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Medical Mistrust among Social Network Members May Contribute to Antiretroviral Treatment Nonadherence in African Americans Living with HIV

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Abstract

Rationale—African Americans living with HIV are less likely to adhere to antiretroviral treatment (ART) compared to other racial/ethnic groups. Medical mistrust is thought to be a factor in this disparity.

Objective—We examined (1) whether exposure to HIV conspiracy beliefs, a specific type of HIV-related mistrust (about the origins and treatment of HIV) in social networks is associated with ART nonadherence among African Americans living with HIV; and (2) the characteristics of individuals who discuss HIV-related mistrust in the social networks of African Americans living with HIV.

Methods—At baseline and 6- and 12-months post-baseline, 175 African Americans living with HIV on ART completed egocentric social network assessments, from which we assessed the structure and composition of their personal networks (the social context immediately surrounding them). HIV-related mistrust was operationalized with an indicator of whether any social network member had expressed HIV conspiracy beliefs to the participant. Daily medication adherence was monitored electronically.

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Results—At baseline, 63% of participants agreed with at least one conspiracy belief, and 55% reported hearing at least one social network member (“alter”) express conspiracy beliefs. In a multivariate linear repeated measures regression, expression of conspiracy beliefs by similar others in the network (in terms of age, gender, HIV status, sexual orientation, and race/ethnicity) was associated with ART nonadherence (i.e., percentage of prescribed doses taken). In a multivariate logistic regression, expression of conspiracy beliefs was more likely among social network members who were HIV-positive, who knew the participants’ serostatus, and with whom participants interacted frequently, and less likely among more well-connected social network members.

Conclusion—HIV-related mistrust in the network may be most influential when expressed by similar others who may be HIV-positive themselves.

Keywords

African American; HIV; medical mistrust

Introduction

African Americans living with HIV are less likely to be engaged in HIV care, to receive antiretroviral treatment (ART), to adhere to ART, and to be virally suppressed, in comparison to people living with HIV from other racial/ethnic groups (Centers for Disease Control and Prevention, 2012; Simoni et al., 2012). Several explanations have been proposed for such disparities, including HIV stigma, racial/ethnic discrimination, and medical mistrust (i.e., of the healthcare system and of medical research), which is high in African American communities (Bogart et al., 2013; Bogart et al., 2010b; Earnshaw et al., 2013; Williams & Mohammed, 2013).

In the present research, we examined the relationship between medical mistrust and HIV-related adherence behavior, from the conceptual standpoint that health disparities arise from multiple levels of influence, including the structural, interpersonal (social network), and individual levels (Johnson et al., 2010; Kaufman et al., 2014). At the individual level, African Americans’ mistrust of healthcare and medical research findings may originate from their knowledge of prior historical institutional discrimination, as well as first-hand experiences in healthcare. At the interpersonal level, African Americans’ social networks may influence individual-level medical mistrust, by transmitting knowledge, norms, and stories about historical discrimination and social network members’ experiences with the medical system. At the institutional level, decades of oppression and discrimination in societal institutions, including historical segregation and unethical medical experimental in healthcare, such as the Tuskegee syphilis study (Friedman et al., 2009; Gamble, 1997; Washington, 2006), as well as documented disparities in healthcare provider treatment practices, are thought to have led to African Americans’ medical mistrust, both at the individual and social network levels. Such mistrust may influence individual-level health behaviors (e.g., delay or lack of healthcare engagement, nonadherence to treatment), and in turn, population-level disparities in health outcomes. In addition to a direct pathway to mistrust, institutional discrimination also may shape the context of health behavior, by constraining the composition and structure of social networks; for example, residential racial

segregation can constrain social networks to be similar in terms of race, which in turn may influence norms and individual-level attitudes (Friedman et al., 2009).

In African American communities, one manifestation of medical mistrust has been HIV-related mistrust regarding HIV's origins and treatment, also called "HIV conspiracy beliefs" (e.g., that HIV is a form of genocide against African Americans) (Bogart & Thorburn, 2005). For example, in a national survey of African Americans, 48% agreed that HIV is manmade, 53% that there is a cure for AIDS that is being withheld from the poor, and 44% that people who take ART are human guinea pigs for the government (Bogart & Thorburn, 2005). Studies continue to show high levels of such beliefs in convenience samples of African Americans, including those living with HIV (Bogart et al., 2010a; Clark et al., 2008; Ford et al., 2013; Westergaard et al., 2014).

