topic was a specific STI, usually HIV or AIDS.

Almost all the sexual health promotion projects (78.4%) were carried out in North-America, Europe, or Australia. The origin of these studies contrasts with the areas where the World Health Organization reports higher rates of STIs (Asia, Africa, and Central and South-America) (2), and where around 74% of all worldwide social media users belong (215). This discrepancy could be explained by the difference in the countries' economies, or social and cultural inequalities (216, 217).

Use of social media

Facebook, the exponentially increasingly popular social medium, which by January 2016 had over 1.5 billion of active users monthly (71), was the choice in almost 9 of every 10 studies (86.3%). The use of Facebook for sexual health promotion in our

review is higher than the 71% reported in a review from 2011, when this social media channel had “only” 500 million of users (211). Facebook, therefore, seems to become established among the public, and in sexual health promotion studies too.

Two approaches on social media use can be distinguished in this review. On the one hand, half of the publications considered or referred to social media as the core of the intervention, or as unique channel for the sexual health promotion. While the other half of the selected publications used social media as a resource supporting the main channel of the promotion.

There is little conclusive evidence, but promising initial results regarding social media use as the only channel for the sexual health promotion. The strongest evidence is supported by the three randomized studies that considered a social network as the unique channel for the promotion, all these projects reported positive results (34, 35, 80). In addition, six non-randomized studies that used social media as a tool supporting the sexual health promotion also found positive effects (81, 168, 170, 185, 190, 191). These studies could represent the first evidence on how to take advantage of democratized social media for promoting sexual health successfully.

1.2. Paper 2 (Case Study – Facebook campaign)

RQ3: Can a Facebook campaign be used to increase the number of visitors to a web-page with a sexual health promotion intervention?

This case study is an example of social media use for sexual health promotion in which these channels were considered as a resource supporting the promotion intervention, and allowed to increase the reach.

The main sexual health promotion was carried out through the website “sjekkdeg.no”, where sensitive topics were addressed by means of text, including explicit images, short educational videos, and a STIs symptom checker. The website was created in a way that guaranteed the anonymous interaction of the users, no personal data were collected, and the possibility of creating an avatar was offered to the visitors, so they could feel that their interaction with the system was even more anonymous.

To increase awareness on STIs among youth from North Norway, we drew on a Social marketing approach (26-28). The promotion consisted of an attractive and gamified educational site “sjekkdeg.no”, that was easily accessible through laptops, mobile phones, or tablet computers and was completely anonymous, and offered quality contents on sexual health. Website contents were elaborated based on Social constructivist learning theory (154). This theory explains that individuals’ new knowledge is constructed based on individuals’ own schemes, and with the interaction with and comparison to other individuals’ schemes. In this sense, sjekkdeg.no contents aimed at encouraging website users to compare their sexual health knowledge with the information provided on the site. Posters and two social media strategies were used to catch the attention of youth, and refer them to the educational site. At the moment that this project was carried out, the creation of a Facebook fan page was necessary in order to use the “Facebook advertisements”

functionality. The Facebook fan page of sjekkdeg.no, however entailed ethical concerns related to the users' privacy and confidentiality. If a social media user joined the fan page, intentionally or accidentally, his/her Facebook identity was automatically displayed on the project page, and also among all his/her friends and contacts on Facebook, with the potentially related stigma. With the use of Facebook advertisements, we were able to display a short message to our targeted audience individually. The advertisement included an attractive sentence aiming at catching the attention of youth, and provided the link to the website "sjekkdeg.no", so the recipients interested in the topic were able to access the site without compromising their privacy and confidentiality, as it has been recommended in the literature (124, 125, 149-152). However, the advertisement also offered individuals the possibility to "like" the fan page, which, as mentioned above, could reveal their identity. At the moment that this study was carried out, we considered that the display of identities would not be very harmful, because all sjekkdeg.no contents were exclusively educative, and the emblem of the University Hospital of North Norway was displayed explicitly everywhere (including on the Facebook fan page). According to a recent publication in which the Technology acceptance model was tested to predict responses to advertisements on social media (218), privacy and intrusiveness concerns, but not the perceived ease of use of the advertisement (i.e. linking directly to the fan page) would explain why users did visit the sjekkdeg.no page, but did not press the "like" button.

Social media, in this case Facebook, offered the possibility to reach hundreds of young people living in remote areas of Northern Norway, and let them know about an educational website to increase their knowledge about sexual health anonymously. In our assessment, this advantage compensated the potential risk that any of the recipients intentionally or accidentally pressed the "like" button, and therefore displayed and linked their identity to sexual health contents. Hundreds of website visitors, or sexual health promotion recipients, could potentially have increased their knowledge about sexual health, and very few displayed their identity on the Facebook fan page. However, in retrospect, other strategies could have been considered, such as "anonymous like-buttons" (219).

Impact of Facebook advertisements for sexual health promotion

Most of the sexual health promotion interventions on social media aim to change users' behaviour. However, researchers might face difficulties with using some sexual contents for educational purposes (i.e. images), as most of the social networks ban these contents. Nevertheless, the efficacy of computer-based technologies for sexual health promotion and STIs prevention has been demonstrated in two meta-analyses (56, 57), and in our updated scoping review the first evidence of the positive effects of social media channels for promoting sexual health are shown (220). The social media approach seems to be a promising strategy, especially to reach youngest populations, either if they are intentionally searching for sexual health information or if they accidentally find it. This is especially relevant in countries like Norway, where Internet access is almost universal, and 92% of young people have reported using social networks (221).

The Facebook advertisements campaign that run for 1 month, and had a cost of 3000 NOK, seems to be the main reason explaining the 1263 website visitors during

that month. This ads campaign promoting an educational site where users were asked to access online contents appears to be more effective than campaigns where the users are asked to do something in the offline world. As an example, an Australian study that spent 1408 AUD (about 8900 NOK) on Facebook advertisements for the recruitment for sexual health services only managed to enrol 318 users in 2 years (222).

In our case, about a third of all the visitors that the site had along the year were counted during the advertisements campaign. During the advertisements campaign, the site received a mean of 42 visits daily, six times more than the average of visitors that the site had along the year (excluding the Facebook advertisements period). This increase of website visitors might be explained by young social media users that were not deliberately searching for sexual health information, but their attention was caught through the Facebook advertisement. Hypothetically, this could mean that a 1-year advertisements campaign (with a cost of 36000 NOK) could have recruited more than 15000 new site visitors in one year, i.e. “information discoverers”, or individuals in precontemplation phases (16, 17), from North Norway. This large number of potential new site visitors represents the individuals who potentially could benefit from the sexual health promotion, and therefore (hypothetically) could be more likely to preserve or improve their sexual health (56, 57, 98). Nowadays, sjekkdeg.no is still a functioning website. Since its launch, and until the end of November 2016, it has received over 14.000 visitors that might have improved their knowledge about STIs.

Sexual health promotion for youth

The use of social media for promoting sensitive topics among youth appears to be controversial, due to the high level of self-disclosure in these media (223). On the one side, the literature shows that youth try to avoid parents or adults monitoring their activities (224), which might occur in online social media environments, where youth and adults coexist (225) and they know their actions on social media will be available to other users in the network. Young people are aware of the importance of online reputation and its risks (226), therefore, their disclosing behaviour on the social networks respond mostly to a rational and intended process, in response to their willingness and intentions (227).

This avoidance of parenting control, combined with intentional self-disclosure might explain the discrepancy between the low numbers of “likes” received on the Facebook fan page, and the high numbers of website visitors identified as being referred by Facebook.

On the other side, another study reported that young people are open to receive sexual health information, but they have privacy concerns regarding sharing this information in their own social networks (129). The same way it happens in offline settings, people choose to discuss or stay silent under specific subjects on the online social media. This phenomenon is known as a “spiral of silence” (228), and it might explain why youth are afraid of being connected to sensitive contents on social media, such as sexual health. In our case, the amount of youth visiting the educational website on sexual health being referred by Facebook, but deliberately avoiding pressing the “like” button on Facebook, could be interpreted as a sign of the “spiral of silence”. As the users know that when they press the “like” button, the

information will appear in their “Timeline”, and therefore other users in their social network will be notified. However, the low numbers of “likes” on the fan page, could also be interpreted as youth checking the website but disliking it; or that they actively boycotted the Facebook fan page. Nevertheless, the 35 likes in 1 month that the fan page of this study received is comparable to the low numbers of fans reported by other studies; i.e. 2 fans in 5 months (94) or 50 fans in 5 months (182). Another study targeting gay people specifically was more successful, and received 2929 fans in 1 year (180).

All these factors stress the idea that when promoting activities aiming to reach young people one should be especially cautious of protecting the privacy and anonymity of the targeted audience, and particularly so when the promotion interventions are on sensitive topics such as sexual health (124, 126, 229, 230).

1.3. Paper 3 (on Twitter)

RQ4: What can be understood about the nature of information on two different STIs available on Twitter, by examining a sample of tweets?

RQ5: What can we learn about the actors involved in the online debate about two different STIs on Twitter, by examining a sample of tweets?

In this observational study, we extracted all messages posted on Twitter regarding two sexually transmitted diseases (chlamydia and HIV) during two separate weeks. This method allowed us to get a picture of the nature of the messages that were shared on one of the most popular social media (Twitter) during the study period, as well as information about the authorship of these posts. The analysis of the sample of messages on chlamydia and HIV shared on Twitter revealed that although most of the tweets had a serious content, some Twitter users joked about chlamydia. Containment and prevention of such information should be an important topic in any public health agenda.

By observing a sample of tweets on STIs, we were also able to notice that a third of the messages posted on Twitter came from individual users, and over a quarter from the general media. This observation supported the idea that health professionals who could be taking advantage of the online debate on chlamydia and HIV to promote sexual health, may be underrepresented on this social network,

Regarding the ethical considerations on the privacy of individuals, due to the difficulties of obtaining informed consent from the many social media users discussing these topics, in this study, all the extracted identifiable information was coded into categories for the data analysis, according to the recommendations in the literature (124, 125, 149-152). Although we extracted contents that could be considered private by some scholars, no personal details that could identify individual users were displayed in the study.

