



Social capital and HIV-serodiscordance: Disparities in access to personal and professional resources for HIV-positive and HIV-negative partners

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ABSTRACT

As people living with HIV are living longer lives, they have a correspondingly greater opportunity to enjoy long-term romantic and sexual partnerships, including with persons who do not live with HIV ("serodiscordant" relationships). In these dyads, asymmetries may emerge in access to social resources between partners. In this paper we examined how serodiscordant couples access informal (interpersonal, such as family and friends) and formal (practitioner, such as doctor or social worker) social resources for health. We recruited 540 participants in current serodiscordant relationships, working with 150 AIDS service organizations and HIV clinics across Canada from 2016 to 2018. Our findings demonstrate that partners with HIV have greater access to formal resources than their partners (through health care professionals, therapists/counselors/support workers), while both persons have similar access to resources through informal social relationships (family and friends). Furthermore, the findings indicated that HIV positive partners accessed more varied forms of support through formal ties, compared to HIV negative persons. We offer recommendations for changes to how HIV-negative partners in a serodiscordant relationship are served and cared for, and particularly, the importance of moving toward dyad-focused policies and practices.

1. Introduction

Since 1985, more than 88,000 HIV infections have been reported in Canada (Public Health Agency of Canada, 2019). With advances in treatment and testing, people living with HIV in Canada are now living longer and healthier lives (Eyawo et al., 2017). The advent of more effective antiretroviral treatments, as well as earlier detection and treatment initiation, mean that many people with HIV may live as long as anyone else (Samji et al., 2013). With this increased longevity has also come the opportunity to have longer-term romantic and sexual partnerships.

Previous work has documented the positive association between health and social capital (i.e. resources embedded in social relationships), across numerous health outcomes (Buck-McFadyen et al., 2019a, 2019b; Ehsan et al., 2019; Kawachi & Berkman, 2014), including among

people living with HIV (Ransome et al., 2018). For example, studies have documented that among people living with HIV, higher levels of social capital are associated with improvements in mental health (Han et al., 2020), self-rated physical health (Dageid & Grønlie, 2015), and overall quality of life (Xie et al., 2019). A recent review found that social capital was associated with a lower risk of HIV infection across a range of studies (Ransome et al., 2018). Despite this substantial body of work, the impact of HIV on social capital has not been thoroughly investigated. Beyond HIV, studies have demonstrated the value of cognitive function for bridging social capital among older Americans (Cornwell, 2009) and the importance of physical health for social connectedness in a long-term care home (Schafer, 2011). Recently, work that examines the disruptive effects of disease diagnosis on psychosocial outcomes has turned to describing the social network conditions that emerge from disease diagnoses (Perry & Pescosolido, 2012; Schaefer et al., 2011).

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Serodiscordant relationships, where people are, by definition, proximate to each other in social space while differing in HIV status and access to social capital, are insightful for the study of these phenomena.

Longstanding romantic and sexual relationships exhibit overlapping social networks over time (Johnson & Leslie, 1982; Kalmijn, 2003) as couples shed ties that both partners do not share. Moreover, partner selection may resemble a matching process, where relationships are formed on the basis of both observable and unobservable characteristics (McPherson, Smith-Lovin, and Cook 2001; Thomas, 2020), although factors that are important for matching may be different from one cohort to the next (Thomas, 2020). While individuals partnered in serodiscordant relationships may be very similar to one another, the experience of one partners' HIV status could change their access to, or use of, social capital. As a growing segment of the population, understanding the challenges of serodiscordant relationships are important in their own right for the effective provision of support. Data from the Ontario Cohort study collected in 2012 shows that 23% of people living with HIV in the province of Ontario, Canada, were in serodiscordant relationships (Burchell & Light, 2013). With the increasing salience of 'undetectable equals untransmittable' messaging around HIV, this proportion may currently be an underestimate. Rates in other countries may be far higher; in data collected across Eastern and Southern African countries, approximately half of participants living with HIV were in serodiscordant relationships (Ryder et al., 2000). Given the importance of social capital for health and the lack of current understanding regarding the effect of serodiscordance on social capital, we undertook an analysis of HIV-related differences in social capital in a Canadian national sample of HIV-serodiscordant relationships.

