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Social network factors as correlates and predictors of high depressive symptoms among Black men who have sex with men in HPTN 061

Carl Latkin[%], Hong Van Tieu, Sheldon Fields, Brett S Hanscom, Matt Connor, Brett Hanscom, Sophia A. Hussen, Hyman Scott, Matthew Mimiaga, Leo Wilton, Manya Magnus, Iris Chen, and Beryl Koblin

[%] Department of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, 737 Hampton House, Baltimore, MD 21205, 410-955-3972, carl.latkin@jhu.edu

Abstract

Depression is linked to a range of poor HIV-related health outcomes. Minorities and men who have sex with men (MSM), suffer from high rates of depression. The current study examined the relationship between depressive symptoms and social network characteristics among community-recruited Black MSM in HPTN 061 from 6 US cities. A social network inventory was administered at baseline and depression was assessed with the CES-D at baseline, 6, and 12-months. At baseline, which included 1167 HIV negative and 348 HIV positive participants, size of emotional, financial, and medical support networks were significantly associated with fewer depressive symptoms. In longitudinal mixed models, size of emotional, financial, and medical support networks were significantly associated with fewer depressive symptoms as was the number of network members seen weekly. In the multivariate analyses, size of medical appointment network remained statistically significant (aOR= 0.89, CI=0.81-0.98). These findings highlight the importance of network support of medical care on depression and suggest the value of support mobilization.

Abstract

Depresión está vinculado a una variedad de resultados de problemas de salud con el VIH. Las minorías y los hombres que tienen sexo con hombres (HSH), sufren de altos índices de depresión. El presente estudio examinó la relación entre síntomas depresivos y características de red social entre reclutó a comunidad negra HSH en HPTN 061 de 6 ciudades de Estados Unidos. Un inventario de la red social fue administrado al inicio del estudio y la depresión se evaluó con el CES-D al inicio, 6 y 12 meses. En línea de base, que incluyó 1167 VIH negativo y 348 VIH positivos los participantes, el tamaño de las redes de apoyo emocional, financiero y médico se asociaron significativamente con menos síntomas depresivos. En modelos mixtos longitudinales, tamaño de las redes de apoyo emocional, financiero y médico se asociaron significativamente con

Compliance with Ethical Standards

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Informed consent: Informed consent was obtained from all individual participants included in the study.

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menos síntomas depresivos como el número de miembros de la red visto semanalmente. En el Análisis multivariantes, tamaño de cita médica red permaneció estadísticamente significativa (aOR = 0.89, CI = 0.81-0.98). Estos resultados destacan la importancia del apoyo de la red de atención médica sobre la depresión y sugieren el valor de la movilización de apoyo.

Keywords

Black MSM; HIV; African American; Social networks; Depression

Introduction

Depression is the one of the leading causes for loss of productivity and lower quality of life.¹ and its many associations with diminished health extend to those with or at risk for HIV. History of depression predicts physical health condition such as cardiovascular disease and diabetes.² Depression is highly associated with hazardous alcohol use, illicit substance use, and relapse of drug use.³ Among people living with HIV (PLWH), depressive symptoms are linked to lower adherence to antiretroviral medications, greater number of missed medical appointments, and physical health symptoms of HIV.⁴⁻⁸ In longitudinal studies of PLWH, depression is also predictive of mortality.^{9,10} Men who have sex with men (MSM) experience higher rates of depression compared with heterosexual populations.¹¹ Among MSM, depressive symptoms are associated with HIV sexual risk behaviors, and predict HIV seroconversion.¹²⁻¹⁶ Depression has been proposed as one of the key measures of syndemic conditions among MSM as it has been linked to substance use and violence, as well as sexual HIV risk behaviors.^{17,18} It has been suggested that treating depression may improve current HIV prevention interventions,¹⁹ and depression has been shown to have a moderating effect on risk reduction among MSM in a risk reduction intervention.²⁰

Relatively few studies have examined depression specifically among Black MSM. One study found that depression was associated with MSM stigma among Black MSM. A sub-analysis of depression among Black MSM in the MACS cohort revealed that depressive symptoms were correlated with sexual compulsiveness and stress.²¹ Among Black MSM depressive symptoms have been found to be associated with unprotected vaginal and anal sex with a female partner.²² In the same sample the author also found that depressive symptoms were associated with problematic alcohol use among Black MSM.²³

