



# Engagement with health care providers as a mediator between social capital and quality of life among a sample of people living with HIV in the United States: Path-analysis



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## A B S T R A C T

**Background:** Social capital is “features of social organizations—networks, norms, and as trust that facilitate coordination and cooperation for mutual benefit”. People with high social capital have lower mortality and better health outcomes. Although utilization of social networks has grown, social capital continues to be a complex concept in relation to health promotion. This study examined 1) associations between social capital and quality of life (QoL), 2) factors of social capital leading to higher QoL among people living with HIV (PLWH), 3) role of health care providers (HCP) as a mediator between social capital and QoL.

**Methods:** This is a secondary analysis of the International Nursing HIV Network for HIV/AIDS Research. This cross-sectional study included 1673 PLWH from 11 research sites in the United States in 2010. Using path analysis, we examined the independent effect of social capital on QoL, and the mediating effect of PLWH engagement with HCP.

**Results:** The majority of participants were male (71.2%), and 45.7% were African American. Eighty-nine percent of the participants were on antiretroviral therapy. Social capital consisted of three factors — social connection, tolerance toward diversity, and community participation — explaining 87% of variance of social capital. Path analysis (RMSEA = 0, CFI = 1) found that social connection, followed by tolerance toward diversity, were the principal domain of social capital leading to better QoL (std. beta = 0.50, std. error = 0.64,  $p < .05$ ). Social capital was positively associated with QoL ( $p < .05$ ). About 11% of the protective effect of social capital on QoL was mediated by engagement with HCP ( $p < .05$ ).

**Conclusions:** This study emphasizes importance of social connections and mediating role of HCP in improving QoL for PLWH. To develop social capital effectively, interventions should focus on strengthening PLWH's social connections and engagement to HCP.

## 1. Introduction

Social capital has several definitions in the literature. Putnam (2001) defined *social capital* as “features of social organizations such as networks, norms, and as trust that facilitate coordination and cooperation for mutual benefit”. Harpham, Grant, and Thomas (2002) defined social capital as “the degree of connectedness and the quality and quantity of social relations in a given population” and emphasized its aspects of social networks. Bourdieu referred to social capital as a “collective of actual or potential resources linked and shared by institutionalized relationships, so to speak, group membership” (Bourdieu, 1986). Bourdieu regarded social capital as instrumental so the group membership and networking are a form of investment to

thrive for resources (Bourdieu, 1986).

Despite the multitude of definitions of social capital, there are major attributes that penetrate the concept. Social capital is both a tangible and an intangible resource available at both the individual and community level. The production and use of social capital occur between and among people (relationships) who are pursuing certain shared goals. The use of social capital can help people to take actions toward their goals. For example, trust, a critical feature of social capital, underpins developing and promoting a policy in a given society (Gilson, 2003).

The positive effects of social capital on health have been well studied. People with high social capital have better health outcomes—including higher self-rated health status and lower mortality

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(Kawachi, Kennedy, & Glass, 1999). The impact of neighborhood factors on birth outcomes, such as low birth weight, is well documented (Metcalf, Lail, Ghali, & Sauve, 2011). The importance of social capital is greater for marginalized population such as homeless individuals (Hwang et al., 2009) and women in vulnerable and deprived situations (Vyncke et al., 2014).

### 1.1. Social capital and HIV outcomes

HIV is a disease largely attributable to disparities (Centers for Disease Control and Prevention, 2011). Social capital, an important determinant of health, may play a role in HIV prevention and treatment. An ecologic study from Zimbabwe showed that HIV incidence was lower among women with high social engagement and capital. Those women were more likely to adopt safer sexual behaviors (Gregson et al., 2011). Social capital can improve HIV outcomes through a reduction in stigmatization. People living with HIV/AIDS (PLWH) with high social capital are less likely to experience stigma, and people with higher social capital are less likely to engage in stigmatizing behavior toward HIV-infected community members (Kreuter & Lezin, 2002). Therefore, building social capital in communities is important to lead a change in social norms (Chi et al., 2009).

### 1.2. Social capital, the relationship with health care providers and quality of life

Gilson (2003) emphasized importance of building trust in health care. Trust lies interpersonally between patients and health care providers (HCP). And the relationship is often shaped by the institutions in the health care systems. In her theory, building trust relationships can produce health and set of societal values at micro level (interpersonal and organizational level) and at macro level (health system to society). And patients with chronic conditions and in vulnerable situations do benefit more from the trust relationships.

Given that trust is one of the seminal features of social capital, studies have shown associations between social capital and engagement with HCP, leading to better health outcomes. A meta-analysis of 13 randomized controlled trials found a small but significant effect of patient-HCP relationship both on subjective pain, quality of life, psychosocial aspects, and objective health outcomes—for example, blood pressure and weight loss (effect size  $d = 0.11$ ,  $p = .02$ ) (Kelley, Kraft-Todd, Schapira, Kossowsky, & Riess, 2014). In addition, a *high-quality patient and HCP relationship*, defined as patients' perception of their provider knowing them "as a person," was independently associated with HIV health outcomes measured by adherence to antiretroviral therapy for HIV and undetectable HIV RNA in serum (Beach, Keruly, & Moore, 2006). Higher community social capital independently predicted the level at which patients trusted their physicians (Ahern & Hendryx, 2003). Also, social capital lowered barriers to health care access and promoted higher trust in HCP and staff (Derose & Varda, 2009).

