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Spontaneous diffusion of information: An analysis of health communication via online social networks

Introduction

Hundreds of millions of active users currently participate in online social networks (OSNs). Over the last decade, online social spaces like MySpace, Facebook, Twitter, Orkut, and LinkedIn have become ubiquitous places for interpersonal conversation and information sharing for an array of populations*.

Thus far, health communication researchers have only minimally investigated how OSNs are used and viewed among health information-seekers (e.g., Moreno, Brockman, Rogers, & Christakis, 2010; Moreno, Briner, Williams, Walker, & Christakis, 2009). This suggests health has been a topic discussed or presented on OSN websites. Due to the large number of online users participating, OSNs have the potential to be pervasive outlets for health messages, and the collective knowledge of these users may provide unique insight into health issues that is greater than the knowledge that can be rendered from traditional patient/doctor communication (Sarasohn-Kahn, 2008); therefore is important to explore the usefulness of OSNs for the retrieval and exchange of health information. To begin addressing this question, this analysis surveyed existing OSN literature to create a comprehensive definition of the concept of OSNs that characterizes how they are used for information retrieval and exchange in order to discern how

*Although outside the scope of this analysis, for a greater discussion about the history and growth of online social networks, consider reading boyd and Ellison (2008), who provide both a history of the development of OSNs an overview of the attention researchers have given to the topic.

they may be useful for the dissemination of health information. Ultimately, this analysis began with the following research question:

RQ1: What is an online social network (OSN) and how is it used for information retrieval and exchange?

The rapid and organic way information is spread via an OSN invites unique considerations for health communicators. For example, traditional boundaries of time and space may be less important and health communicators may have less control over the dissemination of their desired messages and information. These are especially pertinent considerations for health communicators since many health messages are most effectively spread quickly and pervasively, and the spread of erroneous health information can be dangerous. To more thoroughly assess how an OSN may be useful for proliferation of health information, it proves useful to look at OSNs through the lens of a specific concept of communication. For various reasons discussed more thoroughly in a later section of this paper, the concept of spontaneous diffusion of information helps describe the word-of-mouth development and spread of information on OSNs (Russ, 2008). Therefore, while considering the definition developed via RQ1, RQ2 was posed to support this interest in the communication of health information via OSNs:

RQ2: How might OSNs be useful outlets for the spontaneous diffusion of health information?

What is an OSN?

The term “online social network” is used to describe various online technologies that allow users to make connections with other users or information. Researchers uses additional nomenclature to describe the same technology, including “social networking sites (SNSs)” (e.g.,

Moreno & Brockman et al., 2010; Fogel & Nehmad, 2009; Moreno & Briner et al., 2009; boyd & Ellison, 2008; Hargittai, 2008; Lewis, Kaufman, & Christakis, 2008) and “social media” (e.g., Hawn, 2009). “Social media” is also used as an umbrella term for many different types of online communities, one of which is “social networks” (Mayfield, 2008). Some research even distinguishes different types of OSNs, suggesting a separation into dating networking sites, common interest networking sites, and friend networking sites (Valkenburg, Peter, & Schouten, 2006). However, the consistent thread among OSN literature using any of these terms is the fact that the purpose of the technologies is to make some sort of connections with people or information via an online service.

boyd and Ellison (2008) employed the following definition to describe the technologic affordance of a social network website:

“We define social network sites as web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system” (p. 211).

This definition focuses on the ability to create a public-facing profile that can display information and networked connections to other users. While less emphasis is put on the actual behavior of forming connections and sharing information, those characteristics are implied by the fact that the purpose of the technology is to display connections and information. Other researchers have taken this step and incorporated these ideas of connection formation and information sharing to distinguish OSNs from other online spaces (e.g., Kaplan & Haenlein, 2010). Using the concepts of media richness and self-presentation/self-disclosure, Kaplan and Haenlein define social networks as being of medium media richness and high self-presentation/self-disclosure (while, blogs, in contrast, are of low media richness and high self-

presentation/self-disclosure and virtual game worlds like World of Warcraft are of high media richness and low self-presentation/self-disclosure). Both of these definitions are useful for identifying how an OSN website differs from other online communities (e.g., anonymous message boards or forums), and this analysis focuses on relationship and connection formation, information sharing, and other user behaviors as essential components of an OSN, in order to present a rich definition of what an online social network is and how it is used for information retrieval and exchange.