Social support has been consistently found to be protective against depression and social isolation has been consistently found to be associated with depression and well-being.²⁴⁻²⁶ Some stressors such as stigma and discrimination may impact both depression and levels of social support. There is scant literature on social support and psychological well-being among Black MSM. One cross-sectional study in Baltimore found that among Black MSM, receiving emotional support from a family member or a sex partner was associated with reduced odds of having depressive symptoms²⁷, and a cross-sectional study of stigma found that a measure of greater general social support was associated with lower perceived HIV stigma but not MSM stigma.²⁸

For Black MSM who experience high levels of stress, it is important to understand if and what types of social support may militate against depression. There is a wealth of research that suggests that specific types of social support from network members are linked to specific health outcomes and that some types of support or relationships may be harmful.²⁹ For example, among men living with HIV, emotional support has been found to be associated with better HIV medication adherence, but among women living with HIV emotional support from a sex partner has been linked to poorer medication adherence.^{30,31} For some impoverished populations, material support from network members may be more important than emotional support.²⁴ Moreover, perceived support may be beneficial for individuals who are not heavily reliant on their network members; however, in situation where the network members are called on to provide support, such as emergencies and/or lack of resources, then enacted support may be more important than perceived support. These varying effects of social support on health outcomes suggest the value of using a social network approach to study social support, as it allows for a detailed examination of different types of social support function, role relationships, frequency of interactions, quality of support, and overlaps of social roles and support function. In contrast to the use of scales, social network approaches delineate a list of specific individuals based on functional social support, such as instrumental (provides materials support or physical assistance) or emotional support (provides empathy and understanding); social roles, such as family or sex partners; or attributes, such as emotional and geographic closeness and frequency of contact.

The current study examines the relationship between social network functional support and level of depressive symptoms among Black MSM recruited from six cities in the US as part of HIV prevention Trials Network (HPTN) 061. First, we examined the association using cross-sectional data, stratifying by HIV status. Low levels of social support may lead to depression, but depression may also decrease social support; hence, a prospective study design can help to understand the directionality of the association. Consequently, we also examined baseline social network functional support domains (emotional, financial, medical appointment, and social participant); frequency of interactions; network size; and role relationships (family and sex partners) as predictors of depression at the 12-month follow-up assessment.

Methods

The HPTN 061 study, which has been described elsewhere, examined the acceptability and feasibility of a combination intervention to prevent HIV among Black MSM in six US cities.^{32,33} Between 2009-2010, Black MSM were recruited in Los Angeles and San Francisco, CA; Atlanta, GA; Boston, MA; New York, NY; and Washington, DC. Individuals were directly recruited if they were: (1) HIV-infected but unaware of their infection, or (2) previously diagnosed with HIV but not receiving HIV care and reported having unprotected sex with HIV-negative or unknown status partners, or (3) HIV-uninfected. Once recruited into the study, these participants could refer their sex network members to be enrolled into the study. Recruitment methods were tailored to each site and varied across sites.

Enrollment criteria included self-reported male sex or male sex at birth and African American, Black, Caribbean Black, or multi-ethnic Black racial identification; age at least

18 years old; at least one episode of unprotected anal intercourse with a man in the prior six months; residence in the geographic area; no plans to move out of the area during the time of study participation; and provision of written informed consent. Face-to-face or telephone prescreening was used to determine eligibility.

After obtaining written informed consent and confirming eligibility, participants were administered a face-to-face interview, which included a social network inventory. Audio computer-assisted self-interview (ACASI) was used to assess drug and HIV risk behaviors and depressive symptoms. All participants received HIV counseling and testing and those who tested positive were provided medical and social service referrals. Reactive rapid HIV test results were confirmed by Western blot testing at each study site. Additional quality assurance testing was performed retrospectively to confirm the HIV status of each participant by the HPTN Laboratory Center. The institutional review boards at all participating institutions approved the study protocols.

Measures

The survey assessed housing stability, income, education, and age. Self-reported HIV status was also assessed through face-to-face and ACASI interviews. The Center for Epidemiologic Studies Depression Scale (CES-D) was used to measure the number of days in the past week participants had experienced depressive symptoms. Items were answered on a 4-point Likert scale ranging from “Less than 1 day (rarely/none of the time)” to “5-7 days (most of the time)”, with the sum of all the scores computed for participants who answered all 20 items. The scores were added and dichotomized with a score of 16 considered as clinically significant depressive symptoms.³⁴ The scale's Cronbach's alpha coefficient of 0.94 suggested high internal consistency.

