Preventive Medicine 107 (2018) 36–44

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

HIV-related stigma, racial discrimination, and gender discrimination: Pathways to physical and mental health-related quality of life among a national cohort of women living with HIV

Carmen H. Logie[a,b,*], Ying Wang[a], Ashley Lacombe-Duncan[a], Anne C. Wagner[c], Angela Kaida[d], Tracey Conway[b], Kath Webster[d], Alexandra de Pokomandy[e,f], Mona R. Loutfy[b,g]

[a] Factor-Inwentash Faculty of Social Work, University of Toronto, 246 Bloor Street West, Toronto, ON M5S 1V4, Canada
[b] Women's College Research Institute, Women's College Hospital, 76 Grenville Street, Toronto, ON M5S 1B2, Canada
[c] Department of Psychology, Ryerson University, 350 Victoria Street, Toronto, ON M5B 2K3, Canada
[d] Faculty of Health Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada
[e] Department of Family Medicine, McGill University, 5858 chemin de la Côte-des-Neiges, Montreal, QC H3S 1Z1, Canada
[f] Chronic Viral Illness Service, McGill University Health Centre, 3801 University Street, Montreal, QC H3A 2B4, Canada
[g] Department of Medicine, University of Toronto, 190 Elizabeth Street, Toronto, ON M5G 2C4, Canada

ARTICLE INFO

Keywords:
Health-related quality of life
Wellbeing
HIV
Stigma
Women
Sexism
Racism
Intersectional
Intersectionality

ABSTRACT

Social inequities compromise health-related quality of life (HR-QoL) among women living with HIV (WLWH). Little is known about health impacts of intersecting stigma based on HIV status, race and gender among WLWH or potential mechanisms to promote HR-QoL. We tested pathways from multiple types of stigma (HIV-related, racial, gender) to physical and mental HR-QoL utilizing baseline survey data from a national cohort of WLWH in Canada (2013–2015). Structural equation modeling was conducted using maximum likelihood estimation methods to test the direct effects of HIV-related stigma, racial discrimination, and gender discrimination on HR-QoL and indirect effects via social support and economic insecurity, adjusting for socio-demographic factors. Among 1425 WLWH (median age: 43 years [IQR = 35–50]), HIV-related stigma and gender discrimination had significant direct effects on mental HR-QoL. Social support mediated the relationship between HIV-related stigma and mental HR-QoL, accounting for 22.7% of the effect. Social support accounted for 41.4% of the effect of gender discrimination on mental HR-QoL. Economic insecurity accounted for 14.3% of the effect of HIV-related stigma, and 42.4% of the effect of racial discrimination, on physical HR-QoL. Fit indices suggest good model fit ($\chi^2[1] = 3.319$, $p = 0.069$; CFI = 0.998; RMSEA = 0.042 (90% CI: 0–0.069); SRMR = 0.004). Findings reveal complex relationships between intersecting stigma and HR-QoL. Strategies that address intersecting stigma and economic insecurity among WLWH may prevent the harmful impacts of HIV-related stigma and gender discrimination on physical HR-QoL. Increasing social support may mitigate the impacts of stigma on mental health. Findings can inform multi-level interventions to promote health and wellbeing among WLWH.

1. Introduction

Women account for one-fifth of people living with HIV (PLWH) in Canada (Public Health Agency of Canada, 2015) and over half of PLWH worldwide (UN Women, 2016). HIV is an epidemic fuelled by racial, gender, and class inequities (Watkins-Hayes, 2014). Since the advent of antiretroviral treatment (ART), which effectively shifted HIV to a manageable, chronic condition, improving mental and physical health-related quality of life (HR-QoL) have become important clinical objectives for women living with HIV (WLWH).

Population-based studies focused on health-related quality of life (HR-QoL) have predominantly explored the association between HR-QoL and behavioural practices, such as smoking (McClave et al., 2009) or physical activity (Omorou et al., 2016). Other studies focused on sub-populations, such as people with cancer, have focused on interventions to address HR-QoL (Isa et al., 2013). However, the mental and physical health and wellbeing of WLWH is compromised by intersecting types of stigma and discrimination, including HIV-related stigma, racial discrimination, and gender discrimination (Sandelowski et al., 2009; Herek et al., 1998; Logie et al., 2011; Orza et al., 2015).

* Corresponding author at: Factor-Inwentash Faculty of Social Work, University of Toronto, 246 Bloor Street West, Toronto, ON M5S 1V4, Canada.
E-mail addresses: carmen.logie@utoronto.ca (C.H. Logie), yings.wang@mail.utoronto.ca (Y. Wang), ashley.lacombe.duncan@utoronto.ca (A. Lacombe-Duncan), anne.wagner@arts.ryerson.ca (A.C. Wagner), angela_kaida@sfu.ca (A. Kaida), alexandra.depokomandy@mcgill.ca (A. de Pokomandy), Mona.Loutfy@wchospital.ca (M.R. Loutfy).

https://doi.org/10.1016/j.ypmed.2017.12.018
Received 11 July 2017; Received in revised form 2 November 2017; Accepted 19 December 2017
Available online 22 December 2017

Stigma processes include labeling, loss of status, and discrimination in contexts of unequal power distribution (Link and Phelan, 2001). Chronic stress resulting from stigma and discrimination may directly increase women's susceptibility to poor physical and mental health (Krieger, 2001; Logie and Gadalla, 2009; Rueda et al., 2016) and lower physical and mental HR-QoL (Rueda et al., 2016; Degroote et al., 2014; Alsayed et al., 2017). Physical HR-QoL encompasses physical functioning, role limitations due to physical functioning, bodily pain, and general health; mental HR-QoL encompasses vitality, social functioning, role limitations due to emotional functioning, and general mental health (Ware et al., 1996; Larson, 2002). Stigma and discrimination may also indirectly influence physical and mental HR-QoL through mediating factors, such as by limiting access to economic security and/or social support, which in turn reduce wellbeing (Link and Phelan, 2001; Krieger, 2001; Rueda et al., 2016; Hatzenbuehler et al., 2013). Socio-ecological perspectives recognize that health and wellbeing are shaped at multiple levels, including social networks at the community level, and poverty at the structural level (Baral et al., 2011). To illustrate, employment-related discrimination limit opportunities for financial security and reduce access to housing (Anderson and Weatherburn, 2004; Riley et al., 2012; Riley et al., 2011) and food security (Riley et al., 2012; Riley et al., 2011; Weiser et al., 2011), which may in turn harm physical and mental health. A longitudinal study of 133 WLWH found that unmet subsistence needs had the strongest influence on mental health, above lack of social support, substance use, and sex work involvement (Riley et al., 2011). A population-based survey of PLWH in France found that both economic insecurity (financial difficulties, unemployment) and discrimination (experiences of rejection by medical staff) were associated with poorer physical and mental HR-QoL (Douab et al., 2014).

The effects of stigma on HR-QoL can be understood through minority stress theory, which suggests that negative treatment and attitudes from others targeting one's identity may cause chronic stress resulting in negative health outcomes (Meyer, 1995; Meyer, 2003; Herek, 2007). The minority stress theory also posits that social support may mediate the effect of stigma on physical and mental health outcomes (Meyer, 1995; Meyer, 2003). Systematic review findings from 49 studies on determinants of HR-QoL among PLWH (Degroote et al., 2014) reported that social support was among variables most consistently associated with HR-QoL. A systematic review of 20 studies identified that social support groups were associated with reduced mortality and morbidity, increased retention in care, and improved quality of life for PLWH (Bateganya et al., 2015). Other quantitative studies have similarly identified positive associations between social support and HR-QoL for WLWH (Alsayed et al., 2017; Jia et al., 2004). Yet the potential role of economic insecurity and social support as mediators between intersecting stigma and multiple health outcomes (mental, physical) are underexplored.