A growing body of research suggests that medical mistrust, including conspiracy beliefs about HIV and other public health issues, is related to health behaviors (Bogart et al., 2011; Bogart et al., 2010a; Dale et al., 2014; Oliver & Wood, 2014). For example, endorsement of a greater number of public health-related conspiracy beliefs was related to worse health behaviors (e.g., not getting an influenza shot or annual physical examination) in a nationally representative general public sample (Oliver & Wood, 2014). Among African Americans, individuals who are distrustful of healthcare are less likely to utilize healthcare regularly (e.g., to delay regular check-ups and screenings) (Hammond et al., 2010a; Hammond et al., 2010b; Thompson et al., 2004), and among people living with HIV, distrust of healthcare providers has been associated with lower treatment adherence (Thrasher et al., 2008).

Mistrust specifically related to HIV (i.e., HIV conspiracy beliefs) has been related to less consistent condom use among African Americans in general and living with HIV (Bogart & Thorburn, 2005; Ross et al., 2006), and lower adherence among African American men living with HIV (Bogart et al., 2010a). For example, African American men who believed that people who take ART are human guinea pigs for the government were less likely to adhere to treatment at optimal levels for viral suppression. Null associations between belief in conspiracies and behaviors have been found in samples that include racial/ethnic groups other than (and in addition to) African Americans, and that have indicated higher endorsement of conspiracy beliefs among African Americans, especially compared to Whites (Clark et al., 2008; Gillman et al., 2013; Westergaard et al., 2014). Thus, mistrust among African Americans in particular may have greater implications for health behaviors and consequent disparities.

Almost no research has investigated the processes by which individuals obtain information about HIV through their social networks. A small amount of research in sub-Saharan Africa suggests that individuals look to social network members (i.e., the people in their social world) (Christakis & Fowler, 2009), to obtain information about HIV, and that perceived social network norms about HIV may diffuse across a group through communication and observation (Kaler, 2004; Weinreb, 2003). Research also suggests that social network members can promote condom use through communication about norms (El-Bassel et al., 2006). For example, in one study, drug users who had a higher proportion of friends who talked about condoms, encouraged condom use, and used condoms were more likely to use

condoms themselves (Latkin et al., 2003), and in another, individuals on methadone maintenance whose network members encouraged them to use condoms and who talked about HIV risk with network members were less likely to engage in unprotected sex (El-Bassel et al., 2006). Supportive social networks have also been associated with more recent HIV testing and lower-risk sexual behavior among Black and Latino men who have sex with men, and in turn, a higher likelihood of awareness of serostatus (Lauby et al., 2012). In contrast, riskier social networks (e.g., with more members who use substances) have been associated with greater sexual risk behaviors (Neblett et al., 2011). Overall, the body of research on social networks and HIV suggests that social network members can encourage or discourage healthful behaviors through communication about norms and modeling of behavior.

In the present research, we were interested in whether the communication of mistrust in social networks was related to treatment adherence among African Americans living with HIV. We defined social networks as the structural and compositional characteristics of people's social world, including the existence and quantity of social relationships and organization of people's ties to one another, as well as the socio-demographic and other characteristics of each person in the network (Christakis & Fowler, 2009). Our research had two general goals: (1) to examine whether exposure to HIV-related mistrust (i.e., HIV conspiracy beliefs) in social networks is associated with nonadherence to ART among African Americans living with HIV; and (2) to examine the characteristics of individuals who discuss HIV conspiracy beliefs in the social networks of African Americans living with HIV.

In addition to examining socio-demographic characteristics of social network members (i.e., "alters") in general, we explored whether several specific alter characteristics would be associated with discussion of conspiracy beliefs and whether mistrust conveyed by some types of alters would have more impact. Based on social psychological research indicating that similar others (e.g., on key identity dimensions such as race/ethnicity) are viewed as credible information sources (Shibutani, 1986; Simons et al., 1970; Wilson & Sherrell, 1993), we hypothesized that similar others' opinions related to conspiracy beliefs may be especially influential (and thus may be associated with nonadherence). We also based this hypothesis on research on "negative body talk," which has indicated that in groups of similarly stigmatized individuals (in term of body type), there may be a norm to engage in disparaging, stigmatizing conversations about body image (e.g., "fat talk"). Although individuals may experience comfort from discussing such issues with similar others, they may also internalize such conversations and consequently, as indicated by prior research, show greater shame (Engeln-Maddox et al., 2012).

Methods

Participants

In total, 246 participants were recruited for *Project Mednet* through AIDS Project Los Angeles from August 2010 to September 2012. Participants were eligible if they self-identified as Black or African American, were HIV-positive, and were at least 18 years-old. Participants were recruited via flyers and in-person contacts at clinics and AIDS service

organizations, and through media advertisements (e.g., radio, public transit, newspaper) throughout Los Angeles County, California, and screened in-person or by telephone. To ensure a range of participants across the continuum of care engagement (from fully engaged to not engaged in HIV care), we sampled clients of non-health service programs from five AIDS services organizations across Los Angeles County, including through transportation voucher programs and food bank lines.