How OSNs Have Been Studied

Academic literature has explored numerous OSNs (for example, Facebook, Myspace, Orkut, Bebo, Xanga, and Friendster). Some studies have focused examination on one OSN (e.g., Manago, Graham, Greenfield, & Salimkhan, 2008; Ellison, Steinfield, & Lampe, 2007) while others have compared trends among several (e.g., Fogel & Nehmad, 2009). Hargittai (2008) emphasized that each OSN may have a unique purpose and population of users; therefore, care should be taken when generalizing results from a focused study of one OSN to other networks. For example, Manago and colleagues (2008) found that female sexual objectification was common among MySpace users. However, given that MySpace may have a unique cultural environment, that sexual objectification may not generalize to other OSNs like Facebook or Friendster. Fogel and Nehmad (2009) investigated risk, trust, and privacy on both Facebook and MySpace, finding that Facebook was perceived as a more trustworthy website than MySpace, which reinforces the notion that there may be key disparities among OSNs that can impact communications coming through them. Literature addressing only one or several OSNs is common, which indicates a need for further investigation of the similarities and differences among networks and users of OSNs as an inclusive body.

Researchers have investigated the people, the content, and the actual technology associated with OSNs. An array of research methods have been used to study the users of OSNs, including paper survey (e.g., Fogel & Nehmad, 2009; Hargittai, 2008), online survey (e.g., Ellison et al., 2007; Valkenburg et al., 2006), focus groups (Manago et al., 2008), in-depth interview (Livingstone, 2008), and case study (Brown, Broderick, & Lee, 2007), as well as a longitudinal analysis that mixed qualitative and quantitative methods (Steinfeld, Ellison, & Lampe, 2008).

The actual content of OSNs has been directly investigated less often than the habits, behaviors, opinions, and preferences of the users themselves. Agichtein, Castillo, Donato, Gionis, and Mishne (2008) set out to develop a model of measuring the quality of content in social media, including OSNs, by studying clickstream data and using qualitative markers to classify user-generated content. Other researchers have investigated how Facebook profile entries relate to the number of friendship connections users had, yielding information about what types of profile elements encourage more Facebook friends (Lampe, Ellison, & Steinfeld, 2007). This user-generated content has more commonly been assessed as a secondary factor of other studies focusing on the users themselves (e.g., Fogel & Nehmad (2009), who set out to measure by survey if risk taking is related to using social network sites resulted in data describing the frequency various profile elements appeared on users' pages).

A particularly interesting area of research has sought to empirically measure factors of the OSN technologies using timegraphs and usage datasets (e.g., Mislove, Marcon, Gummadi, Druschel, & Bhattacharjee, 2007; Golder, Wilkinson, Huberman, 2007). For example, one study compiled usage datasets from two OSNs (Flickr and Yahoo! 360) and created timegraphs to assess factors like friendship reciprocity, network density, and structure of network population

components (Kumar, Novak, & Tomkins, 2006). Kumar et al. used these data to develop a model of network evolution that characterizes the growth stage of an OSN by observing its density, diameter, and regularity of component structure. Another study in this same area analyzed clickstream data to characterize OSN user behavior (Benevenuto, Rodrigues, Cha, & Almeida, 2009).

These three foci (users, content, and the technology) have emerged from the existing literature as useful in defining what an OSN is and understanding how it is used, therefore, each of these will be now explored individually and more in-depth.

Defining OSN Users

Users of OSNs come from nearly every demographic. Data from the Pew Internet and American Life Project explain that 35% of all adults and 65% of teens have an OSN profile (Lenhart, 2009). When the adult population is segmented, 75% of young adults aged 18-24 and 57% of adults aged 25-34 have an OSN profile (that number steadily decreases as age increases, with 7% of users aged 65 and over). Among each of these groups, users are a variety of ages, races, education, income, and come from a diversity of locales. A majority of these users (51% of adult users) have profiles on more than one OSN website.