STIs on Twitter: Jokes and serious content

In the study, about 9 of every 10 tweets on STIs had a serious content, mostly focusing on HIV, and was tweeted mostly by news and scientific organizations and individuals, with a logo as avatar and was easily identifiable. Almost all the re-tweets had a serious content.

In this study, three of every four joke tweets were about chlamydia. Jokes were frequently posted by individual users, with a human image as avatar, and using non-identifiable accounts (i.e., anonymously). These jokes on chlamydia could be understood as a disinhibited behaviour favoured by the fact that Twitter allows users to interact anonymously. Previous studies have reported high levels of disinhibition in online users acting anonymously, due to the option of separating their behaviour online from their offline identity (231, 232). However, only serious tweets about chlamydia received more than one re-tweet.

Twitter users' behaviour

The disproportion of serious and jokes tweets and their amount of re-tweets might be interpreted as an effect of the group norms, as explained in the Social-identity model of deindividuation effects (SIDE) (233) in which group members, in this case Twitter users, tend to follow social norms in anonymity environments (234, 235). The disparity of jokes on both STIs could also be understood as the Twitter community accepts as tolerable jokes on chlamydia, but that jokes on HIV are inadmissible, maybe due to the different severity of the diseases (236), or the stigma attached to them, or other reasons.

Twitter as a source of sexual health information

As other social media, and ICT in general, Twitter represents a source of information for health information seekers. Individuals use Twitter because it is easy to use and it is perceived as useful, in line with the presumptions of the Technology Acceptance Model (111). But people also use Twitter because they have fun with it (237). Moreover, Twitter users might interact with the information available on this channel, in a comparable manner to Ellis' descriptions of information seeking patterns among social scientists (112). However, Twitter might represent a source of trustable health information for their users, but also for distorted or misguided health information (130, 131, 238, 239). And this information available on Twitter might affect individuals' intentions and actions, according to the Health Belief Model (110), a notion that was suggested in a recent study (240). Because information of any nature can spread very quickly on social media (130-132), and potentially affect social media users' decisions (131, 132, 234), reliable sources of information (governmental departments, and health and academic institutions) should be more active on these channels.

Governmental and health institutions have some presence on Twitter, and they share information on STIs, but the information mostly focuses on HIV. Because Twitter and other social media could represent sources of sensitive information for difficult to reach populations, such as youth, people living in remote areas, or disadvantaged social groups, governmental and health authorities should be more active on these media, and on more diverse sexual health topics, in order to promote preventive measures. Vacation periods, such as August, with higher levels of sexual risk

behaviours (241), might potentially represent especial opportunities for educating Twitter users on STIs prevention.

1.4. Paper 4 (Wikipedia)

RQ6: What can we learn about the temporal pattern of information searching regarding STIs by examining a sample of searches on Wikipedia?

With this observational study, we were able to observe how online information-seeking behaviour on the most popular wiki (Wikipedia) followed a weekly pattern. This study increased the evidence regarding the existence of online health information-seeking patterns. Because Wikipedia is one of the most used sources of online information, information-seeking patterns performed on this medium might be considered a reflection of online information-seeking behaviours on other online channels. Recognizing when people tend to search for sexual health information on Wikipedia, and therefore when people seem to be more open to increase their sexual health literacy, could be relevant for healthcare professionals carrying out sexual health promotions.

Because we only tracked information on the number of hits per day per article on Wikipedia, and this information was completely anonymous, the study did not involve any ethical challenges.

Study 4 suggested that people who actively searched for information on Wikipedia had a weekly pattern in their information seeking-activities. The weekly pattern was found for all the tracked articles, and had the highest peak at the beginning of the week (mostly Mondays and Tuesdays), and the lowest peak on Saturdays.

Previous studies have reported that people search for health information in response to their own or their family members' health concerns (242-244). These information-seeking behaviours can condition individuals' decisions, as suggested by the Health Beliefs Model (110), and therefore it may be linked to better health (108). When people search for health information online, they prefer easy-accessible sites, which are perceived as reliable, and that are simple to use (105, 106). Wikipedia would represent one of technologies that, according to the Technology Acceptance Model, is adopted due to its perceived utility and ease of use (111). Wikipedia would respond to online health information seekers' preferences, as it is very accessible (appears on first page results of Internet searches), its contents are trusted, even by healthcare experts (103, 245, 246), and it is very easy to use.

As on other social media, it is still not well known how users interact with the information available on Wikipedia, how they seek for health information, or their motivations for doing it. Ellis' Behavioural Model proposed the existence of eight information searching patterns based on how social scientists behave (starting; chaining; browsing; differentiating; monitoring; extracting; verifying; and ending) (112). However, it is not known if sexual health-information seekers on Wikipedia

would follow the same searching patterns as social scientists. It is not known either why people search for sexual health information on social media. Wikipedia users might be individuals who are aware of sexual health risks and that by searching for health information could increase their knowledge, and could get ready for a behaviour change. These cases could be considered as individuals in a contemplation phase, or posterior phases, according to the Transtheoretical model of behaviour change (16, 17). But Wikipedia users could also be individuals who are not aware of potential sexual health risks. These individuals could have landed on Wikipedia's sexual health information articles by pressing links from other websites, from other Wikipedia articles, or also by pressing Wikipedia's "Random article" option. According to the Transtheoretical model, these individuals could be considered to be in a precontemplation phase, and by being informed they could increase their intentions of changing behaviour (16, 17). Wikipedia users could benefit by reading appropriate sexual health and STIs contents, no matter the information searching pattern they follow, if they are intentionally searching for STIs information or if they discover the information by chance. Health care professionals and authorities could benefit from Wikipedia's excellent Web positioning and use Wikipedia to provide trustable information to patients and the general public.

Early week information-seeking behaviour

A seven-days cycle has previously been described in studies analysing online health information-seeking behaviour (114-116, 118-120). This weekly pattern, with higher peaks at the beginning of the week, can be understood as an attempt to compensate wrong choices made during the weekend (114-116), and can also be interpreted as a "fresh start" or new and healthy start of the week (118-120). This information-seeking weekly pattern could respond to a higher motivation to learn at the beginning of a temporal landmark, such as the week' commencement, which will go in line with the "fresh start" effect (120, 247). In our case, the mean number of searches at the beginning of the week was higher than on days after public holidays, suggesting that the week effect prevails over other temporal landmarks. These high peaks at the beginning of the week were found for all the tracked terms, including the STIs terms (chlamydia, gonorrhoea, herpes, HIV, and AIDS).

It is not possible to determine why information-seeking behaviours seem to be organized in seven-days cycles or if these behaviours are new habits related to the emergence of the information and communication technologies. However, the results suggest that the weekly pattern responds to a general online information-seeking behaviour, not specifically related to health information; and this pattern could apply to all age groups (i.e. most queries on "Justin Bieber" were probably performed by teenagers and most of the searches on "Menopause" could have been done by middle-aged people). A more recent study also suggests that this weekly pattern could be related to specific languages or cultures (248).

Our findings could benefit health campaigns and other stakeholders aiming at reaching large populations. As people seem to be more motivated for learning at the beginning of the week, online health promotions on these days could potentially have a higher impact.

2. Strengths and limitations

The objectives of this PhD thesis were to investigate the use and outcomes of social media use for sexual health promotion and to increase knowledge about the nature of the information that was shared in a sample of messages on social media about sexually transmitted infections, the actors involved in these online debates, and the patterns of online sexual health information-seeking. With the four studies included in the thesis I have met these objectives and answered the related research questions.

With the review (Paper 1), the knowledge about how social media are used for sexual health promotion, in both scientific studies and non-academic environments, has been increased. The search terms, language, and inclusion criteria might have limited the number of publications considered in this review, and also influenced the results and conclusions. Although the search covered several databases and online resources, and most of the evidence has probably been identified, we might have missed relevant studies or projects that could lead to different views or conclusions. The small number and heterogeneity nature of the studies included in the review did not allow for providing effect sizes of the interventions.

Further reviews will benefit from including more grey literature, and by expanding the search queries to other languages.

The case study (Paper 2) is a good example of how social media can be used for promoting sexual health sites successfully. In our case, the web analytics points to Facebook advertisements as an effective channel for recruiting visitors to a sexual health website. However, the evidence on the website use is difficult to attribute specifically to any of the three used strategies, or other external factors. Other events beyond our control could also have had an impact on the visitor rates.

We chose Facebook due to its popularity (71), and it seemed to have a positive effect on the visitor rates. However, additional social media could have been considered. Twitter and Instagram are raising in popularity (71), and teens have reported increased enthusiasm for these channels (225). To avoid concerns linked to the use of social media (223), instead of a fan page, or Facebook advertisements inviting to “like” the fan page, other strategies could be considered.

With this sexual health promotion intervention, we reached a high number of people, and these people were exposed to educational content aiming at preventing STIs. However, we cannot know if the intervention resulted in actual behaviour change.

The study on Twitter (Paper 3) makes evident that many Twitter users take an interest in sexual health topics. This study also showed that not all the sexual health content on Twitter has a serious tone. However, most of the jokes related to sexual health or STIs that we identified in the study came from individual users and users with anonymous accounts.

Moreover, the limited time period tracked (two non-consecutive weeks), as well as the terms and language chosen might not be representative of the discussion on Twitter about these STIs. Further research studies might broaden the time frame, and the scope by including additional sexual health topics and related hashtags in their search engines; searching tweets in other languages; and considering analyzing debates in other social media channels.