1.1. Social capital and HIV

There are numerous definitions of social capital in the literature. We build upon the scholarly tradition that names resources embedded in social relationships as 'social capital' (Coleman, 1988). According to this framework, social networks are the bearers of social capital, built of connections that allow individuals to access resources that may be interpersonal (e.g., social support through friends and family) and professional (e.g., institutionalized skills and knowledge). While not strictly located at the individual or community level, this form of social capital is *relational*, as it is contained within the ties between actors within a social network, accessible to those who are connected to one another. This form of social capital may still have benefits for communities by assisting their members. Although much has been written of social capital as an interpersonal social resource (Ehsan et al., 2019; Putnam, 1995; Van DerGaag, Tom, & Snijders, 2005a), our working definition can include resources contained within any kind of social tie, as long as the tie can provide useful resources. This approach emerges from the sociological perspective that considers social capital as potential source of social mobility and status attainment, where ties to people with institutionalized skills and knowledge are central to the possibility of economic advancement (Coleman, 1988; Lin, 1999; Portes, 1998). A 'social network', according to this framework, is not just a network of informal ties, but all social ties and any resources embedded within those ties. A tie is no less a tie because it is to a doctor, and not a friend – and depending on the circumstance it may be far more or less consequential. Once social capital is viewed as a resource embedded in social relationships, a broader analysis that captures forms of resources and types of relationships may be undertaken. The present work draws on this approach where, as far as social capital is concerned, resources gained from social ties is not limited to informal, interpersonal relationships.

Insights from biographical disruption theory may also be useful for conceptualizing the role of HIV in the formation of social capital (Bury, 1982; Perry & Pescosolido, 2012; Williams, 2000). This theory holds that diagnosis with an illness creates a crisis of meaning by 'disrupting' a person's concept of the life that they expected to lead (Bury, 1982). For

instance, a person diagnosed with HIV may feel challenged with how their life has to change, and how different that new life is from what they had imagined for themselves (Alexias et al., 2016; Pollard & Saleem, 2020), even if some aspects of their self-concept are reinforced (Carricaburu & Pierret, 1995). Recent turns in biographical disruption theory have taken a relational perspective (Perry & Pescosolido, 2012; Schaefer et al., 2011) that is apposite for a consideration of serodiscordance and HIV. First, social networks may be mobilized around the person diagnosed with the chronic condition. For instance, diagnosis with a mental health disorder may be accompanied by a reduction in social network size as less supportive ties drop out of the network (Perry & Pescosolido, 2012), while at times activating other relationships with confidantes that have had previous experience with mental health challenges (Perry & Pescosolido, 2015).

Although there are numerous studies that consider the impact of social capital on aspects of HIV (Campbell et al., 2002; Ransome et al., 2016, 2018), few have considered the impact of HIV on social capital. A large cross-national study found that people living with HIV had higher levels of social capital compared to the general population when operationalizing social capital as a combination of social participation and trust (Webel et al., 2012). By contrast, social capital among PLHIV could be compromised by stigma, lack of serostatus disclosure, and worsening mental health (Karim et al., 2008; Perazzo et al., 2020; Wang et al., 2019). In a study of Filipino men in Los Angeles, even when support groups created the opportunity for new social connections, HIV stigma strained interpersonal ties with friends and family, 'disrupting' the effect of HIV on social capital (Takahashi & Magalong, 2008). In summary, while HIV status may compromise social capital, it may also concentrate it in professional settings by seeding new connections. These typically individualistic accounts would benefit from additional evidence generated from the perspective of the dyad.

1.2. Social capital and HIV-serodiscordance in a dyadic context

Shifting focus to the relationship perspective, *dyadic* disruption may be conditioned by disruption in biography, as the routines and expectations that people have of their relationship may be altered by a partner's acquisition of a condition that requires a reorganization of their relationship. This perspective shifts the unit of analysis beyond the individual, to focus on the ways in which the networks of *both* partners may be shaped by one partner's diagnosis.

While research that has considered social networks and social capital in the context of serodiscordance has been sparse, there has been some consideration of social support and relationship quality within serodiscordant dyads (Gamarel et al., 2014; Goldenberg & Stephenson, 2015; Palmer & Bor, 2001; Wrubel, Stumbo, and Johnson 2010), and the benefits of external, supportive social networks for relationship functioning (Haas, 2002). However, a dyadic perspective continues to be lacking. For example, a conceptual paper examining the social-ecological conditions for serodiscordant couples to achieve pregnancy, which included access to formal and informal social resources, did not consider asymmetries in social capital that could arise from differences in serostatus (Saleem et al., 2017). A recent qualitative study examined how partners in serodiscordant relationships may disagree on aspects of their shared family social networks, but did not examine HIV as a determinant of network-based social capital, instead focusing on the methodological potential of a network mapping tool (Drysdale et al., 2020). A qualitative study of serodiscordant couples did consider the specificity of the HIV-negative partner's perspective in terms of shared stigma and lack of access to professional sources of information (Straten et al., 1998), suggesting that HIV-negative partner may not have access to professional sources of social capital. A scoping review found few studies that investigated the effects of social networks of serodiscordant couples (Mendelsohn et al., 2015).