Intersectionality, from critical race theory, conceptualizes the intersection of multiple social identities (e.g. gender, race): at this intersection persons experience systems of privilege and oppression (e.g. sexism, racism) (Hill Collins, 2000; Crenshaw, 1989; Bowleg, 2012; McCall, 2005; Bowleg, 2008). Intersectional approaches facilitate comprehensive contextual analyses of health inequities yet are not routinely applied to HR-QoL (Dhamoon and Hankivsky, 2011). We provide a brief overview of the literature related to associations between HIV-related stigma, racial discrimination, gender discrimination, and HR-QoL, including attention to economic insecurity and social support as potential mediators of these relationships. We subsequently present a testable conceptual model of pathways between intersecting stigma and mental and physical HR-QoL for WLWH.

1.1. HIV-related stigma

HIV-related stigma reduces access to HIV prevention, early access to treatment, and ongoing engagement in care (Parker and Aggleton, 2003). Meta-analyses have shown associations between HIV-related stigma and: delayed access to HIV care (Gesesew et al., 2017), low social support (Logie and Gadalla, 2009; Rueda et al., 2016), poor physical (Logie and Gadalla, 2009; Rueda et al., 2016) and mental (Logie and Gadalla, 2009; Rueda et al., 2016) health, and low income (Logie and Gadalla, 2009). Studies in Ontario, Canada reported that HIV-related stigma was associated with depression (Logie et al., 2016; Logie et al., 2013) and that HIV-related stigma had a direct effect on self-rated health (Logie et al., 2016) – a proxy for physical health –among African, Caribbean, and Black (ACB) WLWH. Other large US-based studies have similarly identified the association between high levels of HIV-related stigma and poor self-rated mental and physical health (Wolitski et al., 2009) among PLHIV. HIV-related stigma has also been correlated with reduced quality of life (Rueda et al., 2016; Degroote et al., 2014; Alsayed et al., 2017; Vyavaharkar et al., 2012; Andrinopoulous et al., 2011).

HIV-related stigma has been associated with economic insecurity among PLWH, including food and housing insecurity (Wolitski et al., 2009). Socioeconomic status is strongly associated with HR-QoL among PLWH (Degroote et al., 2014). A quantitative study with ACB WLWH (n = 173) reported that social support mediated the association between HIV-related stigma and a composite measure of quality of life (Logie et al., 2017). Other studies have demonstrated that social support is positively associated with quality of life (Vyavaharkar et al., 2012; Andrinopoulous et al., 2011; Tran et al., 2011). These findings suggest future research is warranted to examine the mediating effects of economic insecurity and social support in the relationship between stigma and physical and mental HR-QoL for WLWH.

1.2. Racial discrimination

A growing body of literature documents the impacts of racial discrimination for WLWH (Logie et al., 2011; Logie et al., 2016; Logie et al., 2013). Cross-sectional survey results with ACB WLWH in Canada (n = 157) reported that racial discrimination was significantly associated with depression (Logie et al., 2016) and had an indirect effect on reduced quality of life (Logie et al., 2017). Few studies have explored racial discrimination and quality of life among PLWH (Degroote et al., 2014).

While the relationships between racial discrimination and economic insecurity among WLWH have been underexplored (Logie et al., 2016), socioeconomic status is believed to account for many poor health outcomes experienced disproportionately by racial minority persons (Williams, 1999). There are mixed findings with regards to the role of social support in mitigating the effects of racism on poor mental or physical health outcomes. A population-based study in the UK (n = 4281) did not find that social support mediated the associations between racism and poor mental health (Chakraborty et al., 2010). A (Logie et al., 2017) study with African, Caribbean and Black WLWH reported that racial discrimination had a direct effect on reduced social support. There are knowledge gaps regarding pathways from racial discrimination to HR-QoL among WLWH, and -how economic insecurity and social support may mediate this relationship.

1.3. Gender discrimination

Physical and mental health inequities among women relative to men are due, in part, to sexism and gender discrimination (Krieger et al., 1993; An and Landry, 2007; Szymanski and Stewart, 2010; Borrell et al., 2010). For example, among a population-based study of women in Spain (n = 10,927), perceived sexism was correlated with poor self-rated physical health and poor mental health (Borrell et al., 2010). Women had over double the odds of poor mental health for each unit increase in sexism (Borrell et al., 2010).

There are several pathways between gender discrimination and health (Borrell et al., 2010). Beyond intrapersonal impacts (e.g.,

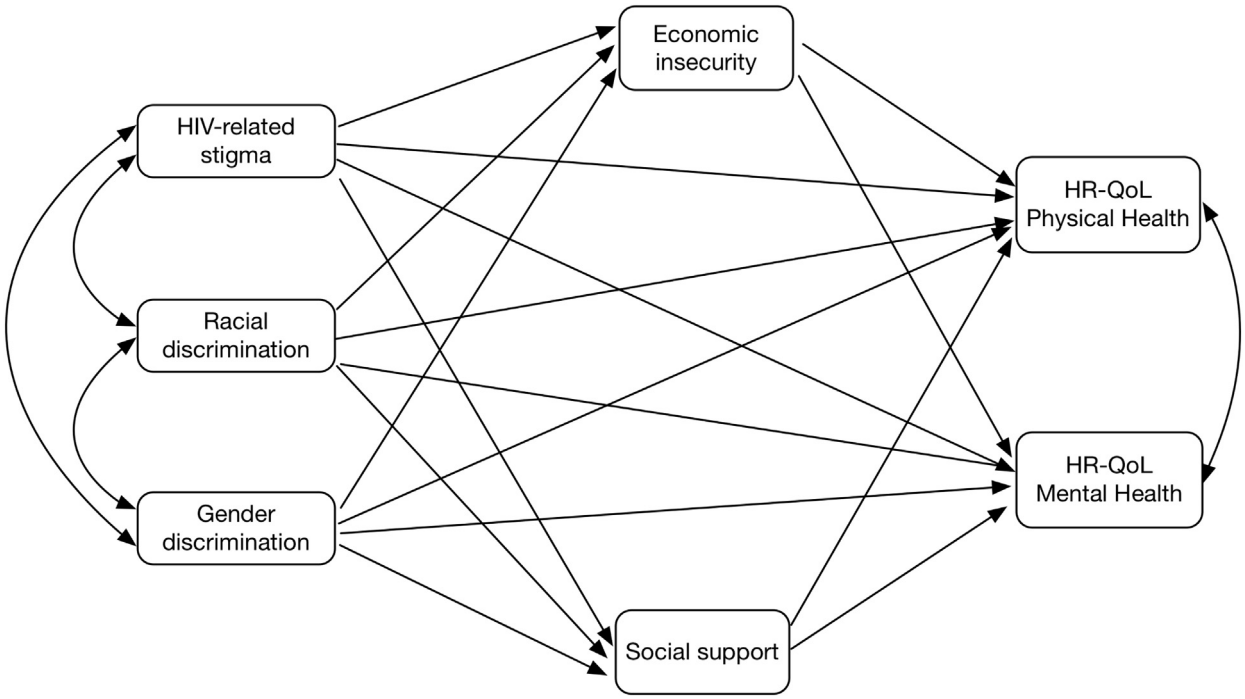

Fig. 1. Tested model for HIV-related stigma, racial discrimination, and gender discrimination on mental and physical health-related quality of life for women living with HIV in Canada (2013–2015).

chronic stress), and interpersonal impacts (e.g., violence), gender discrimination limits access to economic security for women globally (Gradín et al., 2010) with particularly harmful impacts among WLWH (Olowu, 2014). The association between social support and sexism is understudied (Logie et al., 2013).

