

Using Depression Analytics to Reduce Stigma via Social Media: *BlueFriends*

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Abstract

Stigma associated with depression and mental illness is a widespread problem, often leading to negative health outcomes and discrimination for people with these conditions. Common stigma reduction interventions focus on two strategies: education (increasing basic understanding of the condition) and social contact (humanizing or ‘putting a face’ to the condition). These interventions have been explored in various formats, but little is known about the potential of leveraging online social media outlets to reduce stigma. *BlueFriends* is an application that seeks to reduce stigma by displaying a shareable information visualization graphic aimed at increasing both education and social contact. This application employs a predictive model of depression detection on Facebook. It visualizes the potential proportion of depression in a user’s online social network and displays a comparison of depression prevalence with other common prevalence levels in the US. *BlueFriends* expands current stigma reduction interventions by leveraging online social environments. By creating customized visualizations that users can share within their network, we hypothesize that *BlueFriends* will prompt collective stigma reduction and societal depression awareness.

Keywords: social media; Facebook; information visualization; network visualization; depression; stigma; stigma reduction

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1 Depression and Stigma

Depression disorders include several mental health conditions, namely major depressive disorder and dysthymia (NIH, 2013). While surveys report an estimated 1 in 10 US adults are diagnosed with depressive disorders (CDC, 2011), many more have the condition but do not seek treatment (NIH, 2013). Untreated, depression can affect overall health, often leading to chronic illnesses (NIH, 2013). Stigma often poses a barrier to seeking health care (McNair *et al.*, 2002). Stigma is defined as “a mark of shame, disgrace or disapproval,” resulting in a person “being rejected, discriminated against, and excluded” from social life (WHO, 2001, p. 16). Sometimes the stigma associated with mental health disorders is considered even worse than the condition itself (beyondblue, 2012).

Stigma reduction usually focuses on three prongs: protest, education, and social contact. (Corrigan & Penn, 1999). Protest includes speaking out against acts of discrimination; this approach has a limited effect, and, in fact, can cause a rebound and actually increase stigma (Corrigan & Penn, 2001). Education usually includes presenting facts about depression, which has some effect on reducing stigma, but this approach is limited as its impact often fades quickly (Corrigan & Penn, 1999). Social contact, which promotes interpersonal contact between the public and those with mental disorders, is the most promising avenue of stigma reduction because it humanizes the condition, thus breaking down stereotypes (RAND, 2012). Social contact with those from similar backgrounds (*e.g.*, socio-economic status or social group membership) can be even more compelling (RAND, 2012).

Psychological literature has considered many different ways to deploy these stigma reduction techniques. Education efforts have been explored in classrooms (Mann & Himelein, 2008) and online (Burns *et al.*, 2009), and social contact efforts have been explored in-person (Couture & Penn, 2003; Reinke *et al.*, 2004) and via film (Corrigan *et al.*, 2007). However, little is known about the potential of

leveraging online social media outlets to reduce stigma, particularly employing both education and social contact in the same intervention. Therefore, our research contributes to both psychological and social media research.

2 Depression Online

Frequent use of social networking sites (SNS) arguably increases loneliness and depression among users (Burke *et al.*, 2010; Moreno *et al.*, 2011). However, if SNS users are able to tap into supportive communities within their online social networks, SNS may be capable of affecting positive change among those with depression. Previous research has shown that “SNSs could be an innovative avenue for raising self-awareness and combating stigma surrounding mental illness” (Moreno *et al.*, 2011, p. 453). For example, users of health-specific online communities expressed interest in finding a similar emotionally supportive, motivational atmosphere within their Facebook network (Newman *et al.*, 2011). It is important, then, to find ways to help connect people with the members of their online social networks who could be supportive of their health goals (Newman *et al.*, 2011). As some research has found, the ability to draw from a user’s existing social network to promote health and wellness can have powerful effects (Munson *et al.*, 2010).

3 *BlueFriends*: An Online Social Network Application

Our method of signaling depression support and awareness to one’s social network involves computing and visualizing aggregate predictions of depression within one’s social network, and producing a shareable graphic. Because results can be highly individually personalized, visually pleasing, and sometimes surprising, visualizing social media data is often a powerful and engaging way to communicate and spread ideas via social media (*e.g.*, Dialect Quiz & Survey¹, Livehoods²).

In order to develop an engaging visualization, it is necessary to computationally analyze aggregate depression levels within one’s online social network. Several studies have demonstrated the feasibility of creating predictive statistical and machine learning models which can, with the help of natural language processing techniques, potentially detect depression. De Choudhury and colleagues (2013) constructed a model that predicts the presence of depression based on characteristics of a person’s Twitter profile, and created a “social media depression index” with potential for detecting depression in populations. A similar model used machine learning algorithms to distinguish between authentic and inauthentic suicide notes (Pestian *et al.*, 2010), further demonstrating the viability of computationally detecting depression based on written content.

BlueFriends will analyze Facebook status updates, network structure, and interactions between users to detect depression levels within the user’s network. We have chosen Facebook as the SNS with which our application will interact in order to emphasize our goal of visualizing the fact that depression exists within one’s *personal* social network. On other SNS such as Twitter, users often have many one-sided following relationships. However, on Facebook, there primarily exist mutual friend relationships between two users³. The Facebook network’s personalized environment accentuates the personalized nature of *BlueFriends*, furthering our goal of reducing stigma by showing that *people you know* may have depression.