Social capital formation takes place in a social landscape where different organizations can enable or constrain individuals' capacity for

acquiring social capital. In the case of serodiscordance, institutions and programs that are designed around the needs of HIV-positive persons may enhance their social capital while unintentionally excluding their HIV-negative partners, creating a missed opportunity for them to acquire information about HIV independently, even though they are also navigating transmission risk and relationship stigma (Siegel et al., 2018; Straten et al., 1998). Within this structure, the HIV-positive partner in a serodiscordant relationship may operate as a bridge node between the HIV-negative person who is seeking resources, and the formal resources for HIV such as health care professionals.

Therefore, we offer two distinct hypotheses. Hypothesis 1: HIV-positive people will have reduced contact with friends and family, but more strongly held connections to professional sources of support. Hypothesis 2: the reverse may be true for the HIV-negative partner who may have less direct access to the healthcare supports they need to meet the social and sexual challenges of life in a serodiscordant relationship.

1.3. The present study

This picture of social capital within HIV-serodiscordant couples can be summarized in a hypothetical, ideal-typical picture (Fig. 1) where each partner has access to overlapping resources, and unique resources. The HIV-positive partner has access to formal HIV-related resources, such as care and service providers. In this framework, the HIV-negative partner is not completely isolated from formal HIV-related supports; rather, they are less connected in relation to their HIV-positive partner and therefore, may have more limited access to social capital. Similarly, the HIV-negative partner has greater access to informal forms of social

support through friends and family. Although the HIV-positive person is not completely isolated from informal supports, they are less connected in relation to their HIV-negative partner to these informal sources of support. The HIV-positive person may also have lost some support from their informal connections due to perceived and experienced stigma (Alonzo & Reynolds, 1995). In this paper, we set out to examine how HIV-positive and HIV-negative partners within serodiscordant relationships access social capital, advance theory regarding the interplay of health within social relationships, and draw lessons for programs and services aimed at PLHIV and their HIV-negative partners.

2. Methods

2.1. Data

Positive Plus One (PP1), is a national mixed-method study of people living in HIV-serodiscordant relationships that recruited PLHIV and their HIV-negative sexual partners across Canada through 145 AIDS Service Organizations, and 35 clinics. Recruitment took place using pamphlets and posters visible in spaces within these organizations, as well as through trusted service providers approaching potentially interested persons. The study was also promoted through listservs, Facebook advertisements, and word of mouth. Recruitment took place from January of 2016, to June 30, 2018. The study was developed by a multidisciplinary team of people living with HIV, policymakers, academics, infectious disease clinicians, communications experts, and AIDS Service Organization representatives. In addition to publishing in academic journals, a broad knowledge translation plan was designed to