1.4. Gaps in the literature and study objectives

Despite a body of research about HIV-related stigma and its associations with poor mental and physical health, social and structural pathways to HR-QoL remain understudied among WLWH (Rueda et al., 2016). Scant research has examined forms of stigma beyond HIV-related stigma—such as racial and gender discrimination. Finally, the role of social support and economic insecurity as mediators between stigma and HR-QoL warrants further attention.

Our study objective was to test a conceptual model exploring associations between multiple forms of stigma (HIV-related, racial, gender) and physical and mental HR-QoL of WLWH, directly, as well as indirectly through economic insecurity and social support (Fig. 1). We hypothesized that: (1) HIV-related stigma, racial discrimination, and gender discrimination would have significant and negative direct effects on physical and mental HR-QoL; (2) social support and economic insecurity would mediate associations between stigma types and mental and physical HR-QoL.

2. Methods

2.1. Study design

This study draws on baseline data collected as part of a national community-based cohort study conducted in Ontario, Quebec, and British Columbia, Canada–the Canadian HIV Women's Sexual and Reproductive Health Cohort Study (CHIWOS) (Loutfy et al., 2017; Loutfy et al., 2016). Between August 2013 and May 2015, trained peer research associates (PRA) recruited self-identified WLWH aged 16 years or older (n = 1425) utilizing purposive sampling methods (word-of-mouth, online listservs, venue-based sampling from AIDS service organizations). Questionnaires were administered by PRA to participants using a web-based interface, in a confidential location (e.g., AIDS service organization, space in or near clinics, women's home) or by Skype for some rural residents (Abelsohn et al., 2015). Participants provided voluntary written or oral informed consent with a study team member as witness for phone/Skype questionnaires. Participants received a $ 50 CAD honorarium for their participation. Ethics approval was obtained from research ethics boards at Women's College Hospital, University of Toronto, Simon Fraser University, the University of British Columbia/Providence Health, and McGill University Health Centre. Study sites with independent Research Ethics Boards obtained their own approval prior to commencing enrolment.

2.2. Measures

Health-related quality of life (HR-QoL) was measured using the 12-item Short Form Survey (SF-12) (Ware et al., 1996; Larson, 2002). Two subscales were derived from eight subdomains: mental health (vitality, social functioning, mental health and role emotional) (score range: − 1.67–77.22; Cronbach $\alpha = 0.80$) and physical health (physical functioning, role physical, bodily pain and general health perceptions) (score range: 1.31–74.67; Cronbach $\alpha = 0.81$). Higher scores suggest better mental or physical health.

HIV-related stigma was measured with Wright's shortened 10-item version of Berger's HIV Stigma Scale (score range: 0–100; Cronbach $\alpha = 0.85$) (Wright et al., 2007). *Racial discrimination* was assessed with the Everyday Discrimination Scale-Racism (score range: 8–48; Cronbach $\alpha = 0.96$) (Williams et al., 1997). *Gender discrimination* was measured by the Everyday Discrimination Scale-Sexism (score range: 8–48; Cronbach $\alpha = 0.94$) (Williams et al., 1997). Higher scores for each scale indicated higher levels of HIV-related stigma, racial discrimination, or gender discrimination.

Social support was assessed by the 4-item Medical Outcomes Study Social Support Survey (MOS-SSS) (Stewart, 1992; Gjesfjeld et al., 2007). Scores ranged from 4 to 20 (Cronbach α was 0.85) with higher scores indicating higher positive social support.

Economic insecurity included housing insecurity and food insecurity.

Housing insecurity included participants who lived in: a self-contained room, transition house, halfway house, safe house, couch surfing, outdoors on street, parks, or in a car. Housing security included participants who lived in apartment (own/rent) or a house (own/rent). *Food insecurity* was derived from three statements focused on experiences in the past 12 months: fears of running out of food; experiences with running out of food; and inability to eat balanced meals (score range: 0–6).

We examined several socio-demographic factors as covariates, including age (continuous), legal relationship status (single vs. married/common law), immigration status (Canadian citizen, landed immigrant/permanent resident, refugee, other), ethnicity (Indigenous, Black, white/Caucasian and other), and education (less than high school vs. high school or higher).

2.3. Statistical analyses

We first conducted descriptive analyses of all variables for the whole sample. Unadjusted and adjusted linear regressions were used to estimate the regression coefficients of mental and physical HR-QoL. Explanatory variables include HIV-related stigma, racial discrimination, and gender discrimination, controlling for age, education level, relationship status, immigration status, and ethnicity. Structural equation modeling was conducted using maximum likelihood estimation methods to test the direct effects of HIV-related stigma, racial discrimination, and gender discrimination on mental and physical HR-QoL, and the indirect effects via social support and economic insecurity, adjusting for socio-demographic factors. Model fit was assessed using: Chi-square, Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI). A significance level for Chi-square of < 0.05, a score of < 0.05 for RMSEA with 90% confidence interval between 0.02 and 0.08, and a score > 0.90 for CFI indicate acceptable model fit (Mueller and Hancock, 2008). Fig. 1 illustrates all the tested path models. Statistical significance was set at the $p < 0.05$ level. Missing responses were excluded from the analyses. All statistical analyses were performed using STATA (version14.0) and Mplus (version 1.40).

3. Results

3.1. Participant characteristics

Table 1 reports sociodemographic characteristics for the whole sample (n = 1425). The median age for the sample was 43 years old (IQR = 35–50). The majority of the sample (81.45%) was Canadian citizens. Approximately two-thirds (65.26%) had an annual household income less than CAN $20,000.

Table 1
Socio-demographic characteristics of women living with HIV in Canada (n = 1425) (2013–2015).

Variables	Median (IQR)/N (%)	Missing (n)
Age	43 (35–50)	
Immigration status		7
Canadian citizen	1155 (81.45)	
Landed immigrant/permanent resident	168 (11.85)	
Refugee/protected person	63 (4.44)	
Temporary or undocumented person	34 (2.39)	
Ethnicity		
Caucasian	585 (41.05)	
Aboriginal	318 (22.32)	
Black/African/Caribbean	418 (29.33)	
Other ethnicity	104 (7.30)	
Household gross yearly income		43
Less than $20,000	1001 (65.41)	
$20,000–$40,000	284 (20.55)	
Greater than $40,000	194 (14.04)	
Marital status		8
Legally married/common-law/in a relationship	456 (32.18)	
Single	689 (48.62)	
Separated/divorced/widowed	272 (19.20)	
Education-less than high school	227 (16.01)	7
Number of dependents	0 (0–1)	5
Access to HIV care	1313 (93.45)	20
HIV-related stigma	57.5 (42.5–72.5)	22
Gender discrimination scale	17 (9–28)	26
Racial discrimination scale	16 (8–28)	25
Social support	15 (11–18)	55
Economic insecurity	3 (2–4)	21

ART: Antiretroviral Therapy.