Although availability of a HCP and access to health care may vary depending on individuals' resources, it is clear that the ability to engage with their HCP and build trust relationship is driven by their social capital. Considering that social capital predicts better health outcomes, patients' engagement with their HCP may mediate the path between social capital and health outcomes.

### 1.3. Study objectives

The aim of this study is to measure the effect of social capital on health-related quality of life (QoL). Considering its multi-dimensional attributes, we examined major domains of social capital in association with QoL. Our primary hypothesis is that people with high social capital are able to manage their HIV disease better, leading to improved QoL. We hypothesized that the relationship between social capital and QoL

mediated by engagement with health care providers (Baron & Kenny, 1986). Using path analysis, we examined the independent effect of social capital on QoL, as well as the mediating effect of patient engagement with HCP. Certain dimensions of social capital, such as "community participation" and "family and friends' connections", may explain the majority of the variance in the relationship between social capital and QoL. Therefore, our secondary hypothesis is that certain dimensions of social capital explain the mediation between social capital and QoL.

## 2. Methods

### 2.1. Materials and methods

This is a secondary analysis of the International Nursing HIV Network for HIV/AIDS Research study described previously (Dawson Rose et al., 2014; Holzemer, 2007; Webel et al., 2012). This study was a multisite, international, cross-sectional study conducted from August 2009 to December 2010 with 2182 persons with HIV/AIDS in 16 research sites from six countries (Canada, China, Namibia, Thailand, and the United States). For the present analysis, the analytical sample included U.S. respondents ( $n = 1673$ ) from 11 research sites (Boston, MA; Chicago, IL; Cleveland, OH; Corpus Christi, TX; Durham, NC; Harlingen, TX; Honolulu, HI; Newark, NJ; New York, NY; San Francisco, CA; Seattle, WA; and Wilmington, NC). Research sites were HIV-infectious disease clinics or community-based organizations that provide services to PLWH. Each site recruited a minimum of 100 participants via convenience sampling. After providing written and informed consent, participants completed a self-administered survey. Participants were mostly male (71.2%); their median age was 45 years. Stata 13.1 was used for statistical analysis.

### 2.2. 2.2 Measures

#### 2.2.1. Social capital

The Measuring Social Capital (MSC) instrument was administered to measure individual social capital (Onyx & Bullen, 2000). MSC has 36 items measuring eight dimensions of social capital—participation in the local community (seven items), social agency (seven items), feelings of trust and safety (two items), neighborhood connections (seven items), family and friend connections (three items), tolerance of diversity (two items), value of life (two items) and work connection (three items). Each item employs a four-point Likert-type scale from 1 (*no, not much or no, not at all*) to 4 (*yes, definitely or yes, frequently*). Higher scores represent higher levels of social capital among individuals. The instrument is valid and reliable in measuring social capital with a Cronbach's alpha coefficient of 0.84. The average of the total score is used to interpret the level of social capital, with 1 equal to very low social capital and 4 equal to very high social capital (Onyx & Bullen, 2000). The score can be analyzed continuously or categorically. A dichotomous cutoff point of 2.5 can be used to categorize social capital into low versus high. We excluded three items from work connection due to low level of employment among the sample.

#### 2.2.2. Quality of life

SF-12 is a shorter version of SF-36, which is widely used for assessing QoL in relation to health status. SF-12 includes physical and mental health components based common sub-domains—general health perceptions, bodily pain, physical functioning, social functioning, mental health, and energy/vitality. The higher composite scores derived from twelve questions indicate better quality of life in relation to health status. SF-12 is a well-validated, reliable measure based on both the U.S. and global populations (Cronbach's alpha = 0.86 and 0.76, physical and mental, respectively) (Ion et al., 2011; Revicki & Kaplan, 1993).

### 2.2.3. Engagement with HCP

The scale evaluating participants' interaction with their HCP is comprised of 13 items. Using a 4-point Likert scale (1 = *always true*, 4 = *never*), a lower score indicates greater engagement with HCP (Bakken et al., 2000). The composite score is measured continuously and ranges from 13 to 52. This instrument has one factor, engagement with HCP (Eigen-value of 6.8% and 66.5% of variance explained), and high reliability (Cronbach's alpha = 0.96 (Bakken et al., 2000)). Because this variable had a non-normal distribution and was skewed to the right (skewness = 1.93), the score was Log<sub>10</sub> transformed.

### 2.3. Analysis

We first conducted exploratory factor analysis (EFA) using the total score of social capital to examine underlying factors among the U.S. sample. Then we undertook oblique rotation of the data because oblique rotation assumes that factors may correlate to each other and, in particular, important factors do correlate in practice (Munro, 2005). EFA with oblique rotation suggested that three factors—social connection, community participation, tolerance towards diversity—should be retained, based on Eigenvalues greater than 1. Scree plots were also assessed.