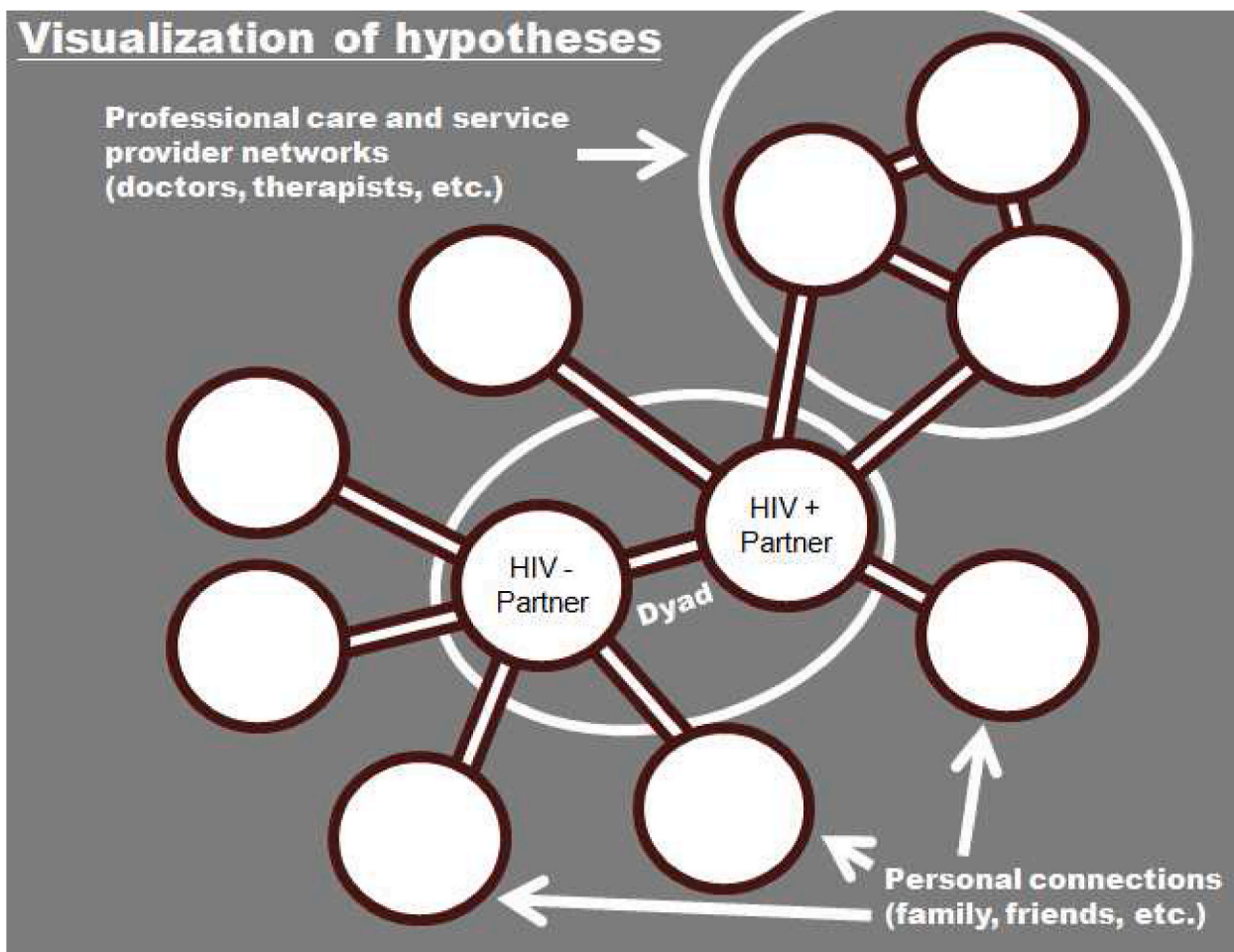


Fig. 1. Hypothetical picture of social capital in HIV-serodiscordant dyads.

present findings and work with policy makers and service providers to ensure study findings were delivered and incorporated into policy and service where appropriate. Ethics approval was provided by the University of Toronto REB (RIS Protocol 31855), and 14 other ethics review boards across Canada.

The study had two components: a survey (telephone or on-line), and a follow-up qualitative telephone interview. Both components were dyadic, meaning the study aimed to interview both partners in a single relationship, with the ability to link people in the dataset to their partners. Not every primary participant had a partner who also participated. Some dyads are 'complete' (i.e., both partners participated, while in other cases, only one partner in a relationship participated). Once one current partner was recruited, this participant were provided with a unique code that they could use to recruit any of their partners. To be eligible for inclusion in the study, respondents had to be ≥ 18 years old, report being together for ≥ 3 months in order to establish interdependence within their relationship, reported that they disclosed their HIV status to one another, and that they considered themselves "together," "dating," or "a couple." Respondents were also eligible if they had been in a serodiscordant relationship within the prior two years that lasted ≥ 3 months. The present analysis was limited to participants in current relationships, with or without partners included in the study. In total, 540 participants in a current HIV-serodiscordant relationship were included in this analysis. At the dyad level, 306 participants were recruited from 153 relationships that included both partners (i.e. complete dyads); 307 individuals participated without their current partner. Of the 540 respondents, 479 (88.7%) participated online, and 61 (11.3%) participated by phone.

2.2. Measures

The primary outcome was social capital, measured using the *resource generator* (Van DerGaag, Tom, & Snijders, 2005b). The resource generator is a common measure of social capital that aims to capture access to different kinds of instrumental and emotional resources, broken down by the kinds of relationships that people share with their contacts. Specifically, respondents were asked if they had someone they could turn to for help when feeling sick, for financial matters, for advice about sex, for advice about their relationship, or for routine communication and support. For each of these five resources, respondents could check up to ten types of relationships from whom these resources could be accessed (i.e., their partner, family, friends, healthcare providers, therapists/counselors/support workers). For the purposes of discussion, friends and family were classified as 'personal' social capital, while therapists, counselors, support workers, and healthcare providers were classified as 'professional' social capital. Scores were summed to create four count variables (friends, family, health care providers, therapists/counselors/support workers), each ranging from 0 to 5 based on the number of types of resources that respondents could access. Reliability of these four count variables was tested using Loewinger's H coefficient, following practices used in the resource generator's construction (Van DerGaag et al., 2005b). In both cases, the H coefficient was greater than 0.5, indicating good reliability.