3.2. Multivariate logistic and linear regressions exploring associations between mental and physical health outcomes, stigma and discrimination, and proposed mediators

Table 2 illustrates the unadjusted and adjusted regression coefficients for mental HR-QoL and physical HR-QoL. Mental HR-QoL is significantly negatively associated with HIV-related stigma, gender discrimination, and economic insecurity; and positively associated with social support. Physical HR-QoL is positively associated with social support, and negatively associated with gender discrimination- and economic insecurity, controlling for age, ethnicity background, immigration status, relationship status and education level.

3.3. Structural equation modeling of associations between mental and physical health outcomes, stigma and discrimination, and proposed mediators

A structural equation model was tested to examine the direct and indirect effects of HIV-related stigma, racial discrimination, and gender discrimination on mental HR-QoL and physical HR-QoL. Model fit indices suggested that our model fit the data well ($\chi^2[1] = 3.319$, $p = 0.069$; CFI = 0.998; RMSEA = 0.042 (90% CI:0–0.069); SRMR = 0.004). Table 3 displays the results of final model tested.

Fig. 2 illustrates the model with regression coefficients and the significance level of each pathway in our model. Standard coefficients indicate that with a standard deviation increase in the independent variable, the dependent variable would increase by x standard deviation, holding all other variables constant (Long and Freese, 2006). For example, with one unit standard deviation increase in HIV-related stigma, mental HR-QoL will decrease by 0.09 standard deviations, holding all other variables constant. Standard errors were included in parentheses. Fig. 2 depicts that the direct paths from HIV-related stigma ($\beta = -0.175$, $p < 0.001$ for direct effect; $\beta = -0.047$, $p < 0.001$ for indirect effect) and gender discrimination ($\beta = -0.187$, $p < 0.001$ for direct effect, $\beta = -0.047$, $p < 0.001$for indirect effect) to mental HR-QoL were significant, accounting for the mediation effects of economic insecurity and social support. HIV-related stigma and racial discrimination were no longer significant predictors of physical HR-QoL after controlling for economic insecurity. Economic insecurity accounted for 14.3% of the total effect of HIV-related stigma on physical HR-QoL, and 42.4% of the total effect of racial discrimination on physical HR-QoL. Social support mediated the relationship between HIV-related stigma and mental HR-QoL ($\beta = -0.041$, $p < 0.001$), accounting for 22.7% of the effect size. Social support also mediated the relationship between gender discrimination and mental HR-QoL ($\beta = 0.046$, $p < 0.01$), accounting for 41.4% of the total effect.

4. Discussion

This is among the first studies to explore pathways between multiple forms of stigma and HR-QoL for WLWH. Our findings suggest that HIV-

Table 2
Unadjusted and adjusted regression coefficients and 95% confidence intervals for mental and physical HR-QoL (n = 1425) among women living with HIV in Canada (2013–2015).

Variables	Mental HR-QoL		Physical HR-QoL	
	Unadjusted coeff. (95% CI)	Adjusted coeff. (95% CI)	Unadjusted coeff. (95% CI)	Adjusted coeff. (95% CI)
HIV-related stigma	− 0.015 (− 0.19–(− 0.11))***	− 0.09 (− 0.14–(− 0.04))***	− 0.05 (− 0.09–(− 0.01))**	− 0.04 (− 0.08–(0.002))
Racial discrimination	− 0.21 (− 0.27–(− 0.14))***	0.06 (− 0.04–(0.16))	− 0.14 (− 0.20–(− 0.07))***	− 0.09 (− 0.23–0.03)
Gender discrimination	− 0.33 (− 0.41–(− 0.26))***	− 0.20 (− 0.29–(− 0.09))***	− 0.19 (− 0.27–(− 0.12))***	− 0.05 (− 0.18–(0.06))
Social support	1.35 (1.18–1.51)***	1.23 (1.05–1.42)***	0.42 (0.25–0.58)***	0.20 (0.01–0.37)*
Economic insecurity	− 2.20 (− 2.83–(− 1.57))***	− 1.03 (− 1.62–(− 0.43))**	− 2.12 (− 2.75–(− 1.49))***	− 1.85 (− 2.24–(− 1.49))***

HR-QoL, health-related quality of life; Coeff, coefficient; CI, confidence interval.
Covariates include: age, ethnicity background, immigrant status, relationship status and education level.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

related stigma, gender discrimination, and racial discrimination impact physical and mental HR-QoL through different pathways. Key findings include: (1) economic insecurity mediated the relationships between HIV-related stigma and racial discrimination and physical HR-QoL; and, (2) social support mediated the relationship between gender discrimination and HIV-related stigma and mental HR-QoL.

Our finding that HIV-related stigma, racial discrimination, and gender discrimination are important factors to consider in understanding HR-QoL is congruent with an intersectional approach to stigma (Sandelowski et al., 2009; Herek et al., 1998; Logie et al., 2011; Orza et al., 2015) that highlights how multiple, interconnected marginalized social identities may result in social inequities (e.g. gender discrimination, racial discrimination) (Hill Collins, 2000; Crenshaw, 1989; Bowleg, 2012; McCall, 2005; Bowleg, 2008). Our findings illuminate how stigma types are interconnected and shape health inequities. While there is no standard approach to intersectional quantitative analysis (Hill Collins, 2000; Crenshaw, 1989; Bowleg, 2012; McCall, 2005; Bowleg, 2008), our approach diverges from some traditional intersectional approaches through its focus on disentangling stigma types (HIV stigma, racial discrimination, gender discrimination) to understand their unique health impacts. Rich qualitative intersectionality research with men living with HIV in Uganda (Mburu et al., 2014) and the U.S. (Bowleg et al., 2013). can inform further intersectional qualitative explorations of HR-QoL with WLWH.

Our study reveals both the direct and indirect pathways from stigma types to physical and mental HR-QoL for WLWH. A systematic review of stigma reducing interventions for ACB WLWH identified only two stigma reduction interventions aimed for this population, both of which only addressed HIV-related stigma (Loutfy et al., 2015). Stangl and colleagues' systematic review of 48 studies to identify effective HIV-related stigma reduction interventions highlighted a dearth of interventions that address multiple stigmas (Stangl et al., 2013). This is an important area for future research.

We corroborate extensive research that demonstrates HIV-related stigma is associated with overall HR-QoL (Rueda et al., 2016; Degroote et al., 2014; Alsayed et al., 2017; Vyavaharkar et al., 2012; Andrinopoulous et al., 2011), mental HR-QoL (Douab et al., 2014) and physical HR-QoL (Douab et al., 2014) for PLHIV (Rueda et al., 2016; Degroote et al., 2014; Douab et al., 2014), and WLWH specifically (Alsayed et al., 2017; Vyavaharkar et al., 2012; Andrinopoulous et al., 2011). Our findings also support prior research that demonstrates negative associations between racial discrimination and HR-QoL for WLWH (Logie et al., 2017). We corroborate research showing that gender discrimination influences women's mental health (Borrell et al., 2010). We provide among the first quantitative evidence in North America of associations between gender discrimination and HR-QoL for WLWH. While addressing HIV-related stigma is needed, addressing racial and gender discrimination are also critical for optimizing physical and mental HR-QoL.