Next, we conducted confirmatory factor analysis (CFA) to assess the configuration of factor structure for the hypothesized model (or theoretical model) and any measurement error (Acock, 2013). During CFA process, we removed three items based on rotated factor loadings for a better fit of the factor structure. The cut-off for factor loading was greater than 0.30. If loading produced more than one factor, we allocated items to factors with higher loading (Acock, 2013).

We treated three identified factors as latent variables for dimensions of social capital. We calculated a subscale score for each factor with error variance specified using the reliabilities of the scales (Acock, 2013; Joreskog and Sörbom, 1993).

We used path analysis to examine the direct and indirect effect (the mediating effect of HCP) of social capital on QoL, using maximum likelihood. Several parameters were used to evaluate model fit—Chi-squared ( $\chi^2$ ) goodness of fit, Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI) (Acock, 2013). We set *p* values > .05 for the  $\chi^2$  test, < .05 for the RMSEA, and > 0.95 (1.0 being a perfect fit) for the CFI to indicate close fit of the model. We reported standardized coefficients to allow comparisons on the same scale between paths.

## 3. Results

### 3.1. Demographic and clinical characteristics of the sample

The study included 1673 study participants. The mean time since initial HIV diagnosis was 14 years (*SD* = 7.5). The majority of the participants were on antiretroviral therapy (88.7%), were male (71.2%) and 45.7% were African American. Approximately 80% of the sample reported their income was totally inadequate or barely adequate to support their needs (Table 1).

### 3.2. Factor analysis of social capital

Social capital is a latent variable and we identified three underlying factors of social capital, explaining 83 percent of the variance in the total score of social capital (Table 2). Questions such as “Can you get help from friends when you need it?” or “Does your local community feel like home?” were in the social connection subscale, which measures how close and dense one's social network was within a given community as well as trust and norm in the community. The second factor, community participation, measured how engaged one engaged in and volunteered for community activities using questions such as “Have you ever taken part in a local community project, in the past 3

**Table 1**  
Demographic characteristics (N = 1673).

Variable	
Age (mean, <i>SD</i> , range)	46.1 years (9.3, 18–74)
Gender (%)	
Male	1181 (71.2)
Female	435 (26.2)
Transgender (MTF/FTM)	36 (1.5) (12/24)
Genderqueer/decline to state	6 (0.4) (5/1)
Race/Ethnicity (%)	
Black	752 (45.7)
White (non-Hispanic)	436 (26.5)
Hispanic	327 (19.9)
Asian/Pacific Islander	50 (3.0)
Native American/Indian	35 (2.1)
Other race	47 (2.9)
Education (%)	
11th grade or less	407 (24.6)
High school or GED	678 (40.9)
Some college or more	524 (31.6)
Master's degree or more	48 (2.9)
Income (%)	
Totally inadequate	408 (24.9)
Barely adequate	881 (53.7)
Enough	351 (21.4)
Insurance (%)	
Yes	1270 (76.3)
No	395 (23.7)
HIV related characteristics	
HIV years since diagnosis (mean, <i>SD</i> )	14.0 (7.5)
On Antiretroviral (%)	1446 (88.7)
Knows own CD4 counts (%)	
Yes	1080 (68.6)
No	494 (31.4)
CD4 counts by report (n = 1098) (mean, <i>SD</i> )	532.1 (464.9)

years?” The last factor was tolerance towards diversity. Examples of questions are “Do you think diversity makes life in your area better?” or “Do you enjoy living among people of different lifestyles?”.

The number of total items measuring social capital was reduced from 31 to 24. Among the three factors, social connection explained the most of the variance of the social capital (33.3%) followed by community participation (26.1%) and tolerance toward diversity (24.4%). Cronbach's alpha reliabilities of each factor are presented in Table 2. Social connection and community participation had good internal consistency (0.8 ≤  $\alpha$  < 0.9) and tolerance toward diversity had acceptable internal consistency (0.7 ≤  $\alpha$  < 0.8; (Hulley, Cummings, Browner, Grady, & Newman, 2007; Munro, 2005).

The social capital score was normally distributed with a mean of 2.67 (standard deviation (*SD*) = 0.54). Social connection was normally distributed with a mean score of 2.69 (*SD* = 0.64). Community participation had relatively low mean (*M*) score (*M* = 2.03, *SD* = 0.89) and tolerance toward diversity was high (*M* = 3.18; *SD* = 0.67; Table 3). In other words, in this sample, PLWH in the United States reported low participation in community activities while maintaining a high tolerance towards diversity.

Although Pearson's correlation coefficients (*r*) among the variables were all statistically significant, only social capital and social connection had moderate correlations with QoL (|0.3| ≤ *r* < |0.5|; Table 3; (Hulley et al., 2007; Munro, 2005)). Social connection, community participation, and tolerance towards diversity were all highly correlated to each other (|0.5| ≤ *r* < |1.0|).