The key predictor was self-reported HIV-status; control variables included gender and sexual identity, age, education, income, ethnicity, length of relationship (in years), and source of recruitment. Participants were classified as men who have sex with men (MSM) if they self-identified with male gender and sexual orientation as other than heterosexual or straight. We included a control for relationship quality, derived from the *Investment Model Scale* (Rusbult et al., 1986; Tran et al., 2019). This scale had a high alpha value, 0.93. We also included a control for *disclosure* of one's serodiscordant relationship to network contacts. This control was included to explore whether it reduced associations between HIV status and social capital (see below).

2.3. Analysis

To address non-independence of data, as many respondents had a partner recruited to the study whose outcomes were tied to theirs, we fit generalized estimating equations using Poisson or Negative Binomial count models using the latter link function if the outcome was over-dispersed according to a Chi-square test. As not every respondent was able to recruit their partner to the study, some respondents had missing data for partners' characteristics. We employed multiple imputation with chained equations to minimize data loss from this group (Young & Johnson, 2013). Outcome variables were used in the imputation model, but cases with missing data on the outcome were excluded from the final analysis (von Hippel & Paul, 2007). We used 20 imputations. We tested interactions between HIV status and relationship length, relationship quality, and sexual/gender identity, then fit models with/without controls for disclosure to confidantes, to check if associations were mediated by openness with one's network contacts. We also estimated partner effects of relationship quality on social capital i.e., the association between social capital and one's partner's assessment of relationship quality, adjusting for one's own assessment of relationship quality. In a robustness check, we restricted the sample to complete dyads, and excluded HIV-positive and HIV-negative persons who did not report having seen a doctor since their relationship started. All analyses were carried out in Stata version 15, using the *xtgee* command to fit regression models, and the *ice* suite of commands to carry out multiple imputation (StataCorp, 2017).

3. Results

3.1. Descriptive statistics

Table 1 shows the descriptive characteristics of the sample. Respondents were more likely to say that they received social capital through their friends than family. HIV-positive people reported higher scores for professional social capital (healthcare providers, therapists/counselors/support workers), compared to HIV-negative people. The complete sample (N = 540) was approximately half MSM, and 42 years old. HIV-positive respondents were more likely to be non-White. About three quarters of the sample were married or cohabiting, and HIV-positive partners reported lower relationship satisfaction than HIV-negative partners. There were asymmetries in income, with HIV-negative partners typically reporting higher incomes. HIV-positive partners were more likely to be recruited through AIDS Service Organizations, compared with HIV-negative partners.

3.2. Regression results

Tables 2 and 3 show associations between personal social capital (i.e., resources from friends and family) and professional social capital (i.e., resources from health care providers, and therapists, counselors, and/or support workers), respectively. HIV-positive serostatus was associated with greater use of professional sources of social capital. No associations were detected between HIV status and personal social capital. Compared with MSM, there was strong evidence that heterosexual women were more likely to report social capital derived from family, while heterosexual men were less likely to report social capital from friends. Heterosexual men were also less likely to report social capital resources from therapists, counselors and/or support workers. White respondents were more likely to report social capital from friends and health care providers. Respondents reporting higher levels of relationship satisfaction were more likely to report greater levels of social capital from friends and health care providers. Compared with those in higher-income brackets, lower-income people were less likely to report both types of professional social capital. There was a curvilinear association between income and social capital through health care providers, where those who reported lower incomes (i.e., \$20,000 –

Table 1
Descriptive statistics for Positive Plus One, a Canadian sample of serodiscordant couples (N = 540 individuals).