Both economic insecurity and social support mediated pathways

Table 3
Final path model parameter estimates of health-related quality of life (mental health and physical health) among women living with HIV in Canada (2013–2015). (n = 1294).[a]

Parameter	Coefficient (SE)	Critical ratio	p	Standardized estimate
Mental HR-QoL on				
HIV-related stigma	− 0.090 (0.022)	− 4.020	< 0.001	− 0.127
Racial discrimination	0.060 (0.050)	1.210	0.226	0.047
Gender discrimination	− 0.202 (0.050)	− 4.066	< 0.001	− 0.142
Social support	1.231 (0.095)	12.958	< 0.001	0.382
Economic insecurity	− 1.034 (0.302)	− 3.429	< 0.01	− 0.086
Physical HR-QoL on				
HIV-related stigma	− 0.040 (0.022)	− 1.839	0.066	− 0.056
Racial discrimination	− 0.092 (0.061)	− 1.495	0.135	− 0.071
Gender discrimination	− 0.054 (0.060)	− 0.901	0.368	− 0.037
Social support	0.198 (0.094)	2.111	0.035	0.061
Economic insecurity	− 1.845 (0.326)	− 5.669	< 0.001	− 0.152
Social support on				
HIV-related stigma	− 0.023 (0.007)	− 3.598	< 0.001	− 0.106
Racial discrimination	0.024 (0.018)	1.387	0.165	0.061
Gender discrimination	− 0.055 (0.018)	− 3.015	< 0.01	− 0.124
Economic insecurity on				
HIV-related stigma	0.004 (0.002)	2.332	< 0.05	0.070
Racial discrimination	0.019 (0.005)	3.890	< 0.001	0.180
Gender discrimination	0.001 (0.005)	0.186	0.852	0.008

SE, standard error; HR-QoL, health-related quality of life.
[a] All results were adjusted by age, relationship status, race/ethnicity, immigration status, education level.

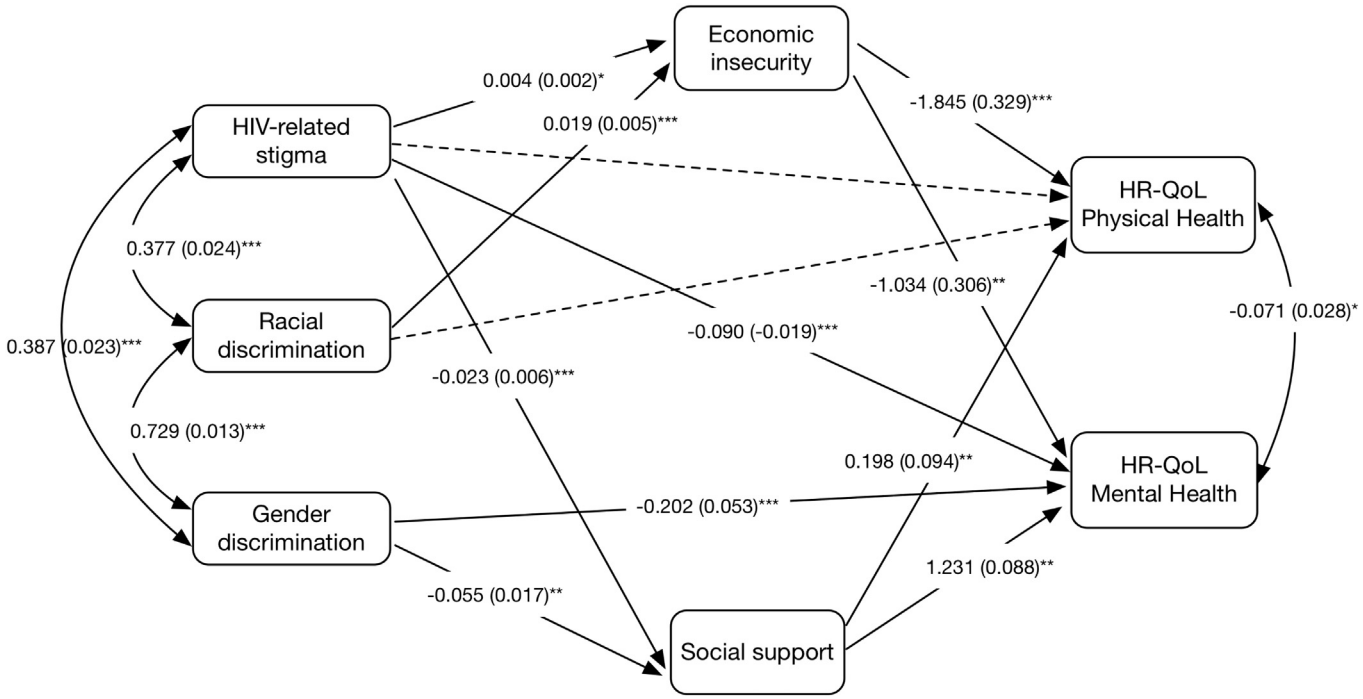

Fig. 2. Final model for HIV-related stigma, racial discrimination, and gender discrimination on health-related quality of life (mental and physical health) among women living with HIV in Canada (2013–2015).
Note. Standard coefficients are reported with the standard errors in parentheses.
Statistical significance is noted with the following notations: *p < 0.05, **p < 0.01, ***p < 0.001.
Covariates include: age, ethnicity, immigration status, relationship status, and education level.

between different types of stigma and different health outcomes for WLWH. We contribute to the body of literature demonstrating that HIV-related stigma is associated with economic insecurity (Logie and Gadalla, 2009; Wolitski et al., 2009) and the gendered poverty of WLWH (Olowu, 2014). We provide evidence for the association between racial discrimination and economic insecurity for WLWH, and confirm studies conducted among racialized persons broadly linking racism to economic insecurity (Williams, 1999). Contrary to prior work with WLWH in Canada (Logie et al., 2016) that did not identify an association between racial discrimination or HIV-related stigma and housing insecurity, we found a direct association between both racial discrimination and HIV-related stigma and economic insecurity. The current study used a larger sample including diverse ethno-racial backgrounds with wider geographic inclusion, and therefore could have had increased power to detect these associations.

In our analysis, economic insecurity mediated the relationship between HIV-related stigma and racial discrimination and physical HR-QoL, but not the association between HIV-related stigma and mental HR-QoL, or the relationship between gender discrimination and mental or physical HR-QoL. Similarly, Degroote et al. (2014) identified that while socioeconomic status had an impact on both physical and mental health status, the effect was almost twice as large for physical health. Economic insecurity may have a greater impact on physical health as food and housing are essential to maintaining health, adherence to treatment, and nutrition (Weiser et al., 2011). Food insecurity can lead to nutrient deficiencies that can result in faster immunological decline and increased morbidity and mortality among -PLWH (Weiser et al., 2011). Moreover, food insecurity can also have mental health consequences, such as depression (Weiser et al., 2011). The null findings with regards to gender discrimination and economic insecurity could be due to the uniformity of the sample; including men living with HIV could help to explore the effects of gender discrimination on economic insecurity. However, these findings suggest the need to address economic security in HIV care and support (Gupta et al., 2008).