All interviews were conducted in a confidential space at an AIDS service organization. Prior to data collection, participants provided written informed consent and signed a Health Insurance Portability and Accountability Act (HIPAA) form for release of medical record information. At baseline and 6- and 12-months post-baseline, participants completed an audio computer-assisted self-interviews (ACASI) and were then led through a social network assessment by the interviewer. If participants were taking ART, their adherence was electronically monitored for 12 months post-baseline. Participants returned every 2 months to download adherence data and provide updated contact information, if needed. Participants received \$50 at baseline, \$30 at 6-months post-baseline, and \$10 for each check-in.

The RAND Human Subjects Protection Committee and the California State University, Dominguez Hills Institutional Review Board provided approval. A Certificate of Confidentiality was obtained from the National Institutes of Health.

Survey Assessment

The survey, which covered socio-demographic characteristics and psychosocial variables, assessed similar constructs at all three time-points. The survey covered other psychosocial measures not listed below (e.g., depression) that were not included in the present analysis.

Socio-demographic Characteristics—Participants were asked to report date of birth, race/ethnicity, gender identity (i.e., male, female, male-to-female transgender, female-to-male transgender), sexual orientation (i.e., heterosexual, gay, bisexual, or something else other than heterosexual), annual household income, employment status, highest level of education, housing status, and incarceration history (i.e., whether they had been placed in the criminal justice system in the last three months).

HIV-Related Mistrust—Participants completed the HIV Conspiracy Beliefs scale, on which they reported their agreement with each of 10 beliefs (e.g., “HIV is a manmade virus”; “The medicine that doctors prescribe to treat HIV is poison”) on a scale labeled 1=strongly disagree, 2=slightly disagree, 3=neutral, 4=slightly agree, and 5=strongly agree (internal reliability $\alpha = .86$) (Bogart & Thorburn, 2005). We added one item to the original 9-item scale based on community stakeholder feedback (“HIV does not cause AIDS”).

Social Network Interview

Participants were guided through the social network assessment, administered on laptops with EgoWeb 2.0, open access social network software (RAND Corporation), at all three time-points, using established and validated procedures for an egocentric network approach (Campbell & Lee, 1991; McCarty, 2002; McCarty et al., 1997).

Alter Listing—At the start of the interview, participants were asked to list the initials of up to 20 social network members (alters) with whom they had contact (in person, or by phone, mail, or email) in the past year (at baseline) and the last 6 months (at both follow-ups). To prompt participants' recall, the interviewer gave examples of several categories of individuals that could be listed (e.g., family members, friends, people in their community such as neighbors, other people living with HIV, and people involved in providing HIV medical care or social services). Participants were asked to list first “the people who are most important to you” followed by “people who have been less important.”

Network Structure—Structural measures of the social network were derived from questions assessing the extent to which participants were close with each alter (i.e., “How much do you see, talk to, or email with [initials] in a typical month?” on a response scale from 0=never to 4=every day or nearly every day); whether participants think each pair of alters knows each other (yes/no); and how often they think each pair of alters interacts (i.e., “How frequently would you say [initials] and [initials] have had contact with each other in the past year, either face-to-face, by phone, mail, or email?” with response options 0=never, 1=almost never, 2=sometimes, and 3=always/almost always). Based on this information, we derived a measure of alter degree centrality (number of relationships a network member has; connectedness) at the alter level and degree centralization (i.e., overall connectedness) at the network level (Wasserman & Faust, 1994).

Network Composition—Participants were asked, to the best of their knowledge, to describe each alter in terms of socio-demographic characteristics (age, gender, race, ethnicity), relationship to participant [e.g., family, friend, spouse/boyfriend/girlfriend, relationship partner, sex partner, drug partner (i.e., someone the participant did drugs with), HIV support group member]. Participants were also asked the extent to which they trusted each alter (not at all=1, a little bit=2, very much=3). Participants were asked several questions related to HIV, to understand the context and nature of HIV-related communication with each alter, including each alter's HIV-serostatus (if known), whether they thought that each alter knew the participant's serostatus, and whether the alter ever talked about HIV (never=1, sometimes=2, often=3). From the network composition questions, we derived indicators for percentages of people with specific characteristics in the network, for example, percentages of alters who were men and who were HIV-positive. Prior research on the validity of our social network approach indicates that information from about 20 alters can provide unbiased estimates of overall network composition and structure (Golinelli et al., 2010; McCarty et al., 2007).