The study on Wikipedia (Paper 4) shows when people are more aware of sexual health topics on social media. The study confirms that people tend to organize their information-seeking activities on sexual health topics following a weekly pattern, also when the information is searched on social media. Unexpectedly, we also detected that other searches on social media, health- and non-health related, seem to follow a weekly pattern too. Wikipedia was considered for this study, because it is one of the main sources of information online (158, 159). However, we tracked only the number of queries on 10 articles performed in the Norwegian language. Our findings might not apply to searches performed in other languages or cultures. Because the searches in Wikipedia are anonymous, it was not possible to identify sociodemographic features that could have an effect on information-seeking behaviour. Although Wikipedia is a social media, most of its consumers use it as if it were an encyclopaedia, therefore it is possible that our findings might not be extrapolated to other online social networks.

3. Future directions

More studies using social media for sexual health promotion are needed

There is not enough evidence yet on the value of social media for sexual health promotion or sexual health education. More studies with strong study designs and anchored in theoretical frameworks are clearly needed to move this field forward. Sexual health promotion studies should be expanded to developing countries, include more age groups, and be expanded to other sexual health topics, such as birth control options, pregnancy, abortion, or female circumcision.

Online intervention studies should explore the effect of the sexual health promotion delivered on days when it has been suggested that people are more active on their online information-seeking behaviour.

A theoretical framework on behavioural interventions through new technologies should be formulated

New technologies and social media are continuously evolving, new channels appear and disappear continually, and the most popular ones incessantly keep changing their appearance, functionalities, and possibilities in an effort to further increase their popularity, and certainly their business. Due to their continuous evolution, and the relatively recent use of these new technologies for sexual health promotion, a strong theoretical framework has not yet been formulated specifically for this field. However, as the evidence on the value of social media and new technologies for sexual health promotion is growing, the development of a theory or model framing the use of social media for this purpose is required. A theoretical framework explaining mechanisms, techniques, occasions, and media that work better for different populations for promoting sexual health will help to move this field forward.

More healthcare professionals involved and active on social media

When people search for a topic on social media, they can find information of varying quality. Healthcare professionals have the possibility to provide trustable information, and to correct misinformation. In order to raise the quality of the information available on these media, there is a need for more involvement on social media from healthcare authorities and institutions and from healthcare professionals.

At the present time, health professionals and authorities are underrepresented in social media. In order to increase their presence on these channels, these professionals have to be confident in how to use them, and to know what the ethical, moral and legal implications of their use are. This learning might be achieved if medical and nursing faculties and schools include teaching and training on social media, and other new ICTs in their curricula, as other institutions have recommended (140, 141).

To enhance the benefits for healthcare professionals and users, and also to reduce potential risks related to sexual health information on social media, ethics guidelines on how to use these media for health promotion are needed.

Conclusions

We still do not know the full potential of promoting sexual health through the fast and continuously evolving social media. These media are already engaging over 2 billion users worldwide, and their popularity keeps growing day after day. Although the most popular social networks were not designed for health promotion purposes, their widespread acceptance makes these channels unique for this purpose. However, it is necessary to deal with some ethical and moral considerations, and healthcare professionals have to weigh the potential risks and benefits of a sexual health promotion through these channels.

Health promoters in the sexual health field have an unprecedented opportunity to reach a large part of the population through social media, and thereby empower them to improve their health. However, these sexual health interventions have to deal with new ethical and moral challenges. In addition to keeping privacy and confidentiality, as in all communication between healthcare professionals and patients, sexual health promotions through social media should take into account issues such as the possible manipulation of identities, misinformation, misuse or misinterpretation of information, usability of these channels or probable changes in their policies and functionalities, as well as other unintended consequences due to publically available information and profiles. Dealing with the conventional ethical issues of sexual health promotion plus the new ones that have appeared with the use of social media is possible, and the amount of evidence supporting the use of social media for health promotion is growing.

So far, relatively few studies with strong study designs have used these channels for promoting sexual health. Most of the studies have focused on sexual health

promotion in general, targeted youth, used Facebook, and had been carried out in developed countries. Most of these studies have found an increased reach and engagement linked to the sexual health promotion through social media. Some of these studies showed how sexual health promotion through social media could change individuals' behaviours. This evidence supports the idea that the more knowledgeable an individual is, the more likely he or she will take measures to preserve or improve his or her own health. The literature suggests that social media may represent promising channels to reach and educate individuals on sexual health. However, the existing evidence is still very limited, and more studies with stronger study designs and anchored in updated theoretical frameworks are needed in order to prove that these networks are valuable in promoting sexual health and move this field forward.

The observation and monitoring of online behaviours on social media offers the possibility of identifying the sexual health concerns, interests, misinformation, attitudes, or information-seeking patterns on online communities. Subsequently, this knowledge might be of importance for health promotion work on social media.

The process of obtaining data proving that quality information on sexual health delivered through social media has an effect on behaviour has just started. However, because social media are democratized systems where everybody can publish contents, both health information-seekers, and health information discoverers can find a wide-ranging quality of sexual health information on these channels. Although it seems that social media users' community tend to reinforce and promote factual information versus distorted information, more professional healthcare presence in social media is needed to increase the proportion of quality content.

People that actively seek for health information on social media seem to search for sexual health information following a weekly pattern. The highest peak of queries is found at the beginning of the week, and mostly on Tuesdays, and the lower peak is on Saturdays. Sexual health promotion campaigns could benefit by carrying out the promotion on the days where it is known that people are more aware of and more interested in sexual health-related information. Sexual health promotion interventions on social media that are carried out during days and occasions when people more frequently seek for information, could possibly maximize the impact of the promotion.

Disseminating trustable information through social media seems to improve the impact of sexual health promotion campaigns, to help to increase people' knowledge about sexual health, and can potentially change peoples' behaviour, and thereby improve their health. However, at the moment, healthcare professionals and institutions are underrepresented on social media, and their involvement in the online debate about sexual health is currently very limited. Healthcare professionals and healthcare institutions aiming at empowering community members regarding sexual health could have a more active role on social media. While dealing with ethical issues of social media use for sexual health promotion, health professionals and authorities would benefit from disseminating quality information, correcting misinformation, and promoting sexual health through social media.

References

1. Newman L, Rowley J, Vander Hoorn S, Wijesooriya NS, Unemo M, Low N, et al. Global Estimates of the Prevalence and Incidence of Four Curable Sexually Transmitted Infections in 2012 Based on Systematic Review and Global Reporting. *PLoS One*. 2015;10(12):e0143304.
2. World Health Organization. Global Strategy for the prevention and control of sexually transmitted infections: 2006-2015 2007 [1st December 2016]. Available from: <http://www.who.int/reproductivehealth/publications/rtis/9789241563475/en/>.
3. World Health Organization. Draft global health sector strategy on sexually transmitted infections, 2016–2021. 2015 [1st December 2016]. Available from: <http://www.who.int/reproductivehealth/STIs-global-strategy-Dec2015.pdf?ua=1>.
4. Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2015;386(9995):743-800.
5. World Health Organization. HIV/AIDS 2015 [1st December 2016]. Available from: <http://www.who.int/mediacentre/factsheets/fs360/en/>.
6. World Health Organization. HIV / AIDS 2016 [1st December 2016]. Available from: <http://www.who.int/immunization/topics/hiv/en/index1.html>.
7. Lawn JE, Blencowe H, Waiswa P, Amouzou A, Mathers C, Hogan D, et al. Stillbirths: rates, risk factors, and acceleration towards 2030. *Lancet*. 2016;387(10018):587-603.
8. Silver BJ, Guy RJ, Kaldor JM, Jamil MS, Rumbold AR. *Trichomonas vaginalis* as a cause of perinatal morbidity: a systematic review and meta-analysis. *Sex Transm Dis*. 2014;41(6):369-76.
9. World Health Organization. What is health promotion? 2016 [1st December 2016]. Available from: <http://www.who.int/features/qa/health-promotion/en/>.
10. World Health Organization. Health education: theoretical concepts, effective strategies and core competencies 2012 [1st December 2016]. Available from: http://applications.emro.who.int/dsaf/EMRPUB_2012_EN_1362.pdf.
11. Diez E, Juarez O, Villamarin F. Health promotion interventions based on theoretical models. *Med Clinica*. 2005;125(5):193-7.
12. Albarracin D, Gillette JC, Earl AN, Glasman LR, Durantini MR, Ho MH. A test of major assumptions about behavior change: a comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. *Psychological bulletin*. 2005;131(6):856-97.
13. Evans WD. How social marketing works in health care. *BMJ*. 2006;332(7551):1207-10.
14. Turner G, Shepherd J. A method in search of a theory: peer education and health promotion. *Health Educ Res*. 1999;14(2):235-47.
15. Wilton T, Keeble S, Doyal L, Walsh A. The effectiveness of peer education in health promotion: theory and practice. Bristol: University of West England, South and West Regional Health Authority; 1995.
16. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: Toward an integrative model of change. *J Consulting Clin Psych*. 1983;51:390-5.