This study has several limitations. First, cross-sectional data limits our ability to assess causation. Future research could draw on longitudinal study designs to determine causality. We utilized a purposive, non-random sampling strategy which may introduce bias. For instance, we oversampled women already engaged in care, potentially excluding women who were more vulnerable. However, we also strategically recruited a significant proportion of women who experience marginalization such as women who use drugs, women engaged in sex work, young and transgender women (Loutfy et al., 2017). Given the vulnerability of the sample, self-reported measures, and the financial incentive, there is a possibility that some participants may not be HIV positive. However, a sub-study validating self-reported viral load through linkage with clinical population-level data among BC participants (n = 356) suggests this is highly unlikely, as only 1/356 participants were unable to be linked (Carter et al., 2017). Data were self-reported, and therefore subject to recall and social desirability bias. The racial and gender discrimination scales measured enacted stigma and did not assess the multi-dimensional aspects of stigma included in the HIV-related stigma scale. Future studies could explore the pathways from different stigma dimensions on HR-QoL to develop targeted interventions.

Despite these limitations, we build on prior work in several ways. Rather than a composite measure of quality of life, we utilized the SF-12 (Degroote et al., 2014) and examined pathways to physical health and mental health separately; this allowed clarification of different mechanisms by which stigma influences each outcome. We have a larger and more racially diverse sample from which to explore pathways between multiple stigma forms and quality of life among WLWH than prior studies (e.g., Alsayed et al., 2017; Logie et al., 2016; Logie et al., 2017). While much research explores HIV-stigma among a particular marginalized group without exploring racial and gender discrimination (Monteiro et al., 2013), we draw on all three constructs.

5. Conclusions

While 90–90-90 (90% diagnosed, 90% initiate ART, 90% virally

suppressed (UNAIDS, 2014)) predominates HIV discourse, others have suggested that a critical fourth component would be that 90% of PLWH who are virally suppressed have good QoL (Lazarus et al., 2016). Interventions could aim to reduce intersectional stigma and poverty, and build social support. Further studies are necessary to understand how poverty limits access to physical health and well-being for WLWH in Canada, where there is universal access to healthcare. A recent systematic review identified social support group participation benefits for WLWH, including reducing HIV stigma (Paudel and Baral, 2015). Our findings suggest the potential of these groups in mitigating the impact of gender discrimination on mental HR-QoL for WLWH. Future research should draw on the robust evidence regarding HIV-stigma reduction strategies (Stangl et al., 2013; Nyblade et al., 2009) combined with effective strategies for reducing racism (Williams and Mohammed, 2013) and sexism (Becker et al., 2014) at institutional, societal, and individual levels in order to promote quality of life among WLWH.

Competing interests

The authors have no competing interests to declare.

Author contributions

CHL conceptualized the manuscript, contributed to study design and analytic methods, and led writing the manuscript. ALD significantly contributed to manuscript writing and conceptualization. YW led data analysis and contributed to manuscript writing; CHL and ALD contributed to data analysis and interpretation. AK, MRL, ADP were principal investigators and designed the study, contributed substantially to data collection, and provided feedback and edits. KW and TC contributed to study design, data collection, and provided feedback and edits. ACW provided feedback and edits. All authors approved the final manuscript version.

Funding statement

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. This work was funded by a Canadian Institutes of Health Research (CIHR) Operating Grant (grant# MOP-111041), the CIHR Canadian HIV Trials Network (CTN 262), the Ontario HIV Treatment Network, and the Academic Health Science Centres (AHSC) Alternative Funding Plans (AFP) Innovation Fund. C. Logie's efforts were also supported by an Ontario Ministry of Research and, Innovation and Science Early Researcher Award.

Transparency document

The Transparency document associated with this article can be found, in online version.

Acknowledgments

The CHIWOS Research Team would like to thank women living with HIV for their contributions to this study. We also thank the national team of co-investigators, collaborators, and Peer Research Associates and acknowledge the national Steering Committee, our three provincial Community Advisory Boards, the National CHIWOS Aboriginal Advisory Board, the BC Centre for Excellence in HIV/AIDS for data support and analysis, and all our partnering organizations for supporting the study. Listed here are all research team members and affiliated institutions; all those not listed by name on the title page are to be hyperlinked as authors:

The CHIWOS Research Team: British Columbia: Aranka Anema (University of British Columbia), Denise Becker (Positive Living Society of British Columbia), Lori Brotto (University of British Columbia), Allison Carter (British Columbia Centre for Excellence in HIV/AIDS and Simon Fraser University), Claudette Cardinal (Simon Fraser University), Guillaume Colley (British Columbia Centre for Excellence in HIV/AIDS), Erin Ding (British Columbia Centre for Excellence), Janice Duddy (Pacific AIDS Network), Nada Gataric (British Columbia Centre for Excellence in HIV/AIDS), Robert S. Hogg (British Columbia Centre for Excellence in HIV/AIDS and Simon Fraser University), Terry Howard (Positive Living Society of British Columbia), Shahab Jabbari (British Columbia Centre for Excellence), Evin Jones (Pacific AIDS Network), Mary Kestler (Oak Tree Clinic, BC Women's Hospital and Health Centre), Andrea Langlois (Pacific AIDS Network), Viviane Lima (British Columbia Centre for Excellence in HIV/AIDS), Elisa Lloyd-Smith (Providence Health Care), Melissa Medjuck (Positive Women's Network), Cari Miller (Simon Fraser University), Deborah Money (Women's Health Research Institute), Valerie Nicholson (Simon Fraser University), Gina Ogilvie (British Columbia Centre for Disease Control), Sophie Patterson (Simon Fraser University), Neora Pick (Oak Tree Clinic, BC Women's Hospital and Health Centre), Eric Roth (University of Victoria), Kate Salters (Simon Fraser University), Margarite Sanchez (ViVA, Positive Living Society of British Columbia), Jacquie Sas (CIHR Canadian HIV Trials Network), Paul Sereda (British Columbia Centre for Excellence in HIV/AIDS), Marcie Summers (Positive Women's Network), Christina Tom (Simon Fraser University, BC), Lu Wang (British Columbia Centre for Excellence), Kath Webster (Simon Fraser University), Wendy Zhang (British Columbia Centre for Excellence in HIV/AIDS). Ontario: Rahma Abdul-Noor (Women's College Research Institute), Jonathan Angel (Ottawa Hospital Research Institute), Fatimatou Barry (Women's College Research Institute), Greta Bauer (University of Western Ontario), Kerrigan Beaver (Women's College Research Institute), Anita Benoit (Women's College Research Institute), Breklyn Bertozzi (Women's College Research Institute), Sheila Borton (Women's College Research Institute), Tammy Bourque (Women's College Research Institute), Jason Brophy (Children's Hospital of Eastern Ontario), Ann Burchell (Ontario HIV Treatment Network), Allison Carlson (Women's College Research Institute), Lynne Cioppa (Women's College Research Institute), Jeffrey Cohen (Windsor Regional Hospital), Tracey Conway (Women's College Research Institute), Curtis Cooper (Ottawa Hospital Research Institute), Jasmine Cotnam (Women's College Research Institute), Janette Cousineau (Women's College Research Institute), Annette Fraleigh (Women's College Research Institute), Brenda Gagnier (Women's College Research Institute), Claudine Gasingirwa (Women's College Research Institute), Saara Greene (McMaster University), Trevor Hart (Ryerson University), Shazia Islam (Women's College Research Institute), Charu Kaushic (McMaster University), Logan Kennedy (Women's College Research Institute), Desiree Kerr (Women's College Research Institute), Maxime Kiboyogo (McGill University Health Centre), Gladys Kwaramba (Women's College Research Institute), Lynne Leonard (University of Ottawa), Johanna Lewis (Women's College Research Institute), Carmen Logie (University of Toronto), Shari Margolese (Women's College Research Institute), Marvelous Muchenje (Women's Health in Women's Hands), Mary (Muthoni) Ndung'u (Women's College Research Institute), Kelly O'Brien (University of Toronto), Charlene Ouellette (Women's College Research Institute), Jeff Powis (Toronto East General Hospital), Corinna Quan (Windsor Regional Hospital), Janet Raboud (Ontario HIV Treatment Network), Anita Rachlis (Sunnybrook Health Science Centre), Edward Ralph (St. Joseph's Health Care), Sean Rourke (Ontario HIV Treatment Network), Sergio Rueda (Centre for Addiction and Mental Health [CAMH]), Roger Sandre (Haven Clinic), Fiona Smaill (McMaster University), Stephanie Smith (Women's College Research Institute), Tsitsi Tigere (Women's College Research Institute), Wangari Tharao (Women's Health in