Expression of HIV-related Mistrust by Alters—Participants were asked questions related to HIV conspiracy beliefs for each alter with whom they reported that they had discussed HIV. Specifically, they were asked the extent to which they heard alters state each of the ten different conspiracy beliefs that comprise the items of the HIV Conspiracy Beliefs Scale (Bogart & Thorburn, 2005) on the scale 1=not at all/never, 2=a little bit (1-2 times), 3=sometimes, and 4=often. From these questions, we derived two indicators: whether any alter ever expressed any conspiracy belief to the participant, and average similarity to participant of the alters who expressed conspiracy beliefs (as explained below).

Medication Adherence

Participants' adherence to ART was electronically monitored adherence daily for 12 months post-baseline using Medication Event Monitoring System (AARDEX, Inc.) bottle caps, which recorded times when their medication bottle was opened. If more than one medication was prescribed, the medication with the most complex dosing schedule was used; if all medications had the same dosing schedule, the base of the drug regimen (non-nucleotide reverse transcriptase inhibitor, protease inhibitor, or integrase strand transfer inhibitor) was monitored (Arnsten et al., 2002). The Medical Events Monitoring System software package was used to calculate the percentage of total scheduled doses taken, at each time-point (starting at 2 months after follow-up and every 2 months thereafter through 12 months after follow-up). We also examined a more stringent dichotomous adherence criterion of greater than or equal to 85% of doses taken at each time-point, in accordance with prior research suggesting clinically significant effects at this adherence level (Bangsberg, 2006; Kobin & Sheth, 2011; Shuter et al., 2007).

Statistical Analysis

Association of Mistrust with Nonadherence—The first set of primary analyses was conducted to understand how exposure to conspiracy beliefs in networks (i.e., through alters' expressing such beliefs) was related to participants' ART adherence. For this analysis, data from the 6-month and 12-month assessments were combined in repeated measures analysis with fixed effects for the survey items and random effects for participants. Bivariate and multivariate linear repeated measures regressions were conducted predicting continuous adherence (i.e., percentage of prescribed doses taken), and logistic regressions were conducted to test a dichotomous adherence outcome (i.e., 85% of doses taken), using a significance level of $p < .05$. The multivariate model controlled for participant socio-demographic characteristics, participant belief in conspiracies, and social network structural and compositional characteristics that were marginally or significantly ($p < .10$) associated with adherence in the bivariate analyses. Note that 7 of the final sample of 175 participants were not on ART at baseline, but started ART during the follow-up period, and thus were included in the analysis.

We examined indicators of HIV conspiracy beliefs in the network, including whether any alter ever expressed any conspiracy belief to the participant, and average similarity to participant of the alters who expressed conspiracy beliefs. This latter analysis tested the hypothesis that alters who were more similar to participants would be more influential, and thus their expressions of conspiracy beliefs (e.g., mistrust of medications) would be associated with participants' nonadherence.

To derive the similarity variable, we selected five key socio-demographic characteristics on which to assess alter-participant similarity (i.e., age, gender, HIV status, sexual orientation, and race/ethnicity) and used a coefficient of similarity (i.e., a "Gower score") to compare alter and participant across characteristics (Gower, 1971). The Gower score was derived by (1) assigning each alter a numerator equal to the sum of the four categorical characteristics on which the respondent and alter were the same (e.g., if both respondent and alter were HIV-positive, but were different on the other three variables, the score would be 1), as well

as a score of how similar their ages were relative to the total range of alter ages [$1-(D/R)$ where D =absolute value of the difference, and R = total range of 1 - 93 (92 years)]; and (2) a denominator equal to the number of the five characteristics for which information was available for both the alter and the respondent (range of 0 to 5). The final score (numerator/denominator) had a range of 0 to 1, with higher numbers representing more similarity across the five characteristics, among those alters who expressed conspiracy beliefs to the participant. The similarity score for alters who expressed conspiracy beliefs is undefined for participants who did not report any alters stating conspiracy beliefs (51% of participants across time-points); for these cases, we imputed the similarity score using the grand mean. Because the model includes an indicator for whether any alters expressed any conspiracy beliefs, the coefficient for the similarity score is estimated only for records for which it was *not* imputed and is therefore unbiased.

Prediction of Alter Expression of Mistrust with Alter Characteristics—The second set of primary analyses was intended to understand the types of alters who were expressing HIV conspiracy beliefs, defined as whether the participant ever heard an alter say any of the ten conspiracy beliefs at baseline. For this analysis, we included all alters for whom we had complete baseline data regarding whether they had been heard discussing conspiracy beliefs by participants.