The network inventory, which assess perceived functional social support and was based on a previously validated measure³⁵, was administered by study staff. For the network name generators, each participant was first asked to name up to five persons whom he could rely on for functional social support in the following four domains: (1) emotional support: “If you wanted to talk to someone about things that are very personal and private is there anybody you could talk to?”; (2) medical appointment support: “Is there anybody who would go to a medical appointment with you?”; (3) financial support: “Is there anybody you know who you would ask to lend you \$100 or more if you needed it?” and (4) social participation: “Is there anybody that you get together with, spend time talking, relaxing or just hanging out with?” Participants were then queried about their sexual network using the following name generator: “I am now going to ask you about additional people in your sexual network. The people in your sexual network are people you have had anal or vaginal sex within the last six months. Although there may be people you only have had oral sex with in the last 6 months, we are not going to include them in this discussion.” Once the list of network members was delineated, participants were asked about the race, age, gender, relationship, and frequency of contact with each network member.

Analyses—The baseline sample consists of 1167 HIV negative, 348 HIV positive, and 32 participants with unknown HIV status. HIV status was determined by serological assays. We

first used chi-square tests to examine the relationship between network factors, other covariates, and baseline level of depression. Then using longitudinal mixed effects logistic regression models, we examined the association between social network factors and depression. These network factors included total network size and the size of three specific types of functional social support: financial support, medical support, and emotional support. One model assessed having family members in the network and one model examined having sexual partner who also were in the network. To assess frequency of interactions with network members, we assessed number of social network members seen daily, weekly, and rarely. At the 12-month assessment, retention was 74.9%. We also model depression as a continuous outcome using linear mixed effects models. The results of the binary and linear models of depression were highly similar. To determine whether baseline network size was associated with changes in depression over time, interactions between the network factors and time (6 and 12 months) were also modeled. Each multivariate model was adjusted for age, education, household income, housing status, city of recruitment, reporting a place to go for medical care when sick, and having seen health care provider in the prior six month. Finally, we stratified the analyses by HIV status. Adjusted odds ratio (AOR) were calculated, as well as 95% confidence intervals. A p-value of <0.05 was considered statistically significant. Analyses were conducted using SAS® version 9.4.

Results

Descriptive analyses

As seen in Table 1, the majority of participants had less than a college education (53%), had household incomes of less than \$20,000 a year (60%), had stable housing (85%), and were over 30 years of age (66%). Lower education, income, and housing stability were significantly associated with higher levels of depressive symptoms. City of recruitment was also associated with depression, with significantly higher levels of depression observed in participants from Boston and San Francisco as compared to Atlanta and Decatur, GA. Having family in social network, the number of sexual partners in social network, the total size of social network, the size of network seen daily, and the size of network seen rarely were not associated with depression. The number of network members seen weekly was marginally associated with lower levels of depression ($P<.10$)

At baseline larger functional support networks were significantly associated with lower levels of depression (emotional support, $p=.0156$; financial support, $p=0.0013$; and medical assistance support, $p=0.0001$) (Figure 1). For each of these three network types, among participants who reported that they have no network members, more than half reported depression.

Using longitudinal logistic mixed effects models, we found that after adjusting for covariates, four network characterizes were significantly associated with level of depression (Table 2), including size of emotional support network, financial support network, and medical appointment support network as well as the number of network members seen weekly. Adjusted odds ratios were similar for the size of the emotional support, financial support, and medical appointment support network variables, ranging from .88 to .92. We examined interactions by network size and levels of depression at the different waves. There

were no significant interactions. Size of the support networks at baseline were not significantly associated with changes in depression over time. In a model that included all four network size measures simultaneously, only size of medical appointments network remained statistically significant (OR=.88, CI=.80-.97).

When stratified by HIV status, a similar pattern emerged for those who were HIV negative. Interestingly, among those participants who were HIV positive, none of the social network factors were associated with depression (Table 3). Among the HIV antibody positive participants, we also modeled their self-reported HIV status. This variable did not appreciably change the findings.

Discussion

In this study of Black MSM, larger emotional, financial, and medical support networks were found to be associated with lower levels of depressive symptoms. In addition, the number of network members seen weekly was found to be protective in the longitudinal analyses. We did not find evidence that network factors predicted change in depression above and beyond the cross-sectional associations. This finding could be due to the episodic nature of depression or that stressors and other negative life events that may occur between assessments impede any protective effects of the prior network support. It is also possible that depression leads to either perceptions of smaller support networks or actually interacting with fewer network members. These findings do not rule out a bidirectional association between social network factors and level of depressive symptoms.