Women's Hands), Sharon Walmsley (Toronto General Research Institute), Wendy Wobeser (Kingston University), Jessica Yee (Native Youth Sexual Health Network), Mark Yudin (St-Michael's Hospital). Quebec: Dada Mamvula Bakombo (McGill University Health Centre), Jean-Guy Baril (Université de Montréal), Nora Butler Burke (University Concordia), Pierrette Clément (McGill University Health Center), Janice Dayle, (McGill University Health Centre), Danièle Dubuc, (McGill University Health Centre), Mylène Fernet (Université du Québec à Montréal), Danielle Groleau (McGill University), Aurélie Hot (COCQ-SIDA), Marina Klein (McGill University Health Centre), Carrie Martin (Native Women's Shelter of Montreal), Lyne Massie, (Université de Québec à Montréal), Brigitte Ménard, (McGill University Health Centre), Nadia O'Brien (McGill University Health Centre and Université de Montréal), Joanne Otis (Université du Québec à Montréal), Doris Peltier (Canadian Aboriginal AIDS Network), Alie Pierre, (McGill University Health Centre), Karène Proulx-Boucher (McGill University Health Centre), Danielle Rouleau (Centre Hospitalier de l'Université de Montréal), Édénia Savoie (McGill University Health Centre), Cécile Tremblay (Centre Hospitalier de l'Université de Montréal), Benoit Trottier (Clinique l'Actuel), Sylvie Trottier (Centre Hospitalier Universitaire de Québec), Christos Tsoukas (McGill University Health Centre). Other Canadian provinces or international jurisdictions: Jacqueline Gahagan (Dalhousie University), Catherine Hankins (University of Amsterdam), Renee Masching (Canadian Aboriginal AIDS Network), Susanna Ogunnaike-Cooke (Public Health Agency of Canada).
All other CHIWOS Research Team Members who wish to remain anonymous.