Social interaction and the sharing of information have been identified as important activities among OSN users (Abril, 2007) and browsing OSN profiles has been identified as the most dominant behavior of OSN users (Benevenuto et al., 2009). According to Benevenuto et al., while browsing, users receive most of their information from friends they are directly networked with (called “1-hop” friends), and 80 % of their rich media (e.g., video and photos) from these direct connections. However, a significant amount (22%) of information exposure is

from network connections 2 or more “hops” away. This mimics offline word-of-mouth communication and suggests the potential for health information to spread quickly even among OSN users who are not directly networked. Furthermore, existing research suggests that most users connect via OSNs with other users they have an offline relationship with (e.g., Ellison et al., 2007). However, though a user may have many online connections, or “friends”, the amount of OSN interaction with friends is often considerably lower than the actual number of online friends (Golder et al., 2007).

Teens have been found to utilize a variety of OSNs to communicate a “reciprocal exchange of mutual support” (Livingstone, 2008, p. 399), where they used comments to provide and receive encouragement. This type of support was seen as a benefit by the teens, who could use the presence of comments as indicators of their online friends’ level of caring. Furthermore, while supportive interaction has been shown to result in an increase in teen self-esteem, negative interaction has also been shown to be directly related to decreases in teen self-esteem (Valkenburg et al., 2006). These findings indicate that certain types of OSN user interactions may have significant effects, both positive and negative, on the self-esteem and friendship statuses of individual users.

Two major motivations users share information via OSNs appear to be self-expression and self-construction. Teenagers have conveyed that OSN profiles are a way to express either their true or manufactured (the teens described this as their “front”) selves to others through their profile layouts and content choices (Livingstone, 2008). Another study found that it is common for users to choose to fill out the fields in an OSN profile that allow them to present themselves to others (e.g., “about me” and “favorites”)(Lampe et al., 2007), supporting this idea that users utilize an OSN for self-expression.

In fact, Manago et al. (2008) found that college students shared their information on MySpace not only for exploring new selves, but also for expressing bits and pieces of the idealized identities, or “fronts”, they wished to construct. Specifically, MySpace was a tool to construct personal, social, and gender identity. Since users have the ability to try out new identities and test them among their networked peers (Abril, 2007), perhaps construction of a new sense of self becomes easier through an OSN. Users do recognize that what they see on an OSN profile may simply be an “online performance of self,” or a misleading representation of the actual, physical person, but some see this as a benefit, since aspects of a user’s personality that would otherwise be hidden in the physical world can reveal themselves (Manago et al., 2008, p. 450). Conversely, however, self-construction based on informational cues received from an OSN may be confusing or damaging, especially for young women, who may seek to obtain unobtainable identities based on misleading, idealized presentations of self they see from others.

Ellison et al. (2007) found that certain kinds of Facebook use increased the creation and maintenance of users’ social capital, or connections among users in a network. College-aged users who reported both low satisfaction and low self-esteem reported a gain in bridging social capital (the creation of loose, informational connections between people) with more intense Facebook use. A longitudinal analysis of the relationship between Facebook use intensity and social capital supported these findings and further suggested that the use of Facebook provided increased opportunity to initiate communication and thereby mitigated fears of social rejection. (Steinfeld et al., 2008). As a result, bridging social capital was increased. Although the creation of tight-knit, emotionally close relationships (bonding social capital) was less significant in

relation to Facebook use, both of these studies suggested that OSN users maintain those types of relationships as well.

With increasing numbers of users sharing their information by presenting versions of themselves in these online social spaces, how to protect personal information has become a question asked by users and researchers alike. Recently, OSN user privacy issues have received increasing attention from researchers (e.g. Krishnamurthy & Wills, 2008; Lewis et al., 2008; Livingstone, 2008; Strater & Lipford, 2008; Abril, 2007). It seems that although OSN users have options to control the sharing of their profile information, many are still willing to publicly share what may be considered private information while possessing little knowledge about exactly who might be able to access it (e.g., third-party tracking websites) (Krishnamurthy & Wills, 2008). Other users may make attempts to protect their privacy, but fail because of interface issues (Strater & Lipford, 2008). These situations are seen as problematic because the sharing of personal information can lead to risky situations such as online stalking, identity theft, and third parties creating a digital dossier of users' behavior (Gross & Acquisti, 2005).