### 3.3. Path analysis

We tested our primary hypotheses in Model 1. Social capital was significantly associated with QoL and explained 14% of variance of QoL, while engagement with HCP explained 3%. About 11% of positive effect of social capital on QoL was mediated by engagement with HCP

**Table 2**  
Exploratory Factor Analysis.

Factors	Items	Loadings
Factor 1.	1. Do you agree that most people can be trusted?	0.41
Social connection	2. Does your local community feel like home?	0.54
	3. Can you get help from friends when you need it?	0.59
	4. If you were caring for a child and needed to go out for a while, would you ask a neighbor for help?	0.46
	5. Have you ever visited a neighbor in the past week?	0.49
	6. When you go shopping in your local area, are you likely to run into friends and acquaintances?	0.50
	7. How many people did you talk to yesterday?	0.52
	8. Over the weekend do you have lunch/dinner with other people outside your household?	0.43
	9. Do you feel valued by society?	0.51
	10. If you were to die tomorrow, would you be satisfied with what your life have meant?	0.50
	11. In the past week, how many phone conversation have you had with friends?	0.48
	12. Do you go outside your local community to visit your family?	0.45
		Eigenvalue
	Percent Variance explained (%)	33.3
	Cronbach's alpha reliabilities (α)	0.81
Factor 2. Community participation	1. Do you help out a local group as a volunteer?	0.52
	2. Have you attended a local community event in the past 6 months?	0.59
	3. Are you on a management committee or organizing committee for any local group or organization?	0.70
	4. In the past 3 years, have you ever joined a local community action to deal with an emergency?	0.73
	5. In the past 3 years, have you ever taken part in a local community project or working bee?	0.76
	6. Have you ever been part of a project to organize a new service in your area?	0.73
	Eigenvalue	1.85
	Percent Variance explained (%)	26.1
	Cronbach's alpha reliabilities (α)	0.83
Factor 3. Tolerance towards diversity	1. If you disagree with what everyone else agreed on, do you feel free to speak out?	0.57
	2. If you disagree with what everyone else agreed on, are you willing to seek medication?	0.52
	3. Do you think diversity makes life in your area better?	0.66
	4. Do you enjoy living among people of different lifestyles?	0.66
	5. If strangers move in neighborhood, would they be accepted?	0.44
	6. Do agree with the term, helping other help yourself	0.40
	Eigenvalue	1.02
	Percent Variance explained (%)	24.4
	Cronbach's alpha reliabilities (α)	0.73
	Items removed for better fit=4	
	Non-loading items=3	
	Total items=31	

( $p < .05$ ; see Fig. 1). This model explained 89% of the variance in QoL, however did not have a good fit ( $\chi^2 = 0$ , RMSEA = 0.495, CFI = 0).

In order to improve the model fit and to test our secondary hypothesis, in Model 2 we examined the effect of three factors—social connection, community participation, and tolerance towards diversity—on social capital and QoL (Fig. 2). Model 2 explains 99% of the total variance in QoL and had a very good fit (RMSEA=0, CFI=1). Social connection had a significant and substantial association both with QoL ( $\beta = 7.05$ ,  $SE = .64$ ,  $p < .05$ ,  $std. \beta = 0.50$ ) and engagement with HCP ( $\beta = -0.08$ ,  $SE = 0.03$ ,  $p < .05$ ,  $std. \beta = -0.14$ ), demonstrating that PLWH who have good social connections were more like to engage with their HCP and to report better QoL. In Model 2, we also tested the

mediating effect of engagement with HCP between the three factors and QoL. Engagement with HCP mediated 4.7% of social connection on QoL (Table 4). Tolerance toward diversity did not present any significant direct association with QoL ( $\beta = -0.61$ ,  $SE = 0.58$ ,  $p = .29$ ,  $std. \beta = -0.04$ ), while the standardized estimate of the effect on engagement with HCP was bigger than social connection ( $std. \beta = -0.19$  vs  $-0.14$ , respectively). As there was no direct effect of tolerance toward diversity on QoL, the positive effect of tolerance toward diversity on QoL is solely mediated by HCP (Table 4).

Conversely, community participation showed a reverse association with other variables in the model (Fig. 2). This indicated that community participation could be detrimental to QoL in this sample. Commu-

**Table 3**  
Pearson's r correlation among variables.

Variables	Social Capital	Quality of life	Engagement with HCP	Community participation	Social connection	Tolerance towards diversity	Mean score of variables (SD)
Social Capital	1						2.67 (0.54)
Quality of life	0.323*	1					43.6 (8.11)
Less engagement with HCP	-0.250*	-0.162*	1				1.39 (0.60)
Community participation <sup>§</sup>	0.688*	0.095*	-0.019*	1			2.03(.89)
Social connection <sup>§</sup>	0.880*	0.382*	-0.177*	0.434*	1		2.69(.64)
Tolerance towards diversity <sup>§</sup>	0.668*	0.218*	-0.207*	0.262*	0.469*	1	3.18(.67)