Our application visualizes the percentage and amount of a user’s Facebook friends who, according to the depression detection model, have profile content and network interactions similar to those suffering from depression. This is depicted through a simulated network visualization, with a person icon

¹ http://www.nytimes.com/interactive/2013/12/20/sunday-review/dialect-quiz-map.html?_r=0

² <http://livehoods.org/>

³ Although there is the possibility of “following” people on Facebook, our application will consider a user’s network as only those with whom a mutual friendship exists.



Figure 1.

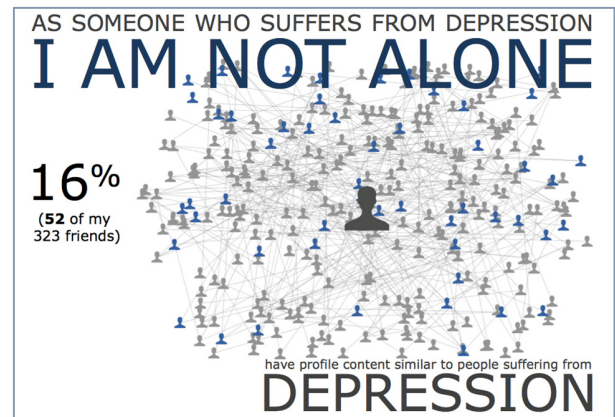


Figure 2.

Visualizations of estimated prevalence of depression within a users' Facebook network.

representing each friend in the user's network (see Figures 1 and 2). Percentage and amount of blue icons depicts the proportion of friends who signal depression. This visual is meant to represent a network visualization, but while the network's size and density is accurately displayed, the graphic is not an actual mapping of a user's network. To maintain anonymity, icon placement and edge location is randomized⁴. The visual solely serves to illustrate the ratio of depression in one's social network.

The visualization is also descriptive by textually displaying how many friends in a user's network indicate signs of depression. The goal of this visualization is to bring awareness to the prevalence of depression in a personalized manner and allow users to share this personalized graphic and the metric it conveys. Figure 1 shows a visualization that a user can share if they themselves do not have depression, but would like to share their network statistics with their friends and promote awareness. Figure 2 shows a very similar visualization display that allows users with depression to share with their network the same graphic with the phrase, "I am not alone", in a sense "coming out" as someone with depression.

Cacioppo and colleagues (2009) found that over time, lonely individuals had less friends and that their non-lonely friends exhibited more loneliness. This is important because "*perceived* social isolation (i.e., loneliness) in normal samples is a more important predictor of...adverse health outcomes [like depression] than is objective social isolation" (Cacioppo *et al.*, 2009, p. 977). Thus, it is imperative to provide resources to combat *perceived* social isolation. By sharing the graphic, *BlueFriends* allows users to spread statements of social awareness and support, thereby potentially decreasing the perception of social isolation around depression.

Following the visualizations, we show the user the prevalence of depression in society compared to illnesses or events that users might otherwise assume would be more common than depression. Thus, users have a reference point to understand the prevalence of depression as a social concern.

BlueFriends works to further both the *education* and *social contact* prongs of stigma reduction in several ways. *Seeing* the predicted level of depression in one's network helps educate users about the prevalence of depression (education prong), while highlighting the proverbial 'face' of depression as *people you know* (social contact prong). *Sharing* the graphic allows users to spread this awareness (education prong) and social support (social contact prong) with their network. Finally, *BlueFriends* further educates users by showing them the prevalence of depression compared to other social concerns.

⁴ Additionally, users with less than 50 Facebook friends will not be allowed to use the application, in order to maintain anonymity within their friend network.

4 Evaluation

Multiple methods can be used to evaluate the effect of *BlueFriends* on reducing stigma around depression. Surveys based on Griffiths and colleagues' (2006) depression stigma measure can be given to a random sample of users before and after using *BlueFriends*. These results can be analyzed quantitatively to test whether there is a difference in users' stigma around depression after using the application. The user experience can also be explored qualitatively through short interviews, allowing for a better understanding of the impact the application has on attitudes around depression.

5 Limitations

When mining and analyzing social media data, ethical concerns arise. We attempt to respect user privacy by presenting depression metrics only in aggregate, and by anonymizing users in our network visualization and using a randomly-generated network structure. Also, conducting health-related interventions without clinical oversight can be problematic. Therefore, before deploying *BlueFriends*, mental health professionals should be consulted in order to mitigate unintended negative consequences.

6 Conclusion

Social media allows ideas, opinions, and resources to quickly spread across the Internet. Our goal is to leverage the inherent power of social media to reduce the stigma of depression on a societal scale by promoting awareness of depression and facilitating collective action to reduce stigma across social networks. Our application allows users to create a personalized network visualization that shows the percentage of people in their online social network who display characteristics similar to those suffering from depression. We hypothesize that seeing this visualization will help individuals contextualize depression: instead of something *other people* deal with, users can see that *people they know* may be depressed. This awareness has the potential to help users better understand the prevalence of depression, thus reducing stigma by breaking down stereotypes. Users are encouraged to share their visualization to promote depression awareness with their network. As users share their personalized visualization across online social networks, promoting both education and social contact, we hypothesize that stigma associated with depression can be decreased.

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