We ran a series of bivariate logistic regressions predicting discussion of conspiracy beliefs with alter socio-demographic characteristics (age, gender, race/ethnicity, sexual orientation, HIV serostatus), relationship characteristics (i.e., how the participant knows and/or interacts with each alter, including interaction frequency, relationship characteristics such as support group member, sex partner, drug partner, family, friend, or provider, and whether the alter knows the participant's serostatus), and position of alter in the network (i.e., degree centrality, or extent that alter was well-connected in the network). We used SAS v9.4 Proc Surveylogistic and clustered on participants. Multivariate models included only those predictors that were marginally or significantly ($p < .10$) associated with alter statement of conspiracy beliefs in bivariate analyses.

Missing data on participant socio-demographic characteristics ranged from 0.0% to 7.2%, and the participant-level conspiracy beliefs scale was missing for 6.6% of participants. Simple mean imputation was used for all missing data on participant characteristics. Alter characteristics were missing for 0.1% - 5.6% of alters; for the regression analyses, data were imputed with a single imputation using a Markov Chain Monte Carlo algorithm implemented with SAS v9.4 Proc MI.

Results

Descriptive Characteristics of the Participants

A total of 246 participants completed the baseline assessment, of whom 221 were on ART and retained for the 12-months, and 175 provided both survey and electronic adherence data during the 12-month study period and thus could be included in the primary analysis of participant adherence.

Fisher's exact tests indicated that participants who were included did not significantly differ from participants who were excluded on any of the socio-demographic variables (i.e., sexual orientation, education, recent incarceration, or employment status) except age, gender identity, and housing. Included participants were older than excluded participants [$M(SD)$] = 48.2 (9.4) vs. 42.7 (10.3), respectively, t -test $p < .001$] and more likely to be female (29% vs. 15%, $p = .03$) and to have stable housing (77% vs. 61%, $p = .02$).

On average, participants were 48.2 years of age ($SD = 9.4$, range = 22-69). Most (71%) were men ($n = 124$), 25% were women ($n = 43$), and 5% ($n = 8$) were male-to-female transgender individuals; 79% of the men ($n = 98$), 9% of the women ($n = 4$), and all of the male-to-female transgender individuals were gay, bisexual, or something else other than heterosexual. Participants as a whole had low socio-economic status: 65% ($n = 113$) had annual incomes below \$10,000, 28% ($n = 49$) between \$10,000 and \$20,000 annually, and 7% ($n = 13$) over \$20,000. Only 9% ($n = 15$) were employed full-time or part-time, and nearly all were not employed, with 69% ($n = 120$) unemployed, and 10% ($n = 18$) retired; the remainder ($n = 22$) reported "other" employment status. The majority (54%; $n = 94$) had a high school degree or general education development (GED) or less, 32% ($n = 56$) attended some college, 10% ($n = 17$) had a college degree, 4% ($n = 7$) had attended some graduate school, and <1% ($n = 1$) had a graduate degree. The majority (69%; $n = 121$) rented or owned their home, 22% ($n = 38$) were homeless or not stably housed (e.g., in a temporary housing situation), 7% ($n = 13$) were in federally subsidized housing, and 2% ($n = 3$) reported an "other" housing situation. Seven-percent ($n = 13$) were incarcerated or on probation or parole in the last three months. Participants were diagnosed with HIV an average of 13.8 ($SD = 7.3$) years.

A total of 62% ($n = 91$) had an undetectable viral load (< 50 copies) by the end of the study period, according to medical records (obtained for $n = 147$). Electronic adherence data indicated, on average, participants took 64% of medications as prescribed ($SD = 30\%$) over the first 6 months of the study period (based on the average of data collected at 2, 4, and 6 months after baseline), and 60% ($SD 31\%$) of prescribed medications during the last 6 months of the study period (average of 8, 10, and 12 month assessments). These averages exceeded 85% of doses taken for 33% of participants during the first 6 months of follow up and 31% during the last 6 months (based on past 2-week adjusted adherence at each time-point). Providing support for the validity of the adherence assessment, dichotomous adherence at 6-months and 12-months post-baseline was significantly associated with undetectable viral load ($r = .31$, $p < .001$ and $r = .24$, $p = .005$, respectively) as measured by medical records.

For HIV conspiracy beliefs (listed in Table 1), on the 5-point scale, average agreement across the 10 beliefs was around the mid-point ($M = 2.55$, $SD = 0.86$; range = 1.0 – 4.3, $n = 175$).

Descriptive Characteristics of Social Network Members (Alters)

Across participants, a total of 3,438 alters were listed at baseline. According to participant reports, alters were 44.4 years old on average ($SD = 13.8$); 42% were female, 55% were male, and 3% were transgender individuals. Participants reported that 43% of their male

alters, 8% of their female alters, and 95% of their transgender alters were gay/bisexual or something other than heterosexual (participants reported that the remainder of each group was heterosexual or did not know their sexual orientation). Most (85%) of alters were reported to be Black, 9% White, and 6% Latino. Almost a quarter (23%) were thought to be HIV-positive and 58% HIV-negative; participants did not know the serostatus of 19% of their alters.