\*  $P < .05$

§ Factor variables of 'social capital'

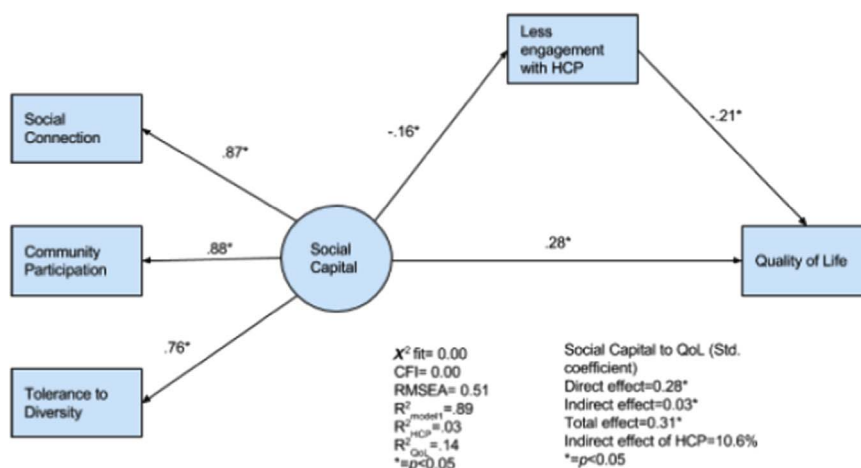


Fig. 1. Model 1. Standardized estimates for social capital and QoL mediated by HCP engagement.

nity participation had a significant and negative association both with QoL ( $\beta = -1.48$ ,  $SE = 0.33$ ,  $p < .05$ ,  $std. \beta = -0.14$ ) and engagement with HCP ( $\beta = 0.05$ ,  $SE = 0.01$ ,  $p < .05$ ,  $std. \beta = 0.12$ ), demonstrating that PLWH who participate more in community activities reported lower QoL and were less like to engage with their HCP. Community participation was minimally correlated with QoL ( $r < .01$ ) and engagement with HCP ( $r < .02$ ; Table 3). When a simple path model conducted only with community participation, the association with engagement with HCP was not significant ( $p = .47$ ) and the association with QoL was positive and significant ( $p < .05$ ).

#### 4. Discussion

This study is one of the first studies to examine the association between subdomains of social capital on health outcomes among PLWH in the United States. The importance of social capital for PLWH has been more highlighted as utilization of social networks and media increase. Among PLWH in an international study, social capital has been found to be associated with both physical and mental health (Webel et al., 2012) as well as lower HIV symptom intensity (Webel et al., 2015). Nokes and colleagues also found that social capital and social support was positively associated HIV medication adherence and self-efficacy mediated the relationship with HCP (Nokes et al., 2012).

In consistent, we found that social connection, followed by tolerance toward diversity, were the principal domain of social capital leading to better QoL. Social connection was the leading factor, and its effect was partially mediated by PLWH’s engagement with their HCP.

Community participation, often assessed by asking about memberships in community organizations or groups has been one of the important domains of social capital. For example, Kawachi et al. (1999) assessed social capital in the United States by using three questions regarding civic trust, perception of reciprocity, and community group membership. Our participants did not benefit from this aspect of social capital to have better QoL. Rather, community participation had negative effects on QoL and its effect was partially (11.3%) mediated by PLWH’s engagement with their HCP. Our sample included a large portion of socioeconomically marginalized people and their community participation rate was low. It is also important to note that 46% of our sample was African Americans. Social capital’s protective effect was smaller for African Americans compared to Whites Americans, and social capital had a detrimental effect on health in disenfranchised African American communities (Gilbert & Dean, 2013). In particular, community participation increased mental distress for residents living in impoverished community (Mitchell & LaGory, 2002). Sixty-five percent of our study participants experienced depressive symptoms and low self-esteem (Eller et al., 2014).

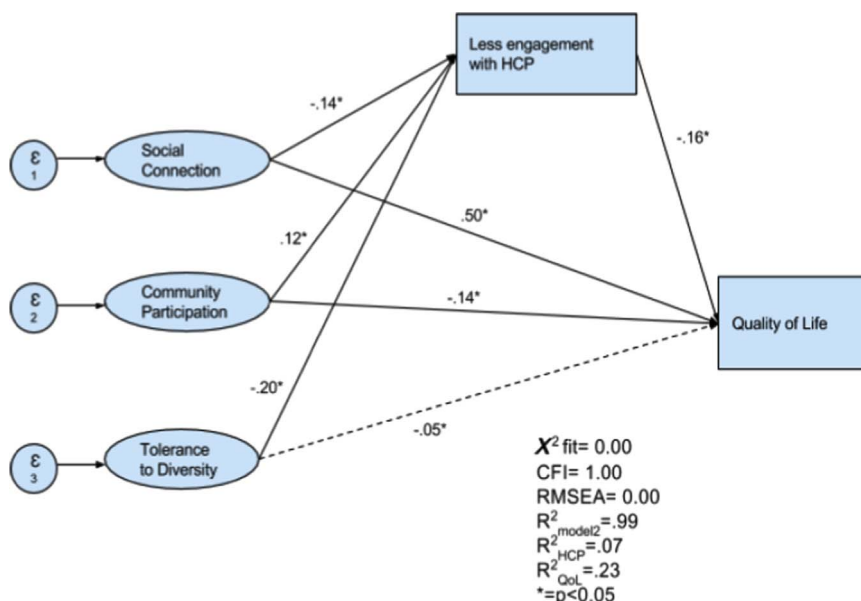


Fig. 2. Model 2. Standardized estimates for 3 factors of social capital and QoL mediated by HCP engagement.



