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Social network approaches to recruitment, HIV prevention, medical care, and medication adherence

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Abstract

This article reviews current issues and advancements in social network approaches to HIV prevention and care. Social network analysis can provide a method to understand health disparities in HIV rates and treatment access and outcomes. Social network analysis is a value tool to link social structural factors to individual behaviors. Social networks provide an avenue for low cost and sustainable HIV prevention interventions that can be adapted and translated into diverse populations. Social networks can be utilized as a viable approach to recruitment for HIV testing and counseling, HIV prevention interventions, and optimizing HIV medical care and medication adherence. Social network interventions may be face-to-face or through social media. Key issues in designing social network interventions are contamination due to social diffusion, network stability, density, and the choice and training of network members. There are also ethical issues involved in the development and implementation of social network interventions. Social network analyses can also be used to understand HIV transmission dynamics.

Keywords

Social Networks; HIV Prevention; Health Disparities; Diverse Populations

Social network members may influence individual HIV/STI risk behaviors that facilitate infection transmission.^{1–3} HIV related behaviors are embedded in dynamic social structures, or networks, that link individuals to others through interactions. Network characteristics, such as size, composition, and density have been found to be associated with HIV risk behaviors that include sharing injection equipment, drug use cessation,^{4–7} having multiple concurrent sexual partnerships, unprotected sex, and exchanging sex for money or drugs.^{8–11} Social network analyses have been used to explain demographic disparities in HIV/AIDS burdens among African Americans compared to other racial groups in the U.S.,¹² the role of social capital on HIV risk behavior among injection drug users (IDUs),^{13,14} and how overlap of drug and sexual networks foster gender differences in HIV risk.¹⁵ Social network approaches have also been developed for HIV prevention interventions to reduce risk behaviors.^{13,16–20}

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Networks dynamics

Most network studies to date are cross-sectional yet network membership and relationships are dynamic over the life course.^{21,22} While HIV prevention literature spans the age spectrum, network analyses have largely ignored the mechanisms by which many risky health behaviors become normative during adolescence and endure through adulthood.²² Indeed, network changes may occur in intensity, function, and frequency of interaction—all of which have important implications for both the spread and prevention of HIV. For example, network instability or turnover in IDUs' network ties has been shown to promote HIV transmission.²³ Assessing social networks as dynamic entities requires both analytic models to account for structural and functional changes, and methods of data collecting that are amenable to modeling network changes over time.

Structural factors and social networks

Social networks are located in physical as well as social spaces. Network members meet each other, live, and engage in risk behaviors in specific settings. Behaviors, therefore, can profoundly effect, and be affected by places in which they occur. Numerous studies have found public injecting among IDUs to be associated with higher risk injection practices.²⁴ On a larger scale, neighborhood factors such as racial and socioeconomic segregation may impact the availability of resources for network members. Gender norms influenced by incarceration patterns, drug use, and sex work may alter social ties and vulnerability to HIV transmission.²⁵ Further, stigma resulting from these structural forces may limit network choices. Individuals in stigmatized groups may be hesitant to affiliate with persons that may disclose their stigmatized behaviors. Although structural factors have been hypothesized to influence social network dynamics related to HIV transmission and care, there is little empirical research on this topic.

Social media, electronic communications, and social networks

Participation in social media is a popular means for creating and maintaining network connections. In fact, most adults (77%) and nearly all (93%) teenagers interact online as of 2010.^{26,27} Therefore, it is feasible to collect a wealth of social network data and deliver HIV/STI interventions with minimal expenditures and unlimited geographic reach. Social media sites such as Facebook have highlighted the potential utility of social network approaches to HIV research, prevention and care. For instance, social network sites may represent a convenient way to recruit participants for either face-to-face or online programs. However, research among African American and Hispanic MSM has found that recruitment using social media may lead to biased samples.²⁸

Nonetheless, the public's use of social media sites also elicits basic research questions about the nature of these social networks. For an individual who has 400 "friends" on Facebook, do all these friends influence behavior? What is the relative behavioral influence of social networking sites in comparison with face-to-face communication? What are the social network structures within a large social networking site that would be most effective to target? How does information and behavior change diffuse within these types of social networks? Chiasson and colleagues^{29,30} have discussed a range of methodological and ethical challenges that researchers who utilize the internet for recruitment and intervention delivery should consider. It is likely that future social network interventions will combine programs that utilize both face-to-face and online approaches.