Is Alter Expression of Mistrust Related to HIV Treatment Nonadherence?

As indicated by the multivariate regression shown in Table 2, nonadherence was associated with the expression of conspiracy beliefs. However, hearing any alter express conspiracy beliefs was not significantly related to treatment nonadherence. Rather, participants showed significantly greater nonadherence only if alters who were similar to themselves expressed conspiracy beliefs. Adjusted results for covariates indicated that adherence was greater among participants with older alters and among participants who were employed, and was lower among participants who had been incarcerated previously. In addition, adherence decreased significantly over time from 6-month to 12-month follow-up.

Parallel effects of alter mistrust were not significant for the dichotomous measure of adherence [for any alter expressed mistrust: Odds Ratio (*OR*) = 1.14 (0.66, 1.99), $p = .69$; for similar alter expressed mistrust: *OR* = 0.70 (0.06, 7.73), $p = .77$]. In addition, results for similar alter effects using unimputed data yielded nearly identical results to the results presented here.

Who is More Likely to Express Mistrust?

Table 1 shows the percentage of participants who agreed with each conspiracy belief (dichotomized at strongly or slightly agree vs strongly or slightly disagree or neutral) and the average percentage of alters who expressed any conspiracy beliefs across participants. At baseline, 63% of participants agreed with at least one conspiracy belief, and 55% of participants reported hearing at least one alter state at least one conspiracy belief; these two measures were significantly correlated overall ($r = .21$, $p = .009$), and were also significantly correlated for nearly all of the individual beliefs when examined separately.

Results of the regressions predicting expression of conspiracy beliefs with alter characteristics are shown in Table 3. In bivariate tests, expression of such beliefs was more likely among alters who were male, who were lesbian, gay, bisexual, or something other than heterosexual, who were HIV-positive, who were sex or drug use partners, who were friends with the participant, who interacted with participants frequently, who were members of an HIV support group, and who knew the participant's serostatus. In addition, alters who were more connected to other alters (i.e., who had higher degree centrality) were marginally less likely to discuss conspiracy beliefs with the participant. In the multivariate model, several of these variables were significant, indicating that expression of conspiracy beliefs was more likely among alters who were HIV-positive, who knew the participants' serostatus, who were drug partners, and with whom participants interacted frequently; further, alters with a higher degree centrality were significantly less likely to express conspiracy beliefs.

Discussion

Our study is the first of which we are aware to explore how mistrust in a social network may be associated with the HIV-related health behaviors of network members. Prior research has similarly found that HIV-related mistrust in the form of conspiracy beliefs, as well as general medical mistrust, is endorsed by a substantial proportion of African Americans (Armstrong et al., 2008; Armstrong et al., 2007; Bogart & Thorburn, 2005; Earnshaw et al., 2013), and is associated with nonadherence to HIV treatment (Bogart et al., 2010a; Dale et al., 2014). The present work takes previous research a step further, by elucidating the larger social context of mistrust, suggesting that merely being exposed to mistrust in the network may not be associated with nonadherence: importantly, the influence of mistrust may depend on its source and who is expressing such beliefs.

In our study, when similar alters expressed conspiracy beliefs, participants exhibited lower treatment adherence. These results suggest that the opinions of social network members who are similar (in terms of age, gender, sero-status, sexual orientation, and race/ethnicity) may have particular impact on people living with HIV. Moreover, similar others are potentially more influential than those who are well-connected within the network. Our findings are consistent with classic social psychological research, which has found that similar others are seen as more credible and thus can be more persuasive (Simons et al., 1970; Wilson & Sherrell, 1993). Similar others, especially those who are also living with HIV, may be perceived as having similar preferences and needs, and thus more able to understand a person's situation as well as the pros and cons that form a basis for his or her decision-making around treatment.

We also examined the types of social network members who discussed conspiracy beliefs with participants in our study. Key findings suggest that HIV-related mistrust may be expressed by close others (i.e., who are seen frequently) who know the participant's serostatus, potentially in the context of HIV support groups. Interestingly, alters who discussed conspiracy beliefs were less well-connected than those who did not, possibly because individuals who are similar on stigmatized characteristics (such as serostatus) may be compartmentalized from others in the network who may be less accepting.