**Table 4**  
Standardized effect of Social capital and QoL with medication of HCP.

Model 2	Direct effect	Indirect effect	Total effect	Indirect effect of HCP (%)
Community participation→QoL	-.148 <sup>*</sup>	-.019 <sup>*</sup>	-.168 <sup>*</sup>	11.3
Social Connection→QoL	.502 <sup>*</sup>	.022 <sup>*</sup>	.524 <sup>*</sup>	4.2
Tolerance towards diversity→QoL	-.050	.033 <sup>*</sup>	-.016	100

\*  $P < .05$ .

In addition, stigma experienced by the study participants can explain the low rate and inverse effect of community participation. Stigma against PLWH is a known barrier to accessing HIV testing and care. Perceived stigma negatively affects the quality of life (QoL) of PLWH (Holzemer et al., 2007). A study from India explored two domains of social capital, group membership/network and collective action, and found a negative association between social capital and stigma, such as reduced fear of HIV transmission and lower levels of feelings of shame (Sivaram et al., 2009). High norms of reciprocity, higher levels of collective action, and perception of safety have been found to be related to lower HIV stigma (Chi et al., 2009; Sivaram et al., 2009).

The study participants also had low education levels and were low-income. Socioeconomic status (SES), often measured by household income and education level, is known to be an independent predictor of overall health outcomes (Kawachi et al., 1999) and correlates with social capital, therefore, it is an important variable to examine. Controlling for SES may attenuate the association between social capital and health, but social capital is still an independent and significant predictor of health outcomes (Kawachi et al., 1999; Ziersch, Baum, Macdougall, & Putland, 2005). While the association between social capital and SES has been established, directionality between these two variables is not well understood. Therefore, focusing interventions on building supportive social networks for PLWH, may improve QoL, even among those with low SES.

This study reinforced the significance of social capital in QoL—particularly, the role of social connection for PLWH. Building engaging and trust relationship in a health care setting is critical (Gilson, 2003), considering that PLWH have chronic health condition and are often marginalized. Also, engaging relationships with HCP is known to be one of the most important factors for improving HIV medication adherence (Corless et al., 2013). Therefore, health care service should not be limited to mere provision of medical services. Rather, helping PLWH to build strong connections with HCP should be an integral part of comprehensive HIV care.

This study was based on a subsample of U.S. participants in a large international study. Webel et al. (2012) reported on study participants from the larger study, whose participants came from China, Canada, Namibia, and Thailand, as well as from the United States. The researchers found that social capital positively affected on QoL and had five factors—community participation, friends and family, tolerance and diversity, neighborhood connections and feelings of trust and safety, which explained 65% of the variance in social capital. Within the sample from the United States, social connection was the leading factor predicting QoL out of three factors. The factor, social connection, was drawn from 13 questions (Table 2). Thirteen items of social connection were drawn from neighborhood connections, family-and-friends connections, and feelings of trust and safety (Onyx & Bullen, 2000). Therefore, social connection is a rather generic, yet representative concept of social capital, which examines how people are well connected and perceive feelings of trust within their social networks.

This study has several limitations. First, our sample was primarily composed of men with HIV in the United States, many of whom reported feeling marginalized; therefore, our results may not be

generalizable to other groups, including women with HIV. Second, all of the measures are based on self-report. Despite the wide use and established validity of the SF-12 instrument, adding biologic markers may have increased validity in the study findings about QoL in relation to HIV disease progression. Third, this study is a secondary analysis of a cross-sectional study; therefore, causal inference between variables in the model cannot be ascertained.

## 5. Conclusion

The association between social capital and QoL suggests health benefits of social connection among PLWH living in the United States. The relationship was mediated by PLWHs' engagement with their HCP. Social connection contributes the most to higher social capital among the other aspects of social capital; community participation and tolerance toward diversity. In other words, PLWH who had supportive and resourceful social networks (i.e., families, friends, and neighbors) reported higher QoL.

Future studies should consider other covariates such as medication adherence, stigma or gender to clarify and expand the model. Considering that intervening one's social environment factor such as social capital can be challenging, we also suggest that future interventions focus on strengthening PLWH's social connections—enhancing the relationship between HCP and PLWH, promoting resourceful and supportive social connections for PLWH.