There are conditions in which users may be more likely to have their OSN information private. One study investigating Facebook users suggested that highly active users, users wishing to protect their safety, female users, and users who prefer certain types of music were more likely to set their OSN profiles to private (Lewis et al., 2007). Additionally, users who have offline roommates or friends who set their profiles to private may be more likely to also protect their online information. Overall, users of OSNs have been found to have significantly greater risk taking attitudes than those who do not use OSN, and men seem to have higher risk taking attitudes than women (Fogel & Nehmad, 2009). In other words, people with OSN

profiles, particularly men, are more willing to accept the risks associated with sharing their information with others online.

A user's decision whether or not to protect or to share personal information may be made early on in the profile creation process, and may not be revisited as new information is added to the profile or as the privacy controls of the network change (Strater & Lipford, 2008). Strater & Lipford explain that as the culture of an OSN changes over time, so may privacy expectations. As users see what other users share or expect to keep private and as the network evolves, they may change their privacy wants and needs. Yet, given that users may not remember to or know how to revisit privacy settings after their initial profile set-up, they may not be achieving the level of privacy they say they want.

Existing research suggests that young people expect to be able to control how they share their information via an OSN and view this ability as their definition of having privacy (Livingstone, 2008). Other, older populations, on the other hand, tend to associate privacy with the protection of specific types of information. In other words, younger populations appear to be more willing to share types of information that older populations may withhold from an OSN, such as religious and political views, age, income, and sexual preference. Overall, users of OSNs have been found to have less concern with identity disclosure (Fogel & Nehmad, 2009), which could explain why younger people, generally the most experienced users of OSNs, have morphed their definitions of privacy to accommodate what would previously be considered private, identifying information, but is now exactly the type of information they wish to share online.

Ultimately, users, particularly younger users, appear to be conflicted regarding the privacy of their online information. On one hand they want to share what would previously be defined as private information. On the other hand, they want to be able to control when they share that information and who they share it with. This is feasible given the structure of many of the currently popular OSNs (e.g., Facebook has detailed privacy settings that let a user achieve this exact type of control). Trouble arises, however, with the fact that these very users have been shown lackadaisical in attending to changing or periodically updating their privacy settings as information and OSNs evolve. It may be that users need to be educated about privacy risks and empowered to regularly manage their OSN information privacy. However, it also indicates that achieving a safe level of information sharing across the board on OSNs must include users who are active in protecting their own privacy (in addition, of course, to well-designed OSN privacy interfaces and affordances).

Content of OSNs

The content shared via OSNs is generally user-created by individuals, groups, and companies. However, some information is also provided by the network itself, as well as advertisers and others promoting products or services. As previously mentioned, this content has only minimally been directly investigated. More often, studies have focused on characteristics of OSN users and have secondarily provided insight about OSN content.

In their study of how Facebook profile entries related to the number of friendship connections users had, Lampe et al. (2007) gathered data about the types of information users posted to their profiles. A majority of users (usually between 60-95% of participants for each item) provided nearly all of the types of profile elements investigated, including sex (94%);

hometown (83%); favorite movies (80%), music (78%), and books (67%); political views (61%); relationship status (79%); birthday (84%), and email address (92%). Less commonly provided content items included website (29%) and current address (14%). It was found that fields that display common referents such as hometown or high school were more highly associated with number of friends than fields that displayed personal likes and dislikes, such as movies, music, and books. Ultimately, these data give a clearer picture of the type of content OSN users provide on their individual profiles.

Fogel & Nehmad (2009) conducted a study to measure the relationship of risk taking to use of social network sites, focusing on MySpace and Facebook. Their survey items provided data describing the frequency various profile elements appeared on users' pages. These data were similar to that of Lampe et al. (2007), indicating that the majority of users provided content about their email address, instant messenger information, and information about their personal interests. Additionally, a majority of users also provided a profile picture, information about their personality, and use their real name on their profile. Users were less likely to provide information regarding their phone number or home address.