17. Prochaska JO, DiClemente CC. Trans-theoretical therapy - toward a more integrative model of change. *Psychother Theo Res Pract.* 1982;19(3):276-88.
18. Bandura A. *Social foundations of thought and action: a social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall; 1986.
19. Kelly J, Murphy D, Sikkema K, McAuliffe T, Roffman R, Solomon L, et al. Randomised, controlled, community-level HIV-prevention intervention for sexual-risk behaviour among homosexual men in US cities. *Community HIV Prevention Research Collaborative. Lancet.* 1997;350(9090):6.
20. Kelly JA. Popular opinion leaders and HIV prevention peer education: resolving discrepant findings, and implications for the development of effective community programmes. *AIDS Care.* 2004;16(2):139-50.
21. Kelly JA, St Lawrence JS, Diaz YE, Stevenson LY, Hauth AC, Brasfield TL, et al. HIV risk behavior reduction following intervention with key opinion leaders of population: an experimental analysis. *Am J Public Health.* 1991;81(2):168-71.
22. Kelly JA, St. Lawrence JS, Stevenson LY, Hauth AC, Kalichman SC, Diaz YE, et al. Community AIDS/HIV risk reduction: the effects of endorsements by popular people in three cities. *Am J Public Health* . 1992;82:1483-89.
23. Pender N. *Health promotion in nursing practice.* Nolvalk, CT: Appleton & Lange; 1996.
24. Pender NJ. *Health Promotion Model Manual* Michigan, IL: University of Michigan; 2011 [1st December 2016]. Available from: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/85350/HEALTH_PROMOTION_MANUAL_Rev_5-2011.pdf.
25. Pender NJ, Walker SN, Sechrist KR, Stromborg MF. Development and testing of the Health Promotion Model. *Cardio-vascular nursing.* 1988;24(6):41-3.
26. Cugelman B, Thelwall M, Dawes P. Online interventions for social marketing health behavior change campaigns: A meta-analysis of psychological architectures and adherence factors. *J Med Internet Res.* 2011;13(1):e17.
27. Andreasen AR. Social Marketing: Its definition and domain. *J Public Policy Marketing.* 1994;13(1):108-14.
28. Cheng H, Kotler P, Lee NR. *Social Marketing for Public Health: An Introduction* 2011 [1st December 2016]. Available from: http://samples.jpub.com/9780763757977/57977_ch01_final.pdf.
29. Phillipson L, Gordon R, Telenta J, Magee C, Janssen M. A review of current practices to increase Chlamydia screening in the community--a consumer-centred social marketing perspective. *Health Expect.* 2016;19(1):5-25.
30. Wei C, Herrick A, Raymond HF, Anglemyer A, Gerbase A, Noar SM. Social marketing interventions to increase HIV/STI testing uptake among men who have sex with men and male-to-female transgender women. *Cochrane Database Syst Rev.* 2011(9):Cd009337.
31. EPPI-Centre. *A review of the effectiveness and appropriateness of peer-delivered health promotion interventions for young people:* University of London; 1999 [1st December 2016]. Available from: http://eppi.ioe.ac.uk/cms/Portals/0/PDF_reviews_and_summaries/peer-delivered_health_promotion.pdf?ver=2006-03-02-124546-933.
32. Maticka-Tyndale E, Barnett JP. Peer-led interventions to reduce HIV risk of youth: a review. *Evaluation and program planning.* 2010;33(2):98-112.
33. Lazarus JV, Sihvonen-Riemenschneider H, Laukamm-Josten U, Wong F, Liljestrand J. Systematic review of interventions to prevent the spread of

- sexually transmitted infections, including HIV, among young people in Europe. *Croatian medical journal*. 2010;51(1):74-84.
34. Young SD, Harrell L, Jaganath D, Cohen AC, Shoptaw S. Feasibility of recruiting peer educators for an online social networking-based health intervention. *Health Educ J*. 2013;72(3):276-82.
 35. Young SD, Holloway I, Jaganath D, Rice E, Westmoreland D, Coates T. Project HOPE: online social network changes in an HIV prevention randomized controlled trial for African American and Latino men who have sex with men. *Am J Public Health*. 2014;104(9):1707-12.
 36. Fuller R, Carter K. Peer education in practice: an example of a youth-led sexual health program. *STI & HIV World Congress 2015*.
 37. Grimley DM, Prochaska JO, Velicer WF, Prochaska GE. Contraceptive and condom use adoption and maintenance: a stage paradigm approach. *Health education quarterly*. 1995;22(1):20-35.
 38. Chacko MR, Von Sternberg K, Velasquez MM. Gonorrhea and chlamydia screening in sexually active young women: the processes of change. *J Adolesc Health*. 2004;34(5):424-7.
 39. Chacko MR, Wiemann CM, Kozinetz CA, von Sternberg K, Velasquez MM, Smith PB, et al. Efficacy of a motivational behavioral intervention to promote chlamydia and gonorrhea screening in young women: a randomized controlled trial. *J Adolesc Health*. 2010;46(2):152-61.
 40. Kasowitz AR, McCusker M, Coury-Doniger P, Neal WP, Indyk D, Burk RD, et al. Stage of change behavioral assessment tool fails to predict the prevalence of chlamydia in an urban adolescent health clinic. *J Pediatr Adolesc Gynecol*. 2006;19(4):277-83.
 41. Peipert JF, Redding CA, Blume JD, Allsworth JE, Matteson KA, Lozowski F, et al. Tailored intervention to increase dual-contraceptive method use: a randomized trial to reduce unintended pregnancies and sexually transmitted infections. *American journal of obstetrics and gynecology*. 2008;198(6):630.e1-8.
 42. Wariki WM, Ota E, Mori R, Koyanagi A, Hori N, Shibuya K. Behavioral interventions to reduce the transmission of HIV infection among sex workers and their clients in low- and middle-income countries. *Cochrane Database Syst Rev*. 2012(2):Cd005272.
 43. Ko N, Hsieh C, Wang M, Lee C, Chen C, Chung A, et al. Effects of Internet popular opinion leaders (iPOL) among Internet-using men who have sex with men. *J Med Internet Res*. 2013;15(2):e40.
 44. Jones K, Baldwin KA, Lewis PR. The potential influence of a social media intervention on risky sexual behavior and Chlamydia incidence. *J Community Health Nurs*. 2012;29(2):106-20.
 45. International Telecommunications Union. *ICT Facts & Figures. The world in 2015 2015* [1st December 2016]. Available from: <http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf>.
 46. Perrin A, Duggan M. *Americans' Internet Access: 2000-2015: PewResearchCenter; 2015* [1st December 2016]. Available from: <http://www.pewinternet.org/2015/06/26/americans-internet-access-2000-2015/>.
 47. Office for National Statistics. *Statistical bulletin: Internet Users, 2015 2015* [1st December 2016]. Available from: http://www.ons.gov.uk/ons/dcp171778_404497.pdf.

48. Lenhart A. Teens, Social Media & Technology Overview 2015: PewResearchCenter; 2015 [1st December 2016]. Available from: <http://www.pewinternet.org/2015/04/09/teens-social-media-technology-2015/>.
49. PewResearchCenter. Internet Seen as Positive Influence on Education but Negative on Morality in Emerging and Developing Nations Internet Usage More Common Among the Young, Well-Educated and English Speakers 2015 [1st December 2016]. Available from: <http://www.pewglobal.org/files/2015/03/Pew-Research-Center-Technology-Report-FINAL-March-19-20151.pdf>.
50. Oyeyemi SO, Wynn R. The use of cell phones and radio communication systems to reduce delays in getting help for pregnant women in low- and middle-income countries: a scoping review. *Global health action*. 2015;8:28887.
51. Oyeyemi SO, Gabarron E, Wynn R. Ebola, Twitter, and misinformation: a dangerous combination? *BMJ*. 2014;349:g6178.
52. Wynn R, Kwabia E, Osei-Bonsu F. Internet-based provider-patient communication in Ghana: recent findings. *Int J Integr Care*. 2016:(In press).
53. Borycki EM, Househ MS, Kushniruk AW, Nøhr C, Takeda H. Empowering Patients: Making Health Information and Systems Safer for Patients and the Public. Contribution of the IMIA Health Informatics for Patient Safety Working Group. *Yearb Med Inform*. 2012;7:56-64.
54. Bjørnes CD, Laursen BS, Delmar C, Cummings E, Nøhr C. Online social support as an opportunity. *Nordisk Sygeplejeforskning*. 2015;2(2):179-92.
55. Swanton R, Allom V, Mullan B. A meta-analysis of the effect of new-media interventions on sexual-health behaviours. *Sex Transm Infect*. 2015;91(1):14-20.
56. Noar S, Black H, Pierce L. Efficacy of computer technology-based HIV prevention interventions: a meta-analysis. *AIDS*. 2009;23(1):107-15.
57. Bailey J, Murray E, Rait G, Mercer C, Morris R, Peacock R, et al. Computer-based interventions for sexual health promotion: systematic review and meta-analyses. *Int J STD AIDS*. 2012;23(6):408-13.
58. Portnoy DB, Scott-Sheldon LA, Johnson BT, Carey MP. Computer-delivered interventions for health promotion and behavioral risk reduction: a meta-analysis of 75 randomized controlled trials, 1988-2007. *Preventive medicine*. 2008;47(1):3-16.
59. Bailey JV, Murray E, Rait G, Mercer CH, Morris RW, Peacock R, et al. Interactive computer-based interventions for sexual health promotion. *Cochrane Database Syst Rev*. 2010;9:CD006483.
60. Guse K, Levine D, Martins S, Lira A, Gaarde J, Westmorland W, et al. Interventions using new digital media to improve adolescent sexual health: a systematic review. *J Adolesc Health*. 2012;51(6):535-43.
61. Jones K, Eathington P, Baldwin K, Sipsma H. The impact of health education transmitted via social media or text messaging on adolescent and young adult risky sexual behavior: a systematic review of the literature. *Sex Transm Dis*. 2014;41(7):413-9.
62. Schnall R, Travers J, Rojas M, Carballo-Diequez A. eHealth interventions for HIV prevention in high-risk men who have sex with men: a systematic review. *J Med Internet Res*. 2014;16(5):e134.
63. Kang M, Skinner R, Usherwood T. Interventions for young people in Australia to reduce HIV and sexually transmissible infections: a systematic review. *Sex Health*. 2010;7(2):107-28.