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## References

- Acock, A. C. (2013). *Discovering structural equation modeling using Stata*. Texas: Stata Press.
- Ahern, M. M., & Hendryx, M. S. (2003). Social capital and trust in providers. *Social Science Medicine*, 57(7), 1195–1203 (doi:S027795360200494X [pii]).
- Bakken, S., Holzemer, W. L., Brown, M. A., Powell-Cope, G. M., Turner, J. G., Inouye, J., & Corless, I. B. (2000). Relationships between perception of engagement with health care provider and demographic characteristics, health status, and adherence to therapeutic regimen in persons with HIV/AIDS. *AIDS Patient Care and STDs*, 14(4), 189–197. <http://dx.doi.org/10.1089/108729100317795>.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
- Beach, M. C., Keruly, J., & Moore, R. D. (2006). Is the quality of the patient-provider relationship associated with better adherence and health outcomes for patients with HIV? *Journal of General Internal Medicine*, 21(6), 661–665 (doi:JG1399 [pii]).
- Bourdieu, P. (1986). The forms of capital. In I. J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). ((Ed.)). New York: Greenwood.
- Centers for Disease Control and Prevention. (2011). HIV surveillance report. (Vol. 23).
- Chi, B. H., Cantrell, R. A., Zulu, I., Mulenga, L. B., Levy, J. W., Tambatamba, B. C., & Stringer, J. S. (2009). Adherence to first-line antiretroviral therapy affects non-virologic outcomes among patients on treatment for more than 12 months in Lusaka, Zambia. *International Journal of Epidemiology*, 38(3), 746–756. <http://dx.doi.org/10.1093/ije/dyp004>.
- Corless, I. B., Guarino, A. J., Nicholas, P. K., Tyer-Viola, L., Kirksey, K., Brion, J., & Sullivan, K. M. (2013). Mediators of antiretroviral adherence: A multisite international study. *AIDS Care*, 25(3), 364–377. <http://dx.doi.org/10.1080/09540121.2012.701723> (doi).
- Dawson Rose, C., Webel, A., Sullivan, K. M., Cuca, Y. P., Wantland, D., Johnson, M. O., & Holzemer, W. L. (2014). Self-compassion and risk behavior among people living with HIV/AIDS. *Research in Nursing Health*, 37(2), 98–106. <http://dx.doi.org/10.1002/nur.21587> (doi).
- Derose, K. P., & Varda, D. M. (2009). Social capital and health care access: A systematic review. *Medical Care Research and Review: MCRR*, 66(3), 272–306. <http://dx.doi.org/10.1177/1077558708330428> (doi).
- Eller, L. S., Rivero-Mendez, M., Voss, J., Chen, W. T., Chaiphibalsarisdi, P., Ipinge, S., & Brion, J. M. (2014). Depressive symptoms, self-esteem, HIV symptom management self-efficacy and self-compassion in people living with HIV. *AIDS Care*, 26(7),