In addition to providing user-generated content themselves, Brown et al. (2007) noted that users of a niche OSN (in this case, an OSN that supported the fans of the popular television shows *Buffy the Vampire Slayer* and *Angel*) also formed interpersonal relationships with the OSN's content provided by other users. The status of this relationship depended on three factors: tie strength, or intensity of interactivity and personalization; homophily, or congruence between users' interests and mindset and the OSN content; and source credibility, or the perceived competence and trustworthiness of the OSN content and its members. What is unique about the users of this niche OSN is that since they contributed to the content of the OSN (via the

information they shared), they formed the strongest ties with the online community itself, rather than the individual members. It is unknown if this relationship exists with other niche OSN content, such as health related content, however this research does suggest the possibility and merits further exploration in future online health research.

Different types of content also have different perceptions in the minds of users. Although this may not be exemplary of all OSNs, one study revealed that Facebook is perceived as a trustworthy site (Fogel & Nehmad, 2009). However, another study found that due to the highly connected nature of OSNs, trust can quickly be degraded when dissemination of spam or virus content happens (Mislove et al., 2007). This suggests that users may be more likely to accept and receive content on OSNs if that information is provided within the proper confines of what the OSN is intended for (which is not likely to be spam or solicitations).

Agichtein, Castillo, Donato, Gionis, and Mishne (2008) developed a set of criteria to identify OSN content quality:

- 1) Intrinsic content quality: includes number of words; punctuation and typos (poor quality text is often marked with errors); syntactic and semantic complexity (e.g., syllables per word and readability measure); and grammaticality (identifying parts of speech sequences to evaluate correct grammatical structure. The more an item conforms to traditional writing standards, the more likely it is of higher quality.
- 2) User relationships: higher quality items are likely to have a greater relationship with users (i.e., they are likely to be favored more by re-posting, responding, or in some other way voted for as “good”).

- 3) Usage Statistics: The greater the number of clicks on an item and the higher the dwell time, the more likely the item is of higher quality.

Ultimately, Agichtein and colleagues (2008) argued that this approach could help identify spam and other malicious content, which ideally could make it easier for OSN administrators to filter these types of bad content away from users. Although they successfully tested these criteria on content from a question-and-answer type OSN, further research is needed to see if these insights are still applicable to other types of OSNs.

Characteristics of OSN Technologies

Additionally important in understanding OSNs is considering characteristics of the technologies themselves. For example, researchers have found that OSNs have specific user structures and lifecycles. Depending on their linkages with others in a network, users can be classified as singletons, members of the “giant component”, or members of the “middle region” (Kumar et al., 2006). Singletons are users who have joined an OSN but are not connected with other users and do not actively participate. The “giant component” represents more highly active users who are directly or indirectly connected to a majority of the entire network. It is this highly connected core of people that contributes to the virility of online, networked information (Mislove et al., 2007). A blast of information from one user in the giant component, whether useful, spam, or even a virus, can quickly be seen by other users in the giant component and spread swiftly among a majority of the entire OSN. Finally, the “middle region” represents the majority of users who are part of smaller, more isolated communities within the larger OSN (Kumar et al., 2006). These are active users who interact within their large or small communities, but are not deeply connected to the “giant component” or the network as a whole.

These smaller communities may be segregated by factors such as nationality, age, or education (Hargittai, 2008).

Enthusiastic early adopters who are excited about the new technology and eager to create linkages with friends are the type of users who mark the earliest phase of the lifecycle of an OSN (Kumar et al., 2006). Eventually, the formation of these linkages slows as the initial networks of the early adopters diminish. The growth of the OSN then picks up once knowledge of the network increases and other users organically join and create connections. Eventually, a steady, organic growth is maintained.

Definition of an OSN

Emerging from this review and in response to RQ1, *What is an online social network (OSN) and how is it used for information retrieval and exchange?*, are several important characteristics of an online social network (Table 1).

Characteristic of OSN	Description
Function	An OSN is a web-based service that connects users to other people or information.
Users	Users of OSNs are represented by most demographic groups and users most frequently connect with users they also know offline.