	HIV Negative (n = 228)		HIV positive (n = 312)		P-value
	Num./Mean	%/(SD)	Num./Mean	%/(SD)	
Social capital through ...					
family	2.03	(1.51)	1.83	(1.57)	0.129
friends	2.79	(1.74)	2.60	(1.75)	0.224
healthcare providers	1.48	(1.31)	1.59	(1.35)	0.322
therapists/counselors/support workers	1.21	(1.52)	1.78	(1.67)	0.000
Gender/sexuality					0.086
MSM	127	55.95%	166	53.21%	
Het. female	37	16.30%	70	22.44%	
Het. male	48	21.15%	47	15.06%	
All else	15	6.61%	29	9.29%	
White	164	71.93%	189	60.58%	0.006
Age	42.57	(12.46)	42.97	(11.41)	0.699
Relationship length (years)	18.61	(9.16)	18.05	(9.07)	0.485
Married or cohabiting	175	77.43%	223	75.16%	0.542
Relationship satisfaction	3.31	(0.71)	3.24	(0.77)	0.339
Education					0.009
No post-secondary	57	26.03%	100	33.33%	
College	60	27.40%	100	33.33%	
University	102	46.58%	100	33.33%	
Income					0.000
Less than 20 k	62	27.80%	131	43.09%	
20 < 49 k	71	31.84%	102	33.55%	
50 k or more	90	40.36%	71	23.36%	
Recruitment					
Through ASOs	43	19.11%	109	35.05%	0.000
Through listservs	10	4.44%	34	10.93%	0.007
Through doctors	24	10.67%	61	19.61%	0.005

Note: Significance tests compare HIV-negative and HIV-positive partners. Significance tests are Chi-squared tests for categorical variables, and t-tests for continuous variables.

\$49,999 CAD) were most likely to report social capital from health care providers.

3.3. Sensitivity analyses restricted to complete dyads

After re-estimating the models using only complete dyads (i.e., dyads where both partners took part, without having to completely impute partner data), we found similar associations between HIV status and social capital as were found using the imputed dataset. Specifically, there was no evidence for an association between HIV status and social capital through family (b = -0.02, n.s.), or through friends (b = 0.08, n.s.). Compared to the imputed dataset, there was similar evidence for an association between HIV status and social capital accessible through health care providers (b = 0.17, p = .054), with a similar effect size (effect size imputation v. effect size complete dyad). There was strong evidence for an association between HIV status and social capital linked to therapists, counselors, and/or support workers (b = 0.15, p < .05).

In analyses including a control for disclosure of the serodiscordant relationship to others outside the relationship there was strong evidence that disclosure was associated with all types of social capital (family, b = 0.27, p < .001; friends, b = 0.24, p < .001; health care providers, b = 0.27, p < .001; therapists/counselors/support workers, b = 0.18, p < .001). Although there was some evidence that disclosure was modestly associated with HIV status (p = .08), disclosure did not mitigate associations between HIV status and social capital.

No evidence was found for an effect of interactions between HIV status and gender/sexual identity, length of relationship, or disclosure of the relationship, on social capital. However, there was strong evidence for an effect of an interaction between HIV status and social capital from

Table 2
Regressions predicting personal social capital in serodiscordant couples. (N = 540).

	Family		Friends	
	Coef.	95% CI	Coef.	95% CI
HIV positive	0.00	(-0.06, 0.08)	0.03	(-0.06, 0.14)
Gender/sexuality (Ref. = MSM)				
Het. female	0.20**	(0.05, 0.34)	-0.13	(-0.28, 0.02)
Het. male	0.10	(-0.06, 0.26)	-0.47***	(-0.66, -0.29)
All else	0.30**	(0.12, 0.49)	-0.06	(-0.26, 0.15)
White	0.06	(-0.06, 0.17)	0.16*	(0.02, 0.28)
Age	-0.06	(-0.11, 0.00)	-0.04	(-0.10, 0.01)
Relationship length	0.01	(-0.08, 0.10)	-0.03	(-0.12, 0.05)
Married or cohabiting	-0.04	(-0.19, 0.10)	-0.03	(-0.16, 0.11)
Relationship satisfaction	0.10*	(0.02, 0.17)	-0.01	(-0.08, 0.07)
Education (Ref. = No post-sec).				
College	0.04	(-0.10, 0.19)	0.09	(-0.06, 0.25)
University	0.02	(-0.14, 0.16)	0.15	(-0.01, 0.29)
Income (Ref. = Less than 20 k)				
20 < 49 k	0.17*	(0.03, 0.30)	0.19**	(0.05, 0.33)
50 k or more	0.38***	(0.23, 0.53)	0.23**	(0.08, 0.40)
Recruitment				
Through ASOs	-0.01	(-0.12, 0.10)	-0.06	(-0.18, 0.07)
Through listservs	-0.04	(-0.22, 0.14)	-0.03	(-0.23, 0.16)
Through doctors	-0.13	(-0.27, 0.02)	-0.02	(-0.17, 0.13)
Constant	-1.86***	(-2.07, -1.65)	0.76***	(0.54, 0.97)
Link function	Neg. binomial		Poisson	

Note: *p < .05; **p < .01; ***p < .001.

therapists, counselors, and/or support workers (b HIV = 0.16, p < .01; b relationship satisfaction = 0.20, p < .05; b interaction = -0.21, p < .05). No other interactions tested with relationship satisfaction, or between HIV status and income were statistically significant.