- 795–803. <http://dx.doi.org/10.1080/09540121.2013.841842> (doi).
- Gilbert, K., & Dean, L. (2013). Social capital, social policy and health disparities: A legacy of political advocacy in African American communities. In I. Kawachi, S. Takao, & S. V. Subramanian (Eds.), *Global perspectives on social capital and health* (pp. 307–322). New York, NY: Springer. <http://dx.doi.org/10.1007/978-1-4614-7464-7>.
- Gilson, L. (2003). Trust and the development of health care as a social institution. *Social Science Medicine*, 56(7), 1453–1468 (doi:S0277953602001429 [pii]).
- Gregson, S., Mushati, P., Grusin, H., Nhamo, M., Schumacher, C., Skovdal, M., & Campbell, C. (2011). Social capital and women's reduced vulnerability to HIV infection in rural Zimbabwe. *Population and Development Review*, 37(2), 333–359.
- Harpam, T., Grant, E., & Thomas, E. (2002). Measuring social capital within health surveys: Key issues. *Health Policy and Planning*, 17(1), 106–111.
- Holzemer, W. L. (2007). University of California, San Francisco international nursing network for HIV/AIDS research. *International Nursing Review*, 54(3), 234–242. <http://dx.doi.org/10.1111/j.1466-7657.2007.00571.x>.
- Holzemer, W. L., Uys, L., Makoae, L., Stewart, A., Phetlhu, R., Dlamini, P. S., & Naidoo, J. (2007). A conceptual model of HIV/AIDS stigma from five African countries. *Journal of Advanced Nursing*, 58(6), 541–551. <http://dx.doi.org/10.1111/j.1365-2648.2007.04244.x>.
- Hulley, S., Cummings, S., Browner, W., Grady, D., & Newman, T. (2007). *Designing clinical research* (third edition). Philadelphia, USA: Lippincott Williams & Wilkins, Wolters Kluwer.
- Hwang, S. W., Kirst, M. J., Chiu, S., Tolomiczenko, G., Kiss, A., Cowan, L., & Levinson, W. (2009). Multidimensional social support and the health of homeless individuals. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 86(5), 791–803. <http://dx.doi.org/10.1007/s11524-009-9388-x> (doi).
- Ion, A., Cai, W., Elston, D., Pullenayegum, E., Smaill, F., & Smieja, M. (2011). A comparison of the MOS-HIV and SF-12v2 for measuring health-related quality of life of men and women living with HIV/AIDS. *AIDS Research and Therapy*, 8(1), <http://dx.doi.org/10.1186/1742-6405-8-5> (doi).
- Joreskog, K. G., & S, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLS command language* (2nd ed.). Hillsdale, NJ: Scientific Software International.
- Kawachi, I., Kennedy, B. P., & Glass, R. (1999). Social capital and self-rated health: A contextual analysis. *American Journal of Public Health*, 89(8), 1187–1193.
- Kelley, J. M., Kraft-Todd, G., Schapira, L., Kossowsky, J., & Riess, H. (2014). The influence of the patient-clinician relationship on healthcare outcomes: A systematic review and meta-analysis of randomized controlled trials. *PLoS One*, 9(4), e94207. <http://dx.doi.org/10.1371/journal.pone.0094207> (doi).
- Kreuter, M., & Lezin, N. (2002). Social capital theory: Implications for community-based health promotion. In R. Diclemente., R. Crosby., & M. Kegler. (Eds.), *Emerging theories in health promotion practice and research: Strategies for improving public health* (pp. 228–254). (first ed.). San Francisco: Jossey-Bass.
- Metcalfe, A., Lail, P., Ghali, W. A., & Sauve, R. S. (2011). The association between neighbourhoods and adverse birth outcomes: A systematic review and meta-analysis of multi-level studies. *Paediatric and Perinatal Epidemiology*, 25(3), 236–245. <http://dx.doi.org/10.1111/j.1365-3016.2011.01192.x> (10.1111/j.1365-3016.2011.01192.x).
- Mitchell, C. U., & LaGory, M. (2002). Social capital and mental distress in an impoverished community. *City Community*, 1(2), 199–222. <http://dx.doi.org/10.1111/1540-6040.00017>.
- Munro, B. H. (2005). *Exploratory factor analysis: Statistical methods for health care research*, (5th ed). Philadelphia: Lippincott Williams & Wilkins, 321.
- Nokes, K., Johnson, M. O., Webel, A., Rose, C. D., Phillips, J. C., Sullivan, K., & Holzemer, W. L. (2012). Focus on increasing treatment self-efficacy to improve human immunodeficiency virus treatment adherence. *Journal of Nursing Scholarship: An Official Publication of Sigma Theta Tau International Honor Society of Nursing*, 44(4), 403–410. <http://dx.doi.org/10.1111/j.1547-5069.2012.01476.x> (doi).
- Onyx, J., & Bullen, P. (2000). Measuring social capital in five communities. *The Journal of Applied Behavioral Science*, 36(1), 23–42. <http://dx.doi.org/10.1177/0021886300361002>.
- Putnam, R. D. (2001). Social capital: Measurement and consequences. *Isuna: Canadian Journal of Policy Research*, 2, 42–51.
- Revicki, D. A., & Kaplan, R. M. (1993). Relationship between psychometric and utility-based approaches to the measurement of health-related quality of life. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, 2(6), 477–487.
- Sivaram, S., Zelaya, C., Srikrishnan, A. K., Latkin, C., Go, V. F., Solomon, S., & Celentano, D. (2009). Associations between social capital and HIV stigma in Chennai, India: Considerations for prevention intervention design. *AIDS Education and Prevention: Official Publication of the International Society for AIDS Education*, 21(3), 233–250. <http://dx.doi.org/10.1521/aeap.2009.21.3.233> (10.1521/aeap.2009.21.3.233).
- Vyncke, V., Hardyns, W., Peersman, W., Pauwels, L., Groenewegen, P., & Willems, S. (2014). How equal is the relationship between individual social capital and psychological distress? A gendered analysis using cross-sectional data from Ghent (Belgium). *BMC Public Health*, 14. <http://dx.doi.org/10.1186/1471-2458-14-960> (doi).
- Webel, A., Phillips, J. C., Rose, C. D., Holzemer, W. L., Chen, W. T., Tyer-Viola, L., & Salata, R. A. (2012). A cross-sectional description of social capital in an international sample of persons living with HIV/AIDS (PLWH). *BMC Public Health*, 12. <http://dx.doi.org/10.1186/1471-2458-12-188> (10.1186/1471-2458-12-188).
- Webel, A., Wantland, D., Rose, C. D., Kemppainen, J., Holzemer, W. L., Chen, W. T., & Portillo, C. (2015). A cross-sectional relationship between social capital, self-compassion, and perceived HIV symptoms. *Journal of Pain and Symptom Management*, 50(1), 59–68. <http://dx.doi.org/10.1016/j.jpainsymman.2014.12.013> (doi).
- Ziersch, A. M., Baum, F. E., Macdougall, C., & Putland, C. (2005). Neighbourhood life and social capital: The implications for health. *Social Science Medicine*, 60(1), 71–86. <http://dx.doi.org/10.1016/j.socscimed.2004.04.027>.