	<p>Positive social interaction via OSNs may help build user self-esteem, create support networks, and increase social capital, while negative interaction may cause a decrease in self-esteem.</p> <p>Users share information for self-expression and self-construction.</p> <p>User privacy is a salient issue regarding information sharing via OSNs; and while users say they want control over their information, many users have been found to not attend to maintaining their online privacy as information and networks evolve.</p>
Content	<p>Content is generally user-created and quickly disseminated among a network of users.</p> <p>Types of content that users are willing to provide on their own profiles include referent information and information about likes and dislikes, as well as profile photos and personality information. More strictly identifying content such as address and phone number are less likely to be provided.</p> <p>A relationship may be formed with the OSN content. Certain types of content (e.g., non-spam content) is viewed as more trustworthy than spam or solicitation content.</p>
Technology	<p>OSNs have a user structure, and users are clustered or segmented according to their connectedness with the network.</p> <p>OSNs also have a lifecycle, first marked by the excitement of early adopters, then a trickling of interest once the networks of these early adopters diminish, and finally resulting in a steady, organic growth.</p>

Table 1. Characteristics of OSNs

Spontaneous Diffusion of Information via OSNs

With this clear picture of what an OSN is and how it is used, we can now discuss a method by which information is disseminated or shared in an online social space like an OSN. The idea of spontaneous diffusion of information is particularly interesting here because of the potential for information to spread quickly among the networked users of an OSN. Since most content in an OSN is user-generated, the concept that that information will be randomly swept up

by other users and spread throughout the network, with little or no control by the information creators (Mangold & Faulds, 2009), is an intuitive description, and one that OSN researchers, as well as other social media researchers, have given attention (e.g., Russ, 2008; Gruhl, Guha, Liben-Nowell, & Tomkins, 2004; Adamic, n.d.).

As Gruhl et al. (2004) described, diffusion of information through online social spaces is rooted in epidemiological models of disease-propagation. Basically, this process begins with a person becoming susceptible to a disease. They then become infected by the disease. The disease runs its course and then at some point is recovered from or removed. A person may then once again be susceptible to the disease or they may become immune, depending on the specific disease (Bailey, 1975).

Building from a business application of this disease-propagation model called the “hyper-cycle” (Fenn & Linden, 2005), Russ (2008) described a series of phases specific to the spontaneous spread of information in OSNs. First is the initiation phase, where an enthusiastic individual or group creates excitement about an item of content. These are often the enthusiastic, highly involved individuals as described by (Kumar et al., 2006). This is followed by the propagation phase, where the visibility of that content is increased through sharing. Factors like awareness and social reputation can help the information propagate quicker during this phase (Russ, 2008). Then, the amplification phase is reached and the spreading of the information reaches the “critical mass,” which is the tipping point that causes the content to either die or become a viral outbreak. (The original hyper-cycle model also includes a termination phase, where, over some period of time, an item of content simply dies (Fenn & Linden, 2005)).

Therefore, combining these ideas and in specific terms of an online social space like an OSN, this process can be described as follows:

- 1) A person becomes susceptible to content by being a user of that OSN, logging on and being exposed to the content provided by others (via their profile information or other “posts” they have made).
- 2) A user becomes infected by the content by viewing it and deciding to share it with others.
- 3) The content “runs its course” by disseminating through a network of users (and each time a user shares the information, they are essentially engaging in steps 1 and 2 of this process).
- 4) The content either dies (is removed) because of lack of interest or reaches a viral outbreak because interest is exceptionally high.

Discussion of Spontaneous Diffusion of Health Information via OSNs

Considering the definition created to address RQ1: *What is an online social network (OSN) and how is it used for information retrieval and exchange?*, we can now discuss how this process of spontaneous diffusion of information may be useful for the retrieval and exchange of health information via an OSN.

Since users of OSNs frequently connect with users they know offline (Ellison et al., 2007), users may be most susceptible to health content provided by those they know offline. Therefore, spontaneous diffusion of health information may be most likely to begin because of content provided by these offline acquaintances. Spam and solicitation content may be less likely to be diffused, since those types of content are less trusted (Mislove et al., 2007).

Furthermore, health-related content that fosters self-expression and self-construction may be more likely to be shared with others, given that these are two primary motivations for users to share content. It may be this same kind of health content that reaches that “critical mass” or viral outbreak point. Content that does not foster self-expression or self-construction, spam content, and content from users less connected to other users offline may be more likely to die off more quickly.