In order to investigate which specific items were driving associations between HIV status and forms of social capital (i.e., personal or professional), we broke down each index to its components (that is every kind of support, by every kind of relationship). None of the individual components of the family/friends social capital measures or of the health care providers' social capital measure were associated with HIV status. In the case of health care providers, this pattern held despite consistent associations with the complete measure. Within the resources that one can access through therapists, counselors, and/or support workers, HIV status was associated with help when sick (b = 0.42, p < .05), financial advice (b = 0.69, p < .05), and asking about one's day (b = 0.47, p < .05).

4. Discussion and conclusions

In this paper, we tested hypotheses arising from biographical disruption theory, dyadic perspectives on serodiscordance, and the social capital literature. We posited that within serodiscordant couples living in Canada, the HIV-positive partner would have more access to professional sources of social capital, but less access to interpersonal resources through friends and family. We found support for the former hypothesis, but not the latter: HIV-positive partners had more access to

Table 3
Regressions predicting professional social capital in serodiscordant couples. (N = 540).

	Health care providers		Therapists, counselors, and support workers	
	Coef.	95% CI	Coef.	95% CI
HIV positive	0.12*	(0.03, 0.22)	0.13**	(0.03, 0.23)
Gender/sexuality (Ref. = MSM)				
Het. female	0.06	(-0.11, 0.23)	0.02	(-0.10, 0.14)
Het. male	-0.18	(-0.38, 0.01)	-0.26**	(-0.43, -0.09)
All else	0.11	(-0.12, 0.34)	-0.01	(-0.19, 0.17)
White	0.18*	(0.04, 0.31)	0.00	(-0.11, 0.10)
Age	-0.04	(-0.11, 0.02)	0.01	(-0.04, 0.07)
Relationship length	-0.04	(-0.14, 0.07)	-0.03	(-0.11, 0.05)
Married or cohabiting	0.08	(-0.09, 0.26)	0.01	(-0.11, 0.14)
Relationship satisfaction	0.12*	(0.03, 0.21)	0.03	(-0.04, 0.10)
Education (Ref. = No post-sec).				
College	0.00	(-0.17, 0.14)	0.00	(-0.13, 0.13)
University	-0.14	(-0.32, 0.01)	-0.06	(-0.20, 0.07)
Income (Ref. = Less than 20 k)				
20 < 50 k	0.14*	(0.01, 0.29)	0.03	(-0.20, 0.07)
50 k or more	0.04	(-0.12, 0.23)	-0.11	(-0.20, 0.08)
Recruitment				
Through ASOs	0.07	(-0.06, 0.20)	0.08	(-0.02, 0.19)
Through listservs	0.24*	(0.06, 0.42)	0.10	(-0.05, 0.25)
Through doctors	-0.04	(-0.20, 0.12)	0.02	(-0.11, 0.15)
Constant	-3.03***	(-3.28, -2.80)	-0.79***	(-0.97, -0.60)
Link function	Neg. binomial		Neg. binomial	

Note: *p < .05; **p < .01; ***p < .001.

social capital through health care providers and therapists/counselors/support workers, compared to HIV-negative partners, but similar interpersonal resources through friends and family. The findings also reinforce what others have argued, namely that because programs for PLHIV often do not reach out to HIV-negative partners, these partners are often not directly able to access resources that may help them to navigate stigma and medical questions (Goldenberg & Stephenson, 2015). The HIV-positive partner, therefore, operates as a kind of bridge node to these professional resources, and acts as a kind of bridging social capital for the dyad as a whole. More detailed analyses imply that when accessing social capital therapists/counselors/support workers, the HIV-positive partner was more likely to have access to help when sick, and general support (i.e., not HIV-specific) around topics including personal finances, which resonates with the wider range of topics often discussed with these types of professionals. In other words, it appears that for HIV-positive partners, the nature of the tie to a professional becomes more ‘generalized’ and not limited to the technical knowledge of a particular professional specialty, taking on the characteristics of a close, informal tie. Future work should investigate whether the lines between ‘professional’ and ‘personal’ are blurry for HIV-positive partners when compared with HIV-negative partners, in terms of their connections to professionals and implications for increased access to resources and information for the HIV-positive partner.