64. Desmet A, Shegog R, Van Ryckeghem D, Crombez G, De Bourdeaudhuij I. A Systematic Review and Meta-analysis of Interventions for Sexual Health Promotion Involving Serious Digital Games. *Games Health J.* 2015;4(2):78-90.
65. Obar J, Wildman S. Social media definition and the governance challenge: An introduction to the special issue. *Telecom Policy.* 2015;39(9):745-50.
66. Boyd D, Ellison N. Social network sites: definition, history, and scholarship. *J Comput Commun.* 2007;13(1):210-30.
67. Grajales F Jr, S S, Ho K, Novak-Lauscher H, Eysenbach G. Social media: a review and tutorial of applications in medicine and health care. *J Med Internet Res.* 2014;16(2):e13.
68. Syed-Abdul S, Gabarron E, Lau AYS, Househ M. An introduction to participatory health through social media. In: Syed-Abdul S, Gabarron E, Lau AYS, editors. *Participatory Health Through Social Media*: Elsevier; 2016.
69. Harris A. Facebook: The company and its founders. *Pioneers T*, editor. North Mankato, Minnesota (USA): ABDO Publishing Company; 2013.
70. The Statistics Portal. Number of social media users worldwide from 2010 to 2020 (in billions) 2016 [1st December 2016]. Available from: <https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/>.
71. The Statistics Portal. Leading social networks worldwide as of January 2016, ranked by number of active users (in millions) 2016 [1st February 2016]. Available from: <http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users>.
72. Neiger BL, Thackeray R, Burton SH, Giraud-Carrier CG, Fagen MC. Evaluating social media's capacity to develop engaged audiences in health promotion settings: use of Twitter metrics as a case study. *Health Promot Pract.* 2013;14:157-62.
73. Neiger BL, Thackeray R, Van Wagenen SA, Hanson CL, West JH, Barnes MD, et al. Use of social media in health promotion: purposes, key performance indicators, and evaluation metrics. *Health Promot Pract.* 2012;13:159-64.
74. Yonker L, Zan S, Scirica C, Jethwani K, Kinane T. "Friending" teens: systematic review of social media in adolescent and young adult health care. *J Med Internet Res.* 2015;17(1):e4.
75. Miron-Shatz T, Hansen M, Grajales Fr, Martin-Sanchez F, Bamidis P. Social Media for the Promotion of Holistic Self-Participatory Care: An Evidence Based Approach. Contribution of the IMIA Social Media Working Group. *Yearb Med Inform.* 2013;8:162-8.
76. Paton C, Bamidis P, Eysenbach G, Hansen M, Cabrer M. Experience in the use of social media in medical and health education. Contribution of the IMIA Social Media Working Group. *Yearb Med Inform.* 2011;6:21-9.
77. Gabarron E, Fernández-Luque L. eSalud y vídeos online para la promoción de la Salud. *Gac Sanit.* 2012;26(3):197-200.
78. Dunne A, McIntosh J, Mallory D. Adolescents, Sexually Transmitted Infections, and Education Using Social Media: A Review of the Literature. *J Nurse Pract.* 2014;10(6):401-8.e2.
79. O'Keeffe GS, Clarke-Pearson K. The impact of social media on children, adolescents, and families. *Pediatrics.* 2011;127:800-4.
80. Bull SS, Levine DK, Black SR, Schmiede SJ, Santelli J. Social media-delivered sexual health intervention: a cluster randomized controlled trial. *Am J Prev Med.* 2012;43(5):467-74.

81. Friedman A, Habel M, Kachur R, McFarlane M, Williamson L, Mishel M, et al. GYT (Get Yourself Tested) campaign: getting young people talking and tested and sparking a social movement. *Sex Transm Infect.* 2011;87(Suppl 1):A257-A.
82. Gold J, Pedrana AE, Stoope MA, Chang S, Howard S, Asselin J, et al. Developing health promotion interventions on social networking sites: recommendations from The FaceSpace Project. *J Med Internet Res.* 2012;14(1):e30-e.
83. Selkie EM, Benson M, Moreno M. Adolescents' Views Regarding Uses of Social Networking Websites and Text Messaging for Adolescent Sexual Health Education. *Am J Health Educ.* 2011;42(4):205-12.
84. Hedge KC, Donald CP. Evaluation of the use of a social networking site in sexual health care. *Int J STD AIDS.* 2011;22(3):171-2.
85. Vyas AN, Landry M, Schnider M, Rojas AM, Wood SF. Public health interventions: reaching Latino adolescents via short message service and social media. *J Med Internet Res.* 2012;14(4):e99-e.
86. Mustanski B. Effects of online comprehensive sexual health education for LGBT youth. *J Sex Med.* 2013;10(Suppl. 5):314.
87. Jaganath D, Gill HK, Cohen AC, Young SD. Harnessing Online Peer Education (HOPE): integrating C-POL and social media to train peer leaders in HIV prevention. *AIDS Care.* 2012;24:593-600.
88. Young SD, Cumberland WG, Lee S-J, Jaganath D, Szekeres G, Coates T. Social networking technologies as an emerging tool for HIV prevention: a cluster randomized trial. *Ann Intern Med.* 2013;159:318-24.
89. Young SD, Shoptaw S. Stimulant use among African American and Latino MSM social networking users. *J Addict Dis.* 2013;32:39-45.
90. McCree D, Millett G, Baytop C, Royal S, Ellen J, Halkitis P, et al. Lessons learned from use of social network strategy in HIV testing programs targeting African American men who have sex with men. *Am J Public Health.* 2013;103(10):1851-6.
91. Rossotti R, Gabrielli E, Gervasoni C, Rosso R, Sabbatini F, Uglietti A, et al. HIV education and counselling using Facebook: a possible new approach. *J Telemed Telecare.* 2012;18:239-40.
92. Wark J, Fenner Y, Tabrizi S, Jayasinghe Y, Moore E, Fletcher A, et al., editors. *Recruiting via Social Networking Sites for Sexual Health Research (assessing Chlamydia and HPV Knowledge).* Medicine 2012; 2012; Boston, MA.
93. Young SD. Recommended guidelines on using social networking technologies for HIV prevention research. *AIDS Behav.* 2012;16(7):1743-5.
94. Ahmed N, Jayasinghe Y, Wark JD, Fenner Y, Moore EE, Tabrizi SN, et al. Attitudes to Chlamydia screening elicited using the social networking site Facebook for subject recruitment. *Sex Health.* 2013;10:224-8.
95. Gunasekaran B, Jayasinghe Y, Fenner Y, Moore EE, Wark JD, Fletcher A, et al. Knowledge of human papillomavirus and cervical cancer among young women recruited using a social networking site. *Sex Transm Infect.* 2013;89:327-9.
96. Veinot TC, Campbell TR, Kruger D, Grodzinski A, Franzen S. Drama and danger: the opportunities and challenges of promoting youth sexual health through online social networks. *AMIA Annual Symposium proceedings / AMIA Symposium AMIA Symposium.* 2011;2011:1436-45.
97. O'mara B. Social media, digital video and health promotion in a culturally and linguistically diverse Australia. *Health Promot Int.* 2012:1-11.

98. Tengland P-A. Behavior Change or Empowerment: On the Ethics of Health-Promotion Goals. *Health Care Anal.* 2016;24:24-46.
99. Laranjo L, Arguel A, Neves AL, Gallagher AM, Kaplan R, Mortimer N, et al. The influence of social networking sites on health behavior change: a systematic review and meta-analysis. *Journal of the American Medical Informatics Association : JAMIA.* 2015;22(1):243-56.
100. Maher C, Lewis LK, Ferrar K, Marshall S, De Bourdeaudhuij I, Vandelanotte C. Are health behaviour change interventions that use online social networks effective? A systematic review. *J Med Internet Res.* 2014;16(2):e40.
101. Balatsoukas P, Kennedy CM, Buchan I, Powell J, Ainsworth J. The role of social network technologies in online health promotion: A narrative review of theoretical and empirical factors influencing intervention effectiveness. *J Med Internet Res.* 2015;17(6):e141.
102. Thomas JC, Sage M, Dillenberg J, Guillory VJ. A code of ethics for public health. *Am J Public Health.* 2002;92(7):1057-59.
103. Bould M, Hladkowicz E, Pigford A, Ufholz L, Postonogova T, Shin E, et al. References that anyone can edit: review of Wikipedia citations in peer reviewed health science literature. *BMJ.* 2014;348:g1585.
104. Song H, Omori K, Kim J, Tenzek KE, Morey Hawkins J, Lin WY, et al. Trusting Social Media as a Source of Health Information: Online Surveys Comparing the United States, Korea, and Hong Kong. *J Med Internet Res.* 2016;18(3):e25.
105. Zhang Y. Beyond quality and accessibility: Source selection in consumer health information searching. *J Assoc Inf Sci Tech.* 2014;65(5):911-27.
106. Eysenbach G, Kohler C. How do consumers search for and appraise health information on the world wide web? Qualitative study using focus groups, usability tests, and in-depth interviews. *BMJ.* 2002;324(7337):573-7.
107. Litras A, Latreille S, Temple-Smith M. Dr Google, porn and friend-of-a-friend: where are young men really getting their sexual health information? *Sex Health.* 2015;12(6):488-94.
108. Hone T, Palladino R, Filippidis FT. Association of searching for health-related information online with self-rated health in the European Union. *Eur J Public Health.* 2016:[Epub ahead of print].
109. Marton C, Choo CW. A review of theoretical models of health information seeking on the web. *J Documentation.* 2012;68(3):330-52.
110. Hochbaum G, Rosentstock I, Kegels S. Health Belief Model United States Public Health Service1952 [1st December 2016]. Available from: http://www.infosihat.gov.my/infosihat/artikelHP/bahanrujukan/HE_DAN_TEORI/DOC/Health Belief Model.doc.
111. Davis FD. A Technology Acceptance Model for empirically testing new end-user information systems: theory and results. Massachusetts Institute of Technology1985.
112. Ellis D. The derivation of a Behavioural Model for Information Retrieval System Design. University of Sheffield: University of Sheffield; 1987.
113. Holden RJ, Karsh BT. The technology acceptance model: its past and its future in health care. *Journal of biomedical informatics.* 2010;43(1):159-72.
114. Fuentes LW, Johnson ML, Holtgrave DR. An exploration of weekly patterns in HIV-related behaviors : implications for successful interventions and future research. *AIDS Care.* 2015:37-41.