Volunteer counseling and testing (VCT) & social networks

Almost one-fourth of those living with HIV are unaware of their status.³¹ Recent studies have found that only about half of urban at-risk African American men have been tested for HIV in the prior year.^{32,33} Effective strategies to identify new HIV infections are imperative since those unaware of their HIV infection status are thought to be the source for more than half of all new infections.³⁴ Compared to partner notification, offering VCT within identified social networks has been shown to be more efficient at identifying new HIV cases.³⁵ Network-based strategies can also alleviate some of the barriers to HIV testing.³⁶ Downing et al.³⁷ found that peer support was a major motivator for HIV testing. Nonetheless, while some studies have begun using social network methodology to increase HIV testing, no randomized controlled trials have utilized social network approaches.^{38,39}

Support networks, HIV medical care and medication adherence

Social network members provide critical material resources (e.g. transportation to medical appointments) and emotional support to people living with HIV, especially those who are impoverished. Social support is a consistent and strong predictor of health care utilization and medication adherence.⁴⁰⁻⁴² Moreover, the presence of specific network members (i.e. sex partner) has been associated with earlier initiation of HIV medical care in a national U.S. sample,⁴³ while having a large number of sources of support has been associated with access to care among IDUs.⁴⁴ Additionally, there appears to be a differential impact of having a main partner by gender among impoverished populations, with having a main partner being associated with better adherence among men but worse adherence among women.⁴⁵ Peer support programs have been developed to promote HIV medication adherence.⁴⁶⁻⁴⁸ An important question for such programs is whether to use existing social networks or to develop new network ties. The use of existing relationships is more likely to be sustainable than developing new relationships, yet it is likely that the effectiveness of these two different approaches will be context-specific and a function of the ability of the current network to provide support for medication adherence.

Social networks and microbiology

It is possible to link different social networks through the genetic strain analyses and to examine associated social network factors such as density, centrality, and betweenness with genetic strain factors.^{49,50} Potentially, genetic strain analyses can be used to develop HIV prevention interventions based on pathways and infection dynamics. It may also be possible to examine how antiretroviral treatments may impede transmission through networks and whom in the network to target for maximum impact.

Issues in social network intervention study design

To date it has been well established that social networks can be used to promote HIV risk reduction. At risk individuals can be taught how to spread risk reduction messages and behaviors within their social networks. An important issue with network intervention research is contamination, whereby individuals in the experimental intervention group talk to and encourage those in the control group to alter their behaviors. This scenario is more problematic with social network-based research than traditional RCTs developed for individual focused interventions. For example, it is unlikely that a blood pressure medication will impact the blood pressure of network members. In contrast, HIV risk behaviors are most often social and interventions are designed to alter the behaviors of more than one individual. Consequently, the differences between groups may be attenuated by contamination. One approach to minimize contamination is to conduct network interventions

with groups that do not interact. Moreover, appropriate methods of evaluating behavior change interventions are needed for network research designs.

Small dense networks that are peripheral and disconnected from other networks are ideal for RCTs when the network is the unit of analysis. For public health interventions, dense and highly connected larger networks are ideal for diffusion of information and behavior change. In addition to network density, another key network factor is turnover. If there is rapid network turnover it is unlikely that there will be sufficient interaction between network members for diffusion of behavior change, but if there is no network turnover then the amount of diffusion will be limited to existing ties.

Social networks and recruitment

One type of social network recruitment is through respondent driven sampling (RDS). RDS approaches often recruit a more diverse sample than convenience sampling. There has been debate as to the biases of RDS and whether the assumptions that RDS are based upon are adequately met. RDS recruitment produces chains, yet the linkages between these chains are often unknown. Collecting network data concurrently with RDS recruitment may enhance our understanding of the structural social network features of RDS samples. An example of using a targeted network sampling approach to reach young injectors may include recruitment of older injectors to delineate the injectors in their social network using a network inventory, and then request that they recruit younger injectors in their network. This process can continue until there is a plateau or recruitment goals are met.

Another method of recruitment through social networks is the random walk method.⁵¹ In this approach, once individuals delineate their networks, the investigator chooses at random one or more network members for the next stage of recruitment. This sampling technique has the advantage of true random selection of network members, but may be limited in capacity to recruit those network members who are randomly selected.