Despite the advantages of our study sample (i.e., a large national sample with diverse recruitment strategies), there are several limitations to generalizability. The small number of same-gender female couples limited analysis of interactions between both partners’ gender to disentangle the effect of own gender from partner gender (Umberson and Karas Montez 2010). Because of the open recruitment strategy, a denominator of dyads was not possible to ascertain (i.e., those who viewed recruitment materials or were informally approached about the study, but not recruited), which prevented calculation of a response rate or quantification of the differences between those who participated, and those who did not. Future work should pursue sampling strategies that reach out more broadly, including to women in serodiscordant relationships with other women, and pursue longitudinal follow-up to gain more explanatory power regarding the trajectory of serodiscordant relationships over time.

This paper contributes new understandings to the study of social relationships and health in view of the dyad’s position within the context of wider social structure. As others have argued, dyadic research needs to move away from theoretical frameworks that reinforce dyadic exceptionalism – a perspective that isolates the dyad from other network structures, rather than seeking to understand the dyad in terms of the social networks that surround it (Cornwell, 2012; Umberson & Montez, 2010). Future work should therefore examine which aspects of couples’ social networks are most important for the management of HIV, serodiscordant relationship dynamics, and overall relationship satisfaction, as well as how couple dynamics impact the network structure that surrounds them. These theoretical insights also shape how programs could consider improving the supportive services they provide to serodiscordant couples. Service providers may need to be aware of the social and emotional needs of HIV-negative partners, by ensuring that they have regular access to counseling and therapy to help navigate the psychosocial aspects of their relationship, and especially those aspects unique to serodiscordance. As people living with HIV are enjoying longer life expectancies, the number of people who may benefit from these study findings is likely to increase. There is considerable potential as well for knowledge-sharing between new programs developed for HIV-serodiscordant couples, and other programs designed couples with a mixed status health condition (i.e., services directed at couples where one of the two has cognitive limitations, has suffered a permanent loss of physical mobility, or is struggling with ongoing mental health challenges). Theoretically this would also follow from our work, as this paper drew on biographical disruption literature, which is generally applicable to a wide range of health conditions (Bury, 1982; Carricaburu & Pierret, 1995; Perry & Pescosolido, 2012). A wider discussion on the dyadic implications of asymmetry in health, where the voices of all partners can be heard and their specific needs addressed, could have considerable relevance across diagnoses. There is substantial reason to move towards a greater focus on serodiscordant relationships, and dyadic policies and practices in general.

Financial disclosure

We certify that all our affiliations with or financial involvement in, within the past 5 years and foreseeable future, any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript are completely disclosed (e.g. employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, royalties).

Ethical Statement

Hereby, I James Iveniuk consciously assure that for the manuscript “Social capital and HIV-serodiscordance: Disparities in access to personal and professional resources for HIV-positive and HIV-negative partners” the following is fulfilled:

- 1) This material is the authors’ own original work, which has not been previously published elsewhere.
- 2) The paper is not currently being considered for publication elsewhere.
- 3) The paper reflects the authors’ own research and analysis in a truthful and complete manner.
- 4) The paper properly credits the meaningful contributions of co-authors and co-researchers.
- 5) The results are appropriately placed in the context of prior and existing research.
- 6) All sources used are properly disclosed (correct citation). Literally copying of text must be indicated as such by using quotation marks and giving proper reference.

7) All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content. The violation of the Ethical Statement rules may result in severe consequences.

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I agree with the above statements and declare that this submission follows the policies of Solid State Ionics as outlined in the Guide for Authors and in the Ethical Statement.

Author statement

Thank you for inviting my co-authors and I to submit a revised manuscript for your consideration. We greatly appreciate the opportunity to strengthen our submission and to address the valuable feedback of both reviewers. We have addressed each point in the attached "Response to Reviewers" document. A revised copy of the manuscript is also provided.

"Social capital and HIV serodiscordance" is a strong fit for Social Science and Medicine: Population Health and its readership. By taking a relational view on social capital in the context of HIV-serodiscordant couples, it advances the literature on health and social relationships, in terms of both methods and theory, and provides valuable practical insights for programs serving people living with HIV, and their HIV-negative partners.

The revision process provided us with the welcome opportunity and feedback necessary to deepen our theoretical arguments and provide clearer links between the interpersonal and societal implications of this manuscript.

Thank you again for considering our revisions. We recognize the time and effort both Social Science and Medicine: Population Health and the reviewers have contributed. We look forward to your decision.

Declaration of competing interest

The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

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