Although users of OSNs come from nearly every demographic, users of a younger age have been found more likely to participate in health-related OSN use (Atkinson, 2009). Other disparities have not been found to significantly predict health-related social media participation (specifically, health support group participation). Therefore, OSN health communications may, in fact, be most effectively diffused when targeted toward a younger age group.

As health content runs its course, it may disseminate quicker among the “giant component” of highly involved users, since they are connected to the majority of the network (Kumar et al., 2006). Since awareness and social reputation can be important during this propagation stage (Russ, 2008), these highly involved users may be very attractive vehicles for getting information to spread quickly because they are actively focused on building their internal network through these very activities (Kumar et al., 2006). These individuals have more linkages, meaning others have been willing to accept them as “friends” or “follow” their social network activities. Research has found that health-related OSN users tend to trust other social networkers they follow because they view them as similar to themselves (Sarasohn-Kahn, 2008). This process of building trust can take time, but knowing that the most enthusiastic individuals are also usually the early adopters (Kumar et al., 2006) we also know that these connections have likely been around the longest, and therefore have simply had more time to build trust.

User privacy is an important overarching issue, especially considering the online dissemination of health information. The health care industry has standards for maintaining the privacy of health information, which does limit the participation of health providers in OSN health information dissemination (Hawn, 2009). Shifting from a one-to-one mindset (patient-provider) to a many-to-many (users-to-users) may help make OSN health information dissemination more valuable. The fact that users, most notably younger users, are willing to share more traditionally “personal” types of information (Fogel & Nehmad, 2009) is encouraging evidence that OSN users may be willing to talk about personal health issues online, on their own terms. This does mean, however, that the control traditionally given to communicators and content creators of their messages would be diminished (Mangold & Faulds, 2009). In other words, instead of being able to nicely package a health message and send it out into the nether of an OSN for consumption, once that message is sent, other users have the control to change that message however they see fit.

This introduces the danger of inaccurate health information being disseminated (Hawn, 2009). Misinformation, especially health information, can be dangerous. Wrong information can cause patients to not treat issues that need to be treated, mistreat health issues, or to become overly-concerned about health issues that are not actually severe. Again, it may require a shift in thinking to accept the value of using OSNs for health information in light of this. Thinking of OSN communication in the traditional patient-provider sense, it seems impossible to be entirely safe about disseminating health information. However, research has found positive patient participation in social media participation for health support (Atkinson, 2009). This is again shifting to that users-to-users mindset, where users are not looking to replace the information

they are getting from their providers, but instead looking for support and insight from other users who are experiencing the same health issues (Hawn, 2009; Sarasohn-Kahn, 2008).

The spontaneous diffusion of health information introduces some key considerations when using OSNs as the vehicle. In response to RQ2, *How might OSNs be useful outlets for the spontaneous diffusion of health information?*, these considerations are summarized in Table 2. Although there are privacy considerations as well as the necessity for content creators to relinquish full control over their messages, viewing OSN health information as a social-support group, rather than a substitute for provider relationships and information, the value of disseminating health information via OSNs in this manner can be seen and has been cursorily studied (e.g., Atkinson, 2009; Hawn 2009). Further research is necessary to flesh out these considerations in more detail, and to determine if there are other currently unknown deleterious effects of sharing health information in this manner. Ultimately, however, given the sheer number of users in OSNs this is an area of health communication that should continue to receive attention by researchers and communicators alike.

Spontaneous Diffusion Stage	Consideration
Content Susceptibility & Infection	<p>Users may be most susceptible to infection by health content from other users they know offline, content that is not spam or solicitation, and content that fosters self-expression and self-construction.</p> <p>Younger users may be most susceptible to health-related messages via OSNs</p>
Content Propagation	Content may propagate quicker among the highly-connected and active “giant component” of users.
Content Virility or Removal	<p>Similar health content may be more likely to become viral: content from other users known offline, content that is not spam or solicitation, and content that fosters self-expression and self-construction.</p> <p>Spam or solicitation content may be more likely to die off.</p>

Table 2. Characteristics of OSNs

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