Prior cross-sectional and prospective studies of social networks and depression in a range of other populations have found that emotional support is protective against depression.²⁴ In a Swedish nationally representative sample of 5,053 adults depression was associated with lower levels of emotional and instrumental support as well as having friends or acquaintances who could provide “medical expertise.”³⁶ There are a few longitudinal studies of networks and depression. Network studies of elderly do find that lower levels of material support within the social network predicts depression^{37,38}. However, these studies tend to combine material and emotional support. The strong association between level of depression and the number of network members who could attend a medical appointment with the participants may be a measure of the resources of the network members, the strength of the relationships, and/or a matching between the needs of participants and the support provided by network members.

The lack of social network associations with depressive symptoms among self-reported HIV positive participants is perplexing. One explanation is that their need for support may be greater than the support available. The network inventory only assessed perceived support and did not assess actual or enacted support. Future research on social networks of Black MSM should assess actual support provided as well as perceived potential support. Participants living with HIV may have requested support from network members and found that their perceptions did not match support provided. Individuals who they anticipated would provide support may have been unwilling or unable to provide support, and others who they did not expect to provide support may have been more helpful than anticipated. As

we did not assess the HIV status of network members we do not know if HIV concordant network members provide important types of support.

It is also possible that the individuals who reported that they were unaware of their HIV positive serostatus or reported that they were seronegative when they knew that they were positive were different than those who knew and reported that they were HIV positive in regards to social network support. However, the majority of HIV positive participants in the study were aware of their positive serostatus. It is also perplexing as to why having network members who were seen weekly was associated lower levels of depressive symptoms, whereas size of network with daily interactions was not associated with lower levels of depressive symptoms. It may be that the network members seen weekly are different or that they provide different types of resources as compared to those network members seen daily or occasionally. For example, network members who are seen daily may request more support than those who are seen weekly, which can be difficult to provide when individuals have limited resources. These results suggest that additional research is needed to better understand the relationship between social network factors and depressive symptoms among people living with HIV.

A list of study limitations should include that the study utilized different recruitment methods at each site, which limits site comparisons. Also, the social network inventory assessed perceived functional support and did not assess enacted support or HIV status of network members, distinctions which, if they could have been analyzed, may have elucidated unexplained patterns in our findings. Moreover, there were limitations on the number of network members who could be named. Recall biases and the limited number of name generating questions may have also influenced the findings. We also did not assess clinical depression; rather we assess symptoms that indicate probable depression. While noting these study limitations, it is also worth acknowledging the strength of the study's multisite design, which enhances the generalizability of the findings, as well as the large sample size.

Although a prior study of Black MSM found that emotional social support was associated with lower levels of depression²⁷, the results of the current study suggest that instrumental support may be an important factor in the psychological well-being of the Black MSM in this study, many of who were impoverished. Interventions to bolster networks that can provide instrumental support may be beneficial for depression and may also help to build a greater sense of community and enhance social capital among Black MSM who may suffer from racial, sexual orientation, and HIV stigma as well as from individual and neighborhood poverty.³³ Such interventions could enhance personal networks as well as develop stronger community networks for providing support and resources and encouraging social norms of risk reduction and health care promotion. As HIV infection also travels through the sexual networks of MSM, it is critical to both understand network dynamics and resilience factors that that can be leveraged to reduce transmission and enhance health behaviors.

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Figure 1.

The relationships between size of functional support networks and proportion of participants reporting high levels of depressive symptoms (CES-D >15) among Black MSM in HPTN

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Table 1

Demographic and social network characteristics by level of depressive symptoms (CES-D, 0-15 vs. 16+) among 1402 Black MSM in HPTN 061