115. Marco J, Barba R, Losa JE, De La Serna CM, Sainz M, Fernández Lantigua I, et al. Advice from a medical expert through the internet on queries about AIDS and hepatitis: Analysis of a pilot experiment. *PLoS Med.* 2006;3:1041-7.
116. Crutzen R, Mevissen FEF. Just Another Manic Monday : Peaking Sexual Concerns After the Weekend. *Arch Sex Behav.* 2011:1105-6.
117. Fortenberry JD, Orr DP, Zimet GD, Blythe MJ. Weekly and Seasonal Variation in Sexual Behaviors Among Adolescent Women with Sexually Transmitted Diseases. *J Adolesc Health.* 1997;20(6):420-5.
118. Ayers J, Althouse B, Johnson M, Cohen J. Circaseptan (weekly) rhythms in smoking cessation considerations. *JAMA Intern Med.* 2014;174(1):146-8.
119. Ayers JW, Althouse BM, Johnson M, Dredze M, Cohen JE. What's the Healthiest Day? *Am J Prev Med.* 2014;47:73-6.
120. Dai H, Milkman K, Riis J. The Fresh Start Effect: Temporal Landmarks Motivate Aspirational Behavior. *Management Sci.* 2014;60:2563-82.
121. Laranjo L. Social Media and Health Behaviour Change. In: Syed-Abdul S, Gabarron E, Lau A, editors. *Participatory Health Through Social Media.* London: Elsevier; 2016. p. 83-111.
122. Holloway IW, Dunlap S, Del Pino HE, Hermanstynne K, Pulsipher C, Landovitz RJ. Online Social Networking, Sexual Risk and Protective Behaviors: Considerations for Clinicians and Researchers. *Current addiction reports.* 2014;1(3):220-8.
123. Adams SA. Use of social media by hospitals and health authorities. In: Syed-Abdul S, Gabarron E, Lau AYS, editors. *Participatory Health Through Social Media.* London: Elsevier; 2016. p. 27-41.
124. Denecke K, Bamidis P, Bond C, Gabarron E, Househ M, Lau A, et al. Ethical Issues of Social Media Usage in Healthcare. *Yearb Med Inform.* 2015;10:137-47.
125. Moreno MA, Goniou N, Moreno PS, Diekema D. Ethics of Social Media Research: Common Concerns and Practical Considerations. *Cyberpsychology & behavior : the impact of the Internet, multimedia and virtual reality on behavior and society.* 2013;16(9):708-13.
126. Gilliam M, Chor J, Hill B. Digital media and sexually transmitted infections. *Curr Opin Obstet Gynecol.* 2014;26(5):381-5.
127. van der Velden M, El Emam K. "Not all my friends need to know": a qualitative study of teenage patients, privacy, and social media. *Journal of the American Medical Informatics Association : JAMIA.* 2013;20(1):16-24.
128. Lim MS, Vella A, Sacks-Davis R, Hellard ME. Young people's comfort receiving sexual health information via social media and other sources. *Int J STD AIDS.* 2014;25(14):1003-8.
129. Byron P, Albury K, Evers C. "It would be weird to have that on Facebook": young people's use of social media and the risk of sharing sexual health information. *Reprod Health Matters.* 2013;21(41):35-44.
130. Lau AY, Gabarron E, Fernandez-Luque L, Armayones M. Social media in health – what are the safety concerns for health consumers? *HIM J.* 2012;41:30-5.
131. Lau AYS, Coiera EW. Impact of web searching and social feedback on consumer decision making: A prospective online experiment. *J Med Internet Res.* 2008;10(1):e2.
132. Lau AYS, Kwok TMY, Coiera E. How online crowds influence the way individual consumers answer health questions. *Appl Clin Inform.* 2011;2(2):177-89.

133. Moreno MA, Parks MR, Zimmerman FJ, Brito TE, Christakis DA. Display of health risk behaviors on MySpace by adolescents: prevalence and associations. *Archives of pediatrics & adolescent medicine*. 2009;163(1):27-34.
134. Pujazon-Zazik MA, Manasse SM, Orrell-Valente JK. Adolescents' self-presentation on a teen dating web site: a risk-content analysis. *J Adolesc Health*. 2012;50:517-20.
135. Pujazon-Zazik M, Park M. To Tweet, or Not to Tweet: Gender Differences and Potential Positive and Negative Health Outcomes of Adolescents' Social Internet Use. *Am J Mens Health*. 2010;4(1):77-85.
136. Fairley CK. Using information technology to control STIs. *Sex Transm Infect*. 2011;87 Suppl 2:ii25-7.
137. Garofalo R, Herrick A, Mustanski BS, Donenberg GR. Tip of the Iceberg: young men who have sex with men, the Internet, and HIV risk. *Am J Public Health*. 2007;97(6):1113-7.
138. Payette MJ, Albreski D, Grant-Kels JM. "You'd know if you 'friended' me on Facebook": legal, moral, and ethical considerations of online social media. *J Am Acad Dermatol*. 2013;69(2):305-7.
139. Pillow MT, Hopson L, Bond M, Cabrera D, Patterson L, Pearson D, et al. Social Media Guidelines and Best Practices: Recommendations from the Council of Residency Directors Social Media Task Force. *West J Emerg Med*. 2014;15(1):26-30.
140. American Medical Association. AMA Policy: Professionalism in the Use of Social Media Annual Meeting 2012 [1st December 2016]. Available from: goo.gl/rmj7iE.
141. British Medical Association. Doctors' use of social media: Guidance London 2013 [1st December 2016]. Available from: http://www.gmc-uk.org/guidance/ethical_guidance/30173.asp.
142. Denecke K, Kriek M, Otrusina L, Smrz P, Dolog P, Nejdil W, et al. How to exploit twitter for public health monitoring? *Methods Inf Med*. 2013;52:326-39.
143. Fung IC, Tse ZT, Fu KW. The use of social media in public health surveillance. *Western Pacific surveillance and response journal : WPSAR*. 2015;6(2):3-6.
144. Hartley DM. Using social media and internet data for public health surveillance: the importance of talking. *The Milbank quarterly*. 2014;92(1):34-9.
145. Velasco E, Agheneza T, Denecke K, Kirchner G, Eckmanns T. Social media and internet-based data in global systems for public health surveillance: a systematic review. *The Milbank quarterly*. 2014;92(1):7-33.
146. Coughlan E, Young H, Parkes C, Coshall M, Dickson N, Psutka R, et al. A novel response to an outbreak of infectious syphilis in Christchurch, New Zealand. *Sex Health*. 2014;12(2):170-3.
147. Thomas DR, Williams CJ, Andrady U, Anderson V, Humphreys S, Midgley CM, et al. Outbreak of syphilis in men who have sex with men living in rural North Wales (UK) associated with the use of social media. *Sex Transm Infect*. 2016;92(5):359-64.
148. Chiu CJ, Young SD. The Relationship Between Online Social Network Use, Sexual Risk Behaviors, and HIV Sero-Status Among a Sample of Predominately African American and Latino Men Who have Sex with Men (MSM) Social Media Users. *AIDS Behav*. 2015;19 Suppl 2:98-105.
149. De nasjonale forskningsetiske komiteene. Ethiske retningslinjer for forskning på Internett 2014 [1st December 2016]. Available from:

- <https://www.etikkom.no/globalassets/documents/publikasjoner-som-pdf/forskningsetiske-retningslinjer-for-forskning-pa-internett.pdf>.
150. Zimmer M. "But the data is already public": on the ethics of research in Facebook. *Ethics Inf Technol*. 2010;12:313-25.
 151. Kosinski M, Matz SC, Gosling SD, Popov V, Stillwell D. Facebook as a research tool. A look at how to recruit participants using Facebook - and the ethical concerns that come with social media research. *Monitor Psych*. 2016;47(3):70-5.
 152. Townsend L, Wallace C. *Social Media Research: A Guide to Ethics 2016* [1st December 2016]. Available from: http://www.gla.ac.uk/media/media_487729_en.pdf.
 153. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009;6(7):e1000097.
 154. Gergen K. *An Invitation to Social Construction*. London: Sage Publications; 1999. 272 p.
 155. Gabarron E, Serrano JA, Wynn R, Armayones M. Avatars using computer/smartphone mediated communication and social networking in prevention of sexually transmitted diseases among North-Norwegian youngsters. *BMC Medical Informatics and Decision Making*. 2012;12:120-.
 156. Folkehelseinstituttet. *Klamydia i Norge 2012 2013* [1st December 2016]. 1-6]. Available from: <https://www.fhi.no/globalassets/migrering/dokumenter/pdf/klamydiasituasjonen-i-norge-2012-pdf.pdf>.
 157. Google Inc. *Google Analytics 2016* [1st November 2016]. Available from: <http://www.google.com/analytics/>.
 158. Wikipedia. *Wikipedia:About 2015* [1st December 2016]. Available from: <https://en.wikipedia.org/wiki/Wikipedia:About>.
 159. Heilman J, Kemmann E, Bonert M, Chatterjee A, Ragar B, Beards G, et al. *Wikipedia: A Key Tool for Global Public Health Promotion*. *J Med Internet Res*. 2011;13:e14.
 160. Patel A, Stern L, Unger Z, Debevec E, Roston A, Hanover R, et al. Staying on track: a cluster randomized controlled trial of automated reminders aimed at increasing human papillomavirus vaccine completion. *Vaccine*. 2014;32(21):2428-33.
 161. Menacho LA, Galea JT, Young SD. Feasibility of Recruiting Peer Educators to Promote HIV Testing Using Facebook Among Men Who have Sex with Men in Peru. *AIDS Behav*. 2015;19(S2):123-9.
 162. Gabarron E, Schopf T, Serrano JA, Fernandez-Luque L, Dorrnzoro E. Gamification strategy on prevention of STDs for youth. *Stud Health Technol Inform*. 2013;192:1066-.
 163. Day S, Hughes A. A highly cost-effective and targeted service promotion campaign using the social media site Facebook. 4th joint BASHH-ASTDA 2012.
 164. Staub R, Derendinger S, Mullis S, Schwendener N. HIV/Sexually transmitted infection prevention campaign in Switzerland: LOVE LIFE - no regrets. 29th European Conference on Sexually Transmitted Infections 2015.
 165. Klingler G. Just talk about it: Changing sexual health conversations in Colorado through Beforeplay.org. 2014 STD Prevention Conference 2014.