Social network interventions

Social network interventions tend to be cost effective because they reach the people in the intervention as well as those individuals indirectly involved. Social network interventions tend to be sustainable when they are able to change social norms that are associated with both sex and drug behaviors.⁵²⁻⁵⁴ Additionally, these interventions can serve a positive role for individuals who are members of disenfranchised and stigmatized groups in the community.

What are the best methods to utilize networks to promote HIV prevention? One approach aims to impede the spread of HIV by altering the network's structure.. However, this approach may also inhibit the spread of information through the network. Therefore, network interventions may alternately existing social networks to disseminate behavior change. Another approach creates new social networks, such as online support networks and self-help groups. Qualitative studies suggest that online support groups are a viable avenue for people living with HIV to gain social support.^{55,56}

When attempting to use networks to promote HIV prevention it is important to probe the mechanisms of behavior change. This is critical for developing appropriate interventions. Are social networks conceptualized as channels through which information and behavior change flows? Or are they treated as reservoirs for social norms that influence behaviors? There is evidence that social networks can be used to change social norms and HIV-related risk behaviors, but less is known about approaches to behavior change that are most effective at altering network-wide risk behaviors.

There are additional key research questions including whether network approaches will work in settings where major structural factors, such as access to clean injection equipment or laws that prohibit and stigmatize same sex sexual behaviors, impede behavior change. Moreover, some individuals join specific social networks that define themselves in opposition to health promotion messages, such as barebackers, and hence these individuals may not be influenced by those network members who encourage risk reduction.

Social influence and information are key aspects of network based behavioral interventions. However, individuals differ on receptivity to social influence. Some network members may have limited economic or social power to engage in risk reduction. On an individual level, mental health and substance use may influence risk behaviors and an individual's ability to change their risk behaviors. Given the multiple levels of direct and indirect influence on risk behaviors, social network interventions should not be viewed as simply substitutes for structural approaches or individual level interventions but they can be used in conjunction with community-wide prevention activities.

Current Models of Social Network Interventions

Social network-based interventions are designed to teach individuals about HIV risk reduction. These individuals then diffuse the information, behaviors, and skills to their network members. Two common network based interventions in HIV prevention are Peer Education and Popular Opinion Leader.

The Peer Education model is based on the premise that individuals in all positions in a social network can influence other members and that every member can be trained in leadership, communication, and social influence skills. In this approach, individuals are trained to be peer educators who disseminate risk reduction information and resources to their social network members. This model has been successfully implemented with drug users, adolescents, and heterosexual women.¹⁶⁻¹⁹ Interventions utilizing the Popular Opinion Leader identify key individuals who are trained in HIV risk reduction and then asked to spread this information to their peers. This model has been widely used with gay men in bar settings,²⁰ though some of the outcomes are mixed.⁵⁷

Ethical issues

Social network analyses are not without ethical issues to consider.⁵⁸ A perennial issue relates to the types of information that can be ethically obtained about individuals who are listed as network members. During network intervention implementation, the question of who needs to consent to be involved in a network intervention study remains unanswered. Network interventions that use negative social influence approaches such as shame, ridicule, or embarrassment also present pervasive challenges. Further, there is concern that peer educators may not follow researchers' scripts while promoting HIV prevention with their network members.

Social influence is a key approach for using social networks in encouraging HIV behavior change. But what if network members refuse to reduce high-risk behaviors? One alternative is to exclude or extrude high-risk individuals. Yet will they simply join other networks and increase the level of risk in those networks?

Conclusion

Social networks are a promising approach to sustainable and cost effective behavior change and for reaching hidden populations. There is convincing evidence that risk behaviors are linked to network factors and that risk behaviors are clustered within networks. Although

there has been great progress in social network and research in HIV prevention and care, there remain major research questions to address. These questions include how to most effectively harness the potentially powerful social influence processes within social networks; how to best delineate the relationship between macro-structural factors and network dynamics; discerning which models to assess network change over time; and to more fully understand HIV transmission dynamics. It is also important to ensure that our research methods are aligned with the complexities of social network dynamics. Social network approaches have the potential for harnessing powerful and sustainable programs that have substantial reach. The goal of the next generation of network interventions ought to be to optimally use the power of networks to reduce HIV transmission and optimize HIV medical care.

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