Baseline Characteristics	Overall	Non-depression (0-15)	Depression (≥ 16)	P-value
HIV status				0.4913
HIV–	1059/1402 (76%)	596/782 (76%)	463/620 (75%)	.
HIV+	311/1402 (22%)	166/782 (21%)	145/620 (23%)	.
Unknown	32/1402 (2%)	20/782 (3%)	12/620 (2%)	.
City				0.0339
Washington, DC	195/1402 (14%)	116/782 (15%)	79/620 (13%)	.
Boston, MA	210/1402 (15%)	98/782 (13%)	112/620 (18%)	.
Los Angeles, CA	266/1402 (19%)	154/782 (20%)	112/620 (18%)	.
San Francisco, CA	188/1402 (13%)	96/782 (12%)	92/620 (15%)	.
Atlanta & Decatur, GA	263/1402 (19%)	155/782 (20%)	108/620 (17%)	.
New York City, NY	280/1402 (20%)	163/782 (21%)	117/620 (19%)	.
Housing status (Stable Housing)	1195/1402 (85%)	688/782 (88%)	507/620 (82%)	0.0011
Education (Some college education or more)	663/1402 (47%)	414/782 (53%)	249/620 (40%)	<.0001
Household income ($\geq$ \$20,000)	566/1402 (40%)	361/782 (46%)	205/620 (33%)	<.0001
Age (31 and older)	927/1402 (66%)	513/782 (66%)	414/620 (67%)	0.6448
Have a specific place to go when need medical care	1098/1402 (78%)	614/782 (79%)	484/620 (78%)	0.8383
Seen a health care professional in prior 6 months	842/1402 (60%)	461/782 (59%)	381/620 (61%)	0.3425
Family in social network	742/1402 (53%)	415/782 (53%)	327/620 (53%)	0.9030
Sexual partners in social network	1208/1402 (86%)	676/782 (86%)	532/620 (86%)	0.7309
Social network size (quartiles)				0.1081
<3 Members	449/1402 (32%)	230/782 (29%)	219/620 (35%)	.
3-4 Members	215/1402 (15%)	129/782 (16%)	86/620 (14%)	.
5-6 Members	475/1402 (34%)	271/782 (35%)	204/620 (33%)	.
>6 Members	263/1402 (19%)	152/782 (19%)	111/620 (18%)	.
Network members seen daily				0.9568
0	249/1402 (18%)	137/782 (18%)	112/620 (18%)	.
1-2	747/1402 (53%)	413/782 (53%)	334/620 (54%)	.
>2	406/1402 (29%)	232/782 (30%)	174/620 (28%)	.
Network members seen weekly				0.0847
0	389/1402 (28%)	211/782 (27%)	178/620 (29%)	.
1-2	726/1402 (52%)	395/782 (51%)	331/620 (53%)	.
>2	287/1402 (20%)	176/782 (23%)	111/620 (18%)	.
Network members seen rarely				0.7286
0	555/1402 (40%)	325/782 (42%)	230/620 (37%)	.
1-2	639/1402 (46%)	341/782 (44%)	298/620 (48%)	.
>2	208/1402 (15%)	116/782 (15%)	92/620 (15%)	.

Table 2

Summary statistics of social network factors associated with high levels of depression (CES-D > 15), using longitudinal logistic mixed-effect models among 1402 Black MSM in HPTN 061

Social network factors	OR (95% C.I.)	P-values
Social network size	0.97 (0.92, 1.0)	0.1079
Size of financial support network	0.92 (0.86, 0.98)	0.0158
Size of medical appointment support network	0.88 (0.82, 0.94)	0.0003
Size of emotional support network	0.92 (0.86, 0.98)	0.0135
Family in social network	0.92 (0.76, 1.1)	0.4178
Sexual partners in social network	0.94 (0.72, 1.2)	0.6478
Network members seen daily	0.97 (0.90, 1.0)	0.3035
Network members seen weekly	0.93 (0.87, 1.0)	0.0406
Network members seen rarely	1.0 (0.96, 1.1)	0.5485

Adjusted for age (dichotomized), education, household income, housing status, city, have a specific place to go when need medical care, and seen a health care professional in prior six months

Table 3

Summary statistics of social network factors associated with high levels of depression (CES-D > 15), stratified by HIV serostatus, using longitudinal logistic mixed-effect models

Social network factors	HIV positive (N=1167)		HIV negative (N=348)	
	OR (95% C.I.)	P-values	OR (95% C.I.)	P-values
Social network size	0.99 (0.89, 1.1)	0.7973	0.96 (0.92, 1.0)	0.1240
Size of financial support network	1.1 (0.95, 1.3)	0.1734	0.88 (0.81, 0.95)	0.0010
Size of medical appointment support network	1.0 (0.87, 1.2)	0.7772	0.85 (0.79, 0.92)	<.0001
Size of emotional support network	0.99 (0.85, 1.2)	0.8934	0.91 (0.84, 0.98)	0.0097
Family in social network	0.76 (0.48, 1.2)	0.2213	0.96 (0.77, 1.2)	0.7338
Sexual partners in social network	0.91 (0.52, 1.6)	0.7429	0.91 (0.52, 1.6)	0.7429
Network members seen daily	0.97 (0.84, 1.1)	0.6962	0.96 (0.89, 1.0)	0.3245
Network members seen weekly	0.92 (0.78, 1.1)	0.3225	0.94 (0.87, 1.0)	0.1041
Network members seen rarely	1.1 (0.92, 1.4)	0.2428	1.0 (0.94, 1.1)	0.7929

Adjusted for age (dichotomized), education, household income, housing status, city, have a specific place to go when need medical care, and seen a health care professional in prior six months