166. International Planned Parenthood Federation (IPPF). Sharing the Peer2Peer project with the Youth Action Movement in Africa 2015 [1st December 2016]. Available from: <https://youthagainstabortionstigma.wordpress.com/2016/07/07/sharing-the-peer2peer-project-with-the-youth-action-movement-in-africa/>.
167. International Planned Parenthood Federation (IPPF). It's About You 2015 [1st December 2016]. Available from: http://www.ippf.org/sites/default/files/2016-05/youth_groups_tackling_abortion_stigma.pdf.
168. International Planned Parenthood Federation (IPPF). Yo Decido Cuándo (I decide when) 2015 [1st December 2016]. Available from: http://www.ippf.org/sites/default/files/2016-05/youth_groups_tackling_abortion_stigma.pdf.
169. Phoenix PLUS and menZDRAV Foundation. menZDRAV – Positive Life 2013 [1st December 2016]. Available from: http://apps.who.int/iris/bitstream/10665/145002/1/WHO_HIV_2014.50_eng.pdf.
170. The Initiative for Equal Rights (TIER). MARP (most at-risk populations) HIV Prevention Programme 2013 [1st December 2016]. Available from: http://apps.who.int/iris/bitstream/10665/145002/1/WHO_HIV_2014.50_eng.pdf.
171. FHI360. SHARPER (Strengthening HIV/AIDS Response Partnership with Evidence - based Results) 2013 [1st December 2016]. Available from: <https://www.fhi360.org/projects/strengthening-hivaids-response-partnership-evidenced-based-results-sharper>.
172. Youth Leading the HIV & Hep C Movement (YouthCO). YouthCO HIV and Hep C Society – Mpowerment 2014 [1st December 2016]. Available from: <http://www.youthco.org/mpowerment>.
173. International Planned Parenthood Federation (IPPF). Girls Power – Tea Parties in Pakistan 2014 [1st December 2016]. Available from: <http://www.ippf.org/our-approach/programmes/myx-fund>.
174. United Nations Population Fund (UNFPA). Arab States: Shifting the informal SRH education model from supply- to demand-driven 2014 [1st December 2016]. 23-4]. Available from: http://www.unfpa.org/sites/default/files/pub-pdf/UNFPA_OperationalGuidance_WEB3.pdf.
175. International Planned Parenthood Federation (IPPF). Women have abortions every day – Advocacy film in Ireland 2013 [1st December 2016]. Available from: <http://www.ippf.org/our-approach/programmes/myx-fund>.
176. Population Council. Men's Health Network Nigeria. Reaching men who have sex with men 2010 [1st December 2016]. Available from: http://www.popcouncil.org/uploads/pdfs/momentum/Momentum_201011.pdf.
177. Hildebrand M, Ahumada C, Watson S. CrowdOutAIDS: crowdsourcing youth perspectives for action. *Reprod Health Matters*. 2013;21(41):57-68.
178. Dowshen N, Lee S, Matty Lehman B, Castillo M, Mollen C. IknowUshould2: Feasibility of a Youth-Driven Social Media Campaign to Promote STI and HIV Testing Among Adolescents in Philadelphia. *AIDS Behav*. 2015;19(Suppl 2):106-11.
179. Chu SKW, Kwan ACM, Reynolds R, Mellecker RR, Tam F, Lee G, et al. Promoting Sex Education Among Teenagers Through an Interactive Game: Reasons for Success and Implications. *Games Health J*. 2015;4(3):168-74.
180. Pedrana A, Hellard M, Gold J, Ata N, Chang S, Howard S, et al. Queer as F**k: reaching and engaging gay men in sexual health promotion through social networking sites. *J Med Internet Res*. 2013;15(2):e25.

181. Nguyen P, Gold J, Pedrana A, Chang S, Howard S, Ilic O, et al. Sexual health promotion on social networking sites: a process evaluation of The FaceSpace Project. *J Adolesc Health*. 2013;53(1):98-104.
182. Syred J, Naidoo C, Woodhall SC, Baraitser P. Would you tell everyone this? Facebook conversations as health promotion interventions. *J Med Internet Res*. 2014;16(4):e108.
183. Prior M, Salmon M, Walker-Baban C, Bodas LaPollo A, Johnson C. Condoms, condoms everywhere! - Examining the reach and awareness of take control Philly! at two years. 2014 STD Prevention Conference 2014.
184. Anderson J, Samplin-Salgado M. GYT: Adapting a national STD testing campaign for a local audience in Santa Clara county, California. 2014 STD Prevention Conference 2014.
185. Friedman AL, Bozniak A, Ford J, Hill A, Olson K, Ledsky R, et al. Reaching Youth With Sexually Transmitted Disease Testing: Building on Successes, Challenges, and Lessons Learned From Local Get Yourself Tested Campaigns. *Social Marketing Quart*. 2014;20(2):116-38.
186. Fisser E. Successfully involving teenagers for effective sexual health campaigns through social media. *STI & AIDS World Congress 2013*.
187. Huang E, Marlin R, Medline A, Young S, Daniels J, Klausner J. Cost-effectiveness of hiv self-testing promotion through Grindr™, a smartphone social networking application. *STI & HIV World Congress 2015*.
188. West R, Daniels D. Sexual networking: does targeting online sexually transmitted infection booking appointments to men who have sex with men on Grindr improve access to sexually transmitted infection testing services? *29th European Conference on Sexually Transmitted Infections 2015*.
189. Huang E, Marlin R, Medline A, Young S, Daniels J, Klausner J. Using Grindr™, a smartphone social networking application, to increase hiv self-testing among men who have sex with men in Los Angeles. *STI & HIV World Congress 2015*.
190. Gourley M. "Syphilis is up" - The effectiveness of a short-term, integrated public information campaign. 2014 STD Prevention Conference 2014.
191. Smith E, Bly S, Sears S. Community based response to decrease gonorrhea in Androscoggin county. 2014 STD Prevention Conference 2014.
192. Veale HJ, Sacks-Davis R, Weaver ER, Pedrana AE, Stoové MA, Hellard ME. The use of social networking platforms for sexual health promotion: identifying key strategies for successful user engagement. *BMC Public Health*. 2015;15(1):85-.
193. McDaid LM, Lorimer K. A Proactive Approach to Online Chlamydia Screening: Qualitative Exploration of Young Men's Perspectives of the Barriers and Facilitators. *Sex Transm Infect*. 2013;89(Suppl 1):A348-A.
194. Bull L, Jones R. #SafeSexIsGreatSex singers, sex and twitter; a novel approach to sexually transmitted infection teaching in schools. *Int J STD AIDS*. 2013;24:29-.
195. Ramallo J, Kidder T, Albritton T, Blick G, Pachankis J, Grandeleski V, et al. Exploring Social Networking Technologies as Tools for HIV Prevention for Men Who Have Sex With Men. *AIDS Educ Prev*. 2015;27(4):298-311.
196. Nasution RD. Challenges in developing social media and web-based communication tools for HIV-AIDS and STI intervention for MSM and transgender communities in Indonesia, Malaysia, Philippines and Timor Leste. *STI & AIDS World Congress 2013*.

197. Wohfeiler D, Hecht J, Volk J, Fisher Raymond H, Kennedy T, McFarland W. How can we improve online HIV and STD prevention for men who have sex with men? Perspectives of hook-up website owners, website users, and HIV/STD directors. *AIDS Behav.* 2013;17(9):3024-33.
198. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33:159-74.
199. Whiteley LB, Mello J, Hunt O, Brown LK. A review of sexual health web sites for adolescents. *Clinical pediatrics.* 2012;51(3):209-13.
200. van Lankveld J. Internet-Based Interventions for Women's Sexual Dysfunction. *Current sexual health reports.* 2016;8:136-43.
201. Suchard MA, Hadfield R, Elliott T, Kennedy S. Beyond providing information: the Internet as a research tool in reproductive medicine. *Hum Reprod.* 1998;13(1):6-7.
202. Ross MW. Typing, doing, and being: sexuality and the internet. *J Sex Res.* 2005;42(4):342-52.
203. O'Sullivan LF. Linking online sexual activities to health outcomes among teens. *New Dir Child Adolesc Dev.* 2014;2014(144):37-51.
204. Niederberger CS. Assisted reproductive technologies on the Web. *Fertility and sterility.* 2005;83(3):550-2.
205. Muessig KE, Pike EC, Legrand S, Hightow-Weidman LB. Mobile phone applications for the care and prevention of HIV and other sexually transmitted diseases: a review. *J Med Internet Res.* 2013;15(1):e1.
206. Kanuga M, Rosenfeld WD. Adolescent sexuality and the internet: the good, the bad, and the URL. *J Pediatr Adolesc Gynecol.* 2004;17(2):117-24.
207. Hieftje K, Edelman EJ, Camenga DR, Fiellin LE. Electronic media-based health interventions promoting behavior change in youth: a systematic review. *JAMA pediatrics.* 2013;167(6):574-80.
208. Barak A, Fisher WA. [Intervention for the promotion of sexual health through the internet: theory, empirical evidence and application]. *Harefuah.* 2009;148(9):628-33, 56.
209. Aslani A, Pournik O, Abu-Hanna A, Eslami S. Web-site evaluation tools: a case study in reproductive health information. *Stud Health Technol Inform.* 2014;205:895-9.
210. Aarts JW, van den Haak P, Nelen WL, Tuil WS, Faber MJ, Kremer JA. Patient-focused internet interventions in reproductive medicine: a scoping review. *Human reproduction update.* 2012;18(2):211-27.
211. Gold J, Pedrana AE, Sacks-Davis R, Hellard ME, Chang S, Howard S, et al. A systematic examination of the use of online social networking sites for sexual health promotion. *BMC Public Health.* 2011;11(1):583-.
212. Bailey J, Mann S, Wayal S, Hunter R, Free C, Abraham C, et al. *Public Health Research.* Southampton (UK): NIHR Journals Library; 2015.
213. Gammon D, Johannsen L, Sørensen T, Wynn R, Whitten P. An overview and analysis of theories employed in telemedicine studies - A field in search of an identity. *Methods Inf Med.* 2008;47:260-9.
214. Leanza F, Hauser D. Teens, technology, and health care. *Prim Care.* 2014;41(3):559-66.
215. The Statistics Portal. Distribution of worldwide social media users as of January 2016, by region 2016 [1st December 2016]. Available from: <http://www.statista.com/statistics/295619/regional-distribution-of-social-media-users-worldwide/>.