Findings have implications for future intervention development research. Consistent with theoretical models of HIV-related behaviors (Friedman et al., 2009; Johnson et al., 2010), our results suggest that individual behavior change may be dependent on social network change. If other people with HIV, potentially those met through support groups, are conveying or reinforcing misinformation about HIV and its treatment, it is important to test the effectiveness of support group facilitators who are trained in strategies for overcoming mistrust and supporting receptivity to accurate information. For example, a motivational interviewing approach to counteracting conspiracy beliefs could be used by facilitators, that both acknowledges the historical context of mistrust to validate individuals' perspective, as well as offers accurate information about treatment in a non-confrontational fashion (Miller & Rollnick, 2012). In addition, tests of social network interventions are needed, to understand the effects of infusing accurate information about HIV throughout networks, perhaps through individuals who share similar socio-demographic characteristics (e.g., who

are also African American), or through new alters as part of programs that help people living with HIV expand and strengthen their support networks.

Importantly, our study shows that mistrust persists at high levels among African Americans, suggesting that structural interventions are critical to address the roots of mistrust as well as discrimination, including the wider historical and present context of structural discrimination in healthcare and other societal institutions. Further, healthcare providers could be made aware of the historical context of discrimination that may be influencing African Americans' health behaviors, as well as the prevalence of mistrust among clients and their social networks. In cultural competency trainings, healthcare providers could be educated about the historical context from which African American patients are approaching healthcare and medical research; providers could also be trained in motivational interviewing to proactively stem such beliefs in a non-confrontational, empathetic fashion.

Limitations

Several limitations should be noted. Mistrust in the network was operationalized as whether alters had expressed conspiracy beliefs to the participant. We do not know the context or content of such conversations and whether the alters agreed or disagreed with the beliefs. In addition, we did not ask network members directly about their socio-demographic and other characteristics, or their discussion of conspiracy beliefs with the participant; rather, we relied on participants' reports about alters. Although sociometric studies of whole networks may be important to verify our results, network research comparing participant and alter reports of alter characteristics has shown the validity of participant reports for key alter characteristics such as alter serostatus (Green et al., 2013). A further limitation is that nearly a third of baseline participants dropped out by the 12-month follow-up assessment. Our retention rate is consistent with those in other studies of similar populations (Bogart et al., 2010b; Wagner et al., 2006), in which housing instability, substance use, and other factors can lead to challenges in locating individuals over time. In addition, it is possible that mistrust is a greater deterrent to linkage to care than adherence to ART. Thus, individuals with the highest levels of mistrust may not have been represented in our study, as they may never have received care and been prescribed treatment.

Conclusion

In sum, the present study indicates that mistrust, in the form of HIV conspiracy beliefs, is actively discussed in the social networks of African Americans living with HIV, and that such discussions could potentially affect HIV-related health behaviors and consequent health. Future intervention development work is needed to determine how to target structural factors at the root of mistrust, as well as how to stem the spread of mistrust in networks, which ultimately may be contributing to HIV-related disparities in adherence and survival.

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Highlights

- African Americans living with HIV show low antiretroviral treatment adherence
- We examined medical mistrust and nonadherence in African Americans' social networks
- Expression of mistrust by similar network members was associated with nonadherence
- Expression of mistrust was more likely among network members who were HIV-positive
- Expression of mistrust was less likely by network members who were well-connected

Table 1

Percentages of participants who agreed with HIV conspiracy beliefs and percentages of alters who expressed HIV conspiracy beliefs at baseline (n = 175).

Conspiracy Belief	% of Participants Who Agreed ^a	% of Participants Reporting That Any Alter Stated Belief ^b	Correlation between Participant Agreement with Belief and Report of Any Alter Stating Belief (p) ^c
The medicine that doctors prescribe to treat HIV is poison	11.0%	22.0%	.08 ($p = .30$)
HIV is a manmade virus	29.9%	28.9%	.19 ($p = .01$)
There is a cure for AIDS, but it is being withheld from the poor	31.6%	28.9%	.30 ($p < .001$)
AIDS was created by the government to control minority populations	30.5%	22.0%	.29 ($p < .001$)
HIV was created and spread by the CIA	18.5%	12.7%	.27 ($p < .001$)
AIDS was produced in a government laboratory	28.2%	20.2%	.33 ($p < .001$)
AIDS is a form of genocide, or planned destruction against Blacks	21.3%	16.2%	.28 ($p < .001$)
People who take antiretroviral medications for HIV are human guinea pigs for the government	20.7%	18.5%	.17 ($p = .03$)
HIV does not cause AIDS	24.6%	9.2%	.14 ($p = .06$)
The medication used to treat HIV causes people to get AIDS	5.7%	4.0%	.07 ($p = .33$)
Any of the above beliefs	63.2%	54.5%	.21 ($p = .009$)

^a Agreement was rated on a 5-point scale (1=disagree strongly, 2=disagree slightly, 3=not sure, 4=agree slightly, 5=agree strongly). Responses were dichotomized as agree strongly or slightly versus disagree strongly or slightly or not sure.