216. Bergvik S, Sorlie T, Wynn R. Approach and avoidance coping and regulatory focus in patients having coronary artery bypass graft surgery. *J Health Psychol.* 2010;15(6):915-24.
217. Wynn R. Provider-patient interaction: a corpus-based study of doctor-patient and student-patient interaction. Kristiansand S. - Norway: Høyskoleforlage - Norwegian Academic Press; 1998.
218. Lin CA, Kim T. Predicting user response to sponsored advertising on social media via the technology acceptance model. *Comp Human Behav.* 2016;64:710-8.
219. Alves P, Ferreira P. AnonyFacebook - Liking Facebook Posts Anonymously. On the Move to Meaningful Internet Systems: OTM 2013 Workshops. 81862013. p. 709-13.
220. Gabarron E, Wynn R. Use of social media for sexual health promotion: a scoping review. *Global health action.* 2016;9:32193.
221. Statistics Norway. ICT usage in households, 2016, 2nd quarter 2016 [1st December 2016]. Available from: <https://ssb.no/en/teknologi-og-innovasjon/statistikker/ikthus>.
222. Gamage DG, Fuller CA, Cummings R, Tomnay JE, Chung M, Chen M, et al. Advertising sexual health services that provide sexually transmissible infection screening for rural young people - what works and what doesn't. *Sex Health.* 2011;8:407-11.
223. Kaplan AM, Haenlein M. Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons.* 2010;53:59-68.
224. Gammon D, Christiansen E, Wynn R. Exploring morally relevant issues facing families in their decisions to monitor the health-related behaviours of loved ones. *J Med Ethics.* 2009;35:424-28.
225. Madden M, Lenhart A, Cortis S, Gasser U, Duggan M, Smith A, et al., editors. *Teens, Social Media and Privacy 2013*; Washington DC.
226. Bryce J, Fraser J. The role of disclosure of personal information in the evaluation of risk and trust in young peoples' online interactions. *Comp Human Behav.* 2014;30:299-306.
227. Van Gool E, Van Ouytsel J, Ponnet K, Walrave M. To share or not to share? Adolescents' self-disclosure about peer relationships on Facebook: An application of the Prototype Willingness Model. *Comp Human Behav.* 2015;44:230-9.
228. Hampton K, Rainie L, Weixu L, Dwyer M, Shin J, Purcell K, editors. *Social Media and the "Spiral of Silence."* 2014; Washington DC.
229. Johnsen J, Vambheim S, Wynn R, Wangberg S. Language of motivation and emotion in an Internet support group for smoking cessation: explorative use of automated content analysis to measure regulatory focus. *Psychol Res Behav Manag.* 2014;7:19-29.
230. Gabarron E, Serrano JA, Schopf T, Fernandez-Luque L, Wynn R. Play as a prevention strategy: Using a web app to teach youth about STDs. *Stud Health Technol Inform.* 2014;205:1187.
231. Joinson A. Social desirability, anonymity, and Internet-based questionnaires. *Behavior research methods, instruments, & computers : a journal of the Psychonomic Society, Inc.* 1999;31(3):433-8.
232. Suler J. The online disinhibition effect. *Cyberpsychology & behavior : the impact of the Internet, multimedia and virtual reality on behavior and society.* 2004;7(3):321-6.

233. Reicher S, Spears R, Postmes T. A social identity of deindividuation phenomena. *Eur Rev Soc Psychol*. 1995;6(1):161-98.
234. Postmes T, Spears R, Sakhel K, de Groot D. Social influence in computer-mediated communication: the effects of anonymity on group behaviour. *Personality Social Psych Bull*. 2011;27(10):1243-54.
235. Sassenberg K, Boos M. Attitude change in computer-mediated communication: effects of anonymity in category norms. *Gr Proc Intergr Rel*. 2003;6(4):405-22.
236. World Health Organization. Sexually transmitted infections (STIs) 2013 [1st December 2016]. Available from: http://apps.who.int/iris/bitstream/10665/82207/1/WHO_RHR_13.02_eng.pdf.
237. Sago B. Factors influencing social media adoption and frequency of use: an examination of Facebook, Twitter, Pinterest and Google+. *Int J Business Commerce*. 2013;3(1):1-14.
238. Lau AYS, Siek KA, Fernández-Luque L, Tange H, Chhanabhai P, Li SYW, et al. The role of social media for patients and consumer health. *Yearb Med Inform*. 2011;6:131-8.
239. Coiera E, Aarts J, Kulikowski C. The dangerous decade. *Journal of the American Medical Informatics Association : JAMIA*. 2011.
240. Yoo SW, Kim J, Lee Y. The Effect of Health Beliefs, Media Perceptions, and Communicative Behaviors on Health Behavioral Intention: An Integrated Health Campaign Model on Social Media. *Health Commun*. 2016:1-9.
241. Rogstad KE. Sex, sun, sea, and STIs: sexually transmitted infections acquired on holiday. *BMJ*. 2004;329(7459):214-7.
242. Bratucu R, Gheorghe I, Purcarea R, Gheorghe C, Popa Velea O, Purcarea V. Cause and effect: the linkage between the health information seeking behavior and the online environment- a review. *J Med Life*. 2014;7(3):310-16.
243. Chisolm D. Does Online Health Information Seeking Act Like a Health Behavior?: A Test of the Behavioral Model. *Telemed J E Health*. 2010;16(2):154-60.
244. Santana S, Lausen B, Bujnowska-Fedak M, Chronaki C, Prokosch H, Wynn R. Informed citizen and empowered citizen in health: results from an European survey. *BMC Fam Pract*. 2011;12:20.
245. Maskalyk J. Modern medicine comes online: How putting Wikipedia articles through a medical journal's traditional process can put free, reliable information into as many hands as possible. *Open Med*. 2014;8(4):e116-9.
246. Kraenbring J, Monzon Penza T, Gutmann J, Muehlich S, Zolk O, Wojnowski L, et al. Accuracy and completeness of drug information in Wikipedia: a comparison with standard textbooks of pharmacology. *PLoS One*. 2014;9(9):e106930.
247. Hengchen D, Milkman K, Riis J. Put Your Imperfections Behind You: Why and How Meaningful Temporal Landmarks Motivate Aspirational Behavior. *Social Sci Res Network*. 2014.
248. Gabarron E, Annie AYS, Wynn R. Weekly pattern for online information seeking on HIV - a multi-language study. *Stud Health Technol Inform*. 2016;228:778-82.

Errata correction

Page number	From this	To this
11	We have identified only one meta-analysis (...)	I have identified only one meta-analysis (...)
18	(...) we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method (153).	(...) I followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method (153).
23	We identified 9,462 articles.	I identified 9,462 articles.
28	In this study, we found that most of the information posted on Twitter on STIs was of a serious tone and factual nature.	In this study, I found that most of the information posted on Twitter on STIs was of a serious tone and factual nature.
39	(...) we drew on a Social marketing approach (26-28).	(...) I drew on a Social marketing approach (26-28).
40	(...) we were able to display a short message to our targeted audience individually.	(...) I was able to display a short message to our targeted audience individually.
40	At the moment that this study was carried out, we considered that the display of identities would not be very harmful (...)	At the moment that this study was carried out, I considered that the display of identities would not be very harmful (...)
42	In this observational study, we extracted all messages posted on Twitter (...)	In this observational study, I extracted all messages posted on Twitter (...)
42	Although we extracted contents that could be considered private (...)	Although I extracted contents that could be considered private (...)
44	With this observational study, we were able to observe (...)	With this observational study, I was able to observe (...)
44	Because we only tracked information on the number of hits per day (...)	Because I only tracked information on the number of hits per day (...)
46	(...) we might have missed relevant studies or projects that could lead to different views or conclusions.	(...) I might have missed relevant studies or projects that could lead to different views or conclusions.
46	We chose Facebook (...)	I chose Facebook (...)
46	With this sexual health promotion intervention, we reached a high number of people (...)	With this sexual health promotion intervention, I reached a high number of people (...)
46	However, most of the jokes related to sexual health or STIs that we identified (...)	However, most of the jokes related to sexual health or STIs that I identified (...)
47	Unexpectedly, we also detected that other searches on social media, health- and non-health related, seem to follow a weekly pattern too.	Unexpectedly, I also detected that other searches on social media, health- and non-health related, seem to follow a weekly pattern too.
47	However, we tracked only the number of queries on 10 articles performed in the Norwegian language.	However, I tracked only the number of queries on 10 articles performed in the Norwegian language.