^b Participants rated the frequency with which they heard each alter state each of the conspiracy beliefs on the scale 1=not at all/never, 2=a little bit (1-2 times), 3=sometimes, and 4=often. Responses for each alter were dichotomized as not at all versus a little bit, sometimes, or often. Shown here are the percent of participants who reported that any alter ever stated the belief.

^c Pearson correlation of dichotomized participant agreement with indicator that any of participant's alters ever stated the belief.

Table 2

Repeated measures linear regressions predicting HIV treatment adherence from alter discussion of HIV conspiracy beliefs (n = 175).

Alter Expression of Conspiracy	Unadjusted Beta (Standard Error)	p	Adjusted Beta (Standard Error)	p
<u>Beliefs</u>				
Average similarity of alters stating beliefs	-37.9 (15.7)	.017	-33.4 (14.8)	.026
Heard beliefs from any alter	0.9 (4.1)	.819	3.9 (3.8)	.312
<u>Alter Characteristics</u>				
Average Age	0.8 (0.3)	.002	0.6 (0.3)	.042
% Male	-17.3 (9.2)	.063	9.7 (10.7)	.365
% Black	-12.9 (9.2)	.162	---	---
% lesbian, gay, bisexual, or something else	-16.5 (5.7)	.005	-10.0 (6.4)	.120
% HIV-positive	-13.7 (6.0)	.024	-8.8 (7.4)	.235
<u>Alter Relationship</u>				
% Know participant's serostatus	-6.1 (6.0)	.312	---	---
% HIV support group member	18.1 (9.0)	.047	20.8 (9.8)	.036
% Current sex partner	-24.2 (14.6)	.101	---	---
% Drug use partner	-27.0 (10.6)	.012	-15.8 (9.2)	.088
% Family	0.1 (8.3)	.988	---	---
% Friend	2.6 (7.6)	.733	---	---
% Provider	18.1 (11.3)	.112	---	---
Interaction frequency (past year)	-6.7 (6.1)	.274	---	---
<u>Network Structure: Degree Centralization</u>	-17.41 (12.41)	.163	---	---
<u>Participant Characteristics</u>				
Agreement with conspiracy beliefs	-0.6 (2.3)	.787	-0.1 (2.1)	.949
Age (continuous)	0.7 (0.2)	.003	0.2 (0.3)	.489
Low income	-10.0 (3.9)	.012	-4.7 (3.8)	.218
Stable Housing	12.5 (5.4)	.023	5.5 (5.0)	.269
Employed (full-time or part-time)	15.4 (5.5)	.006	13.2 (4.9)	.008
Previously incarcerated	-14.8 (5.4)	.007	-12.6 (5.3)	.018
Wave (12-month follow-up)	-1.8 (2.1)	.410	-5.2 (2.2)	.020

Table 3

Logistic regressions testing associations between alter characteristics and expression of HIV conspiracy beliefs (n = 3,438).

Alter Characteristic	Bivariate Models Odds Ratio (95% Confidence Interval)	p	Multivariate Model Odds Ratio (95% Confidence Interval)	p
<u>Alter Socio-Demographics</u>				
Age	1.00 (0.99, 1.01)	.82	---	---
Male	1.66 (1.27, 2.17)	< .001	1.13 (0.83, 1.54)	.40
Black	1.03 (0.62, 1.71)	.92	---	---
Lesbian, gay, bisexual, or not heterosexual	2.27 (1.55, 3.32)	< .001	1.08 (0.67, 1.75)	.79
HIV-positive (vs negative)	4.15 (2.72, 6.34)	< .001	2.81 (1.66, 4.76)	< .001
HIV status unknown (vs negative)	1.30 (0.64, 2.62)	.47	1.55 (0.71, 3.41)	.23
<u>Alter Relationship</u>				
Knows participant's serostatus	5.97 (3.12, 11.40)	< .001	4.66 (2.37, 9.19)	< .001
HIV support group member	2.29 (1.41, 3.73)	< .001	1.17 (0.71, 1.93)	.45
Current sex partner	2.52 (1.53, 4.13)	< .001	1.38 (0.84, 2.27)	.21
Drug use partner	2.21 (1.28, 3.79)	.004	1.84 (1.03, 3.30)	.07
Family	0.67 (0.47, 0.95)	.03	1.54 (0.87, 2.74)	.29
Friend	1.48 (1.07, 2.05)	.02	1.35 (0.81, 2.24)	.44
Provider	0.75 (0.49, 1.17)	.21	---	---
Interaction frequency (past yr)	1.73 (1.26, 2.36)	< .001	1.65 (1.19, 2.27)	.002
<u>Alter Position: Degree centrality</u>	0.27 (0.07, 1.08)	.065	0.17 (0.04, 0.82)	.03