References

Abelsohn, K., Benoit, A.C., Conway, T., Cioppa, L., Smith, S., Karamba, G., 2015. “Hear (ing) new voices”: peer reflections from community-based survey development with women living with HIV. Prog. Community Health Partnersh. 9 (4), 561–569.
Alsayed, N.S., Sereika, S.M., Albrecht, S.A., Terry, M.A., Erlen, J.A., 2017. Testing a model of health-related quality of life in women living with HIV infection. Qual. Life Res. 26 (3), 655–663.
An, Zucker, Landry, L.J., 2007. Embodied discrimination: the relation of sexism and distress to women's drinking and smoking behaviors. Sex Roles 56 (3–4), 193–203.
Anderson, W.J., Weatherburn, P., 2004. The needs of people with HIV in the UK: findings from a national survey. Int. J. STD AIDS 15 (12), 793–796.
Andrinopoulous, K., Clum, G., Murphy, D.A., Harper, G., Perez, L., Xu, J., et al., 2011. Health related quality of life and psychosocial correlates among HIV-infected adolescent and young adult women in the US. AIDS Educ. Prev. 23 (4), 367–381.
Baral, S., Logie, C.H., Grosso, A., Wirtz, A.L., Beryer, C., 2011. Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics. BMC Public Health 13, 482.
Bateganya, M.H., Amanyeiwe, U., Roxo, U., Dong, M., 2015. Impact of support groups for people living with HIV on clinical outcomes: a systematic review of the literature. J. Acquir. Immune Defic. Syndr. 68 (Suppl. 3) S368-S364.
Becker, J.C., Zawadzki, M.J., Shields, S.A., 2014. Confronting and reducing sexism: a call for research on intervention. J. Soc. Issues 70 (4), 603–614.
Borrell, C., Artazcoz, L., Gil-Gonzalez, D., Perez, G., Rohlfs, I., Perez, K., 2010. Perceived sexism as a health determinant in Spain. J. Women's Health 19 (4), 741–750.
Bowleg, L., 2008. When Black + Lesbian + Woman ≠ Black Lesbian Woman: the methodological challenges of qualitative and quantitative intersectionality research. Sex Roles 59 (5–6), 312–325.
Bowleg, L., 2012. The problem with the phrase women and minorities: intersectionality-an important theoretical framework for public health. Am. J. Public Health 102 (7), 1267–1273.
Bowleg, L., et al., 2013. “It's an uphill battle everyday”: intersectionality, low-income Black heterosexual men, and implications for HIV prevention research and interventions. Psychol. Men Masculinity 14 (1), 25–34.
Carter, A., et al., 2017. Validating a self-report measure of HIV viral suppression: an analysis of linked questionnaire and clinical data from the Canadian HIV Women's Sexual and Reproductive Health Cohort Study. BMC. Res. Notes 10 (1), 138.
Chakraborty, A.T., McKenzie, K.J., Hajat, S., Stansfeld, S.A., 2010. Racism, mental illness and social support in the UK. Soc. Psychiatry Psychiatr. Epidemiol. 45 (12), 1115–1124.
Crenshaw, K., 1989. Demarginalizing the intersection of race and sex: a Black feminist critique of antidiscrimination doctrine, feminist theory, and antiracist politics. In: University of Chicago Legal Forum.
Degroote, S., Vogelaers, D., Vandijck, D.M., 2014. What determines health-related quality of life among people living with HIV: an updated review of the literature. Arch. Public Health 72 (1), 40.
Dhamoon, R.K., Hankivsky, O., 2011. Why the theory and practice of intersectionality matter to health research and policy. In: Hankivsky, O. (Ed.), Health Inequities in Canada: Intersectional Frameworks and Practices. UBC Press, Vancouver, BC, pp. 16–50.
Douab, T., Marcellin, F., Violotitch, A., Protopopescu, C., Preau, M., Suzan-Monti, M., et al., 2014. Health-related quality of life of people living with HIV followed up in hospitals in France: comparing trends and correlates between 2003 and 2011 (ANRS-VESPA and VESPA2 national surveys). AIDS Care 26 (Suppl. 1), S29–S40.
Gesesew, H.A., Tesfay Gebremedhin, A., Demissie, T.D., Kerie, M.W., Sudhakar, M., Mwanri, L., 2017. Significant association between perceived HIV related stigma and late presentation for HIV/AIDS care in low and middle-income countries: a systematic review and meta-analysis. PLoS One 12 (3), e0173928.
Gjesfjeld, C.D., Greeno, C.G., Kim, K.H., 2007. A confirmatory factor analysis of an abbreviated social support instrument-the MOSS-SSS. Res. Soc. Work. Pract. 18 (3), 31–237.
Gradín, C., del Río, C., Cantó, O., 2010. Gender wage discrimination and poverty in the EU. Fem. Econ. 16 (2), 73.
Gupta, G.R., Parkhurst, J.O., Ogden, J.A., Aggleton, P., Mahal, A., 2008. Structural approaches to HIV prevention. Lancet 372 (9640), 764–775.
Hatzenbuehler, M.L., Phelan, J.C., Link, B.G., 2013. Stigma as a fundamental cause of population health inequalities. Am. J. Public Health 103 (5), 813–821.
Herek, G.M., 2007. Confronting sexual stigma and prejudice: theory and practice. J. Soc. Issues 63 (4), 905–925.
Herek, G.M., Mitnick, L., Burris, S., Chesney, M., Devine, P., Fullilove, R., et al., 1998. Workshop report: AIDS and stigma: a conceptual framework and research agenda. AIDS Public Policy J. 13 (1), 36–47.
Hill Collins, P., 2000. Black Feminist Thought Knowledge, Consciousness, and the Politics of Empowerment. Routledge, New York.
Isa, M.R., Moy, F.M., Razack, A.H., Zainuddin, Z.M., Zainal, N.Z., 2013. Impact of applied progressive deep muscle relaxation training on the health related quality of life among prostate cancer patients—a quasi experimental trial. Prev. Med. 57 (Suppl), S37–S40.
Jia, H., Uphold, C.R., Wu, S., Reid, K., Findley, K., Duncan, P.W., 2004. Health-related quality of life among men with HIV infection: effects of social support, coping, and depression. AIDS Patient Care STDs 18 (10), 594–603.
Krieger, N., 2001. Theories for social epidemiology in the 21st century: an ecosocial perspective. Int. J. Epidemiol. 30 (4), 668–677.
Krieger, N., Rowley, D.L., Herman, A.A., Avery, B., Phillips, M.T., 1993. Racism, sexism, and social class: implications for studies of health, disease, and well-being. Am. J. Prev. Med. 9 (6 Suppl), 82–122.
Larson, C.O., 2002. Use of the SF-12 instrument for measuring the health of homeless persons. Health Serv. Res. 37 (3), 733–750.
Lazarus, J.V., Safreed-Harmon, K., Barton, S.E., Costagliola, D., Dedes, N., Del Amo Valero, J., et al., 2016. Beyond viral suppression of HIV - the new quality of life frontier. BMC Med. 14 (1), 94.
Link, B.G., Phelan, J.C., 2001. Conceptualizing stigma. Annu. Rev. Sociol. 27 (1), 363–385.
Logie, C., Gadalla, T.M., 2009. Meta-analysis of health and demographic correlates of stigma towards people living with HIV. AIDS Care 21 (6), 742–753.
Logie, C.H., James, L., Tharao, W., Loutfy, M.R., 2011. HIV, gender, race, sexual orientation, and sex work: a qualitative study of intersectional stigma experienced by HIV-positive women in Ontario, Canada. PLoS Med. 8 (11), e1001124.
Logie, C.H., James, L., Thaaro, W., Loutfy, M., 2013. Associations between HIV-related stigma, racial discrimination, gender discrimination, and depression among HIV-positive African, Caribbean, and Black Women in Ontario, Canada. AIDS Patient Care STDs 27 (2), 114.
Logie, C.H., Jenkinson, J.I., Earnshaw, V., Tharao, W., Loutfy, M.R., 2016. A structural equation model of HIV-related stigma, racial discrimination, housing insecurity and wellbeing among African and Caribbean Black women living with HIV in Ontario, Canada. PLoS One 11 (9), e0162826.
Logie, C.H., Ahmed, U., Tharao, W., Loutfy, M.R., 2017. A structural equation model of factors contributing to quality of life among African and Caribbean women living with HIV in Ontario, Canada. AIDS Res. Hum. Retrovir. 33 (3), 290–297.
Long, J.S., Freese, J., 2006. Regression Models for Categorical Dependent Variables Using Stata. STATA Press.
Loutfy, M., Tharao, W., Logie, C.H., Aden, M.A., Chambers, L.A., Wu, W., et al., 2015. Systematic review of stigma reducing interventions for African/Black diasporic women. J. Int. AIDS Soc. 18, 19835.
Loutfy, M., Greene, S., Kennedy, V.L., et al., 2016. Establishing the Canadian HIV Women's Sexual and reproductive health cohort study (CHIWOS): operationalizing community-based research in a large national quantitative study. BMC Med. Res. Methodol. 16, 101. http://dx.doi.org/10.1186/s12874-016-0190-7. (PMID: 27543135).
Loutfy, M., de Pokomandy, A., Kennedy, V.L., Carter, A., O'Brien, N., Proulx-Boucher, K., et al., 2017. Cohort profile: the Canadian HIV Women's Sexual and Reproductive Health Cohort Study (CHIWOS). PLoS ONE 12 (9), e0184708.
Mburu, G., et al., 2014. Intersectionality of HIV stigma and masculinity in eastern Uganda: implications for involving men in HIV programmes. BMC Public Health 14, 1061.
McCall, L., 2005. The complexity of intersectionality. Signs 30 (3), 1771–1800.
McClave, A.K., Dube, S.R., Strine, T.W., Mokdad, A.H., 2009. Associations between health-related quality of life and smoking status among a large sample of U.S. adults. Prev. Med. 48 (2), 173–179.
Meyer, I.H., 1995. Minority stress and mental health in gay men. J. Health Soc. Behav. 36 (1), 38–56.
Meyer, I.H., 2003. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. Psychol. Bull. 129 (5),

674–697.
Monteiro, S.S., Villela, W.V., Soares, P.S., 2013. The interaction between axes of inequality in studies on discrimination, stigma and HIV/AIDS: contributions to the recent international literature. Glob. Public Health 8 (5), 519–533.
Mueller, R.O., Hancock, G.R., 2008. Best practices in structural equation modeling. In: Osborne, J. (Ed.), Best Practices in Quantitative Methods, pp. 488–508.
Nyblade, L., Stangl, A., Weiss, E., Ashburn, K., 2009. Combating HIV stigma in health care settings: what works? J. Int. AIDS Soc. 12 (5), 15.
Olowu, D., 2014. Poverty, migration and the incidence of HIV/AIDS among rural women in Lesotho: a rights-based approach to public health strategies. Gend. Behav. 12 (2), 6317–6328.
Omorou, A.Y., Vuillemin, A., Menai, M., Latarche, C., Kesse-Guyot, E., Galan, P., et al., 2016. 10-year cumulative and bidirectional associations of domain-specific physical activity and sedentary behaviour with health-related quality of life in French adults: results from the SU.VI.MAX studies. Prev. Med. 88, 66–72.
Orza, L., Bewley, S., Logie, C.H., Crone, E.T., Moroz, S., Strachan, S., et al., 2015. How does living with HIV impact on women's mental health? Voices from a global survey. J. Int. AIDS Soc. 18 (Suppl. 5), 20289.
Parker, R., Aggleton, P.H.I.V., 2003. AIDS-related stigma and discrimination: a conceptual framework and implications for action. Soc. Sci. Med. 57 (1), 13–24.
Paudel, V., Baral, P.K., 2015. Women living with HIV/AIDS (WLHA), battling stigma, discrimination and denial and the role of support groups as a coping strategy: a review of literature. Reprod. Health 12, 53.
Public Health Agency of Canada, 2015. Summary: Estimates of HIV Incidence, Prevalence, and Proportion Undiagnosed in Canada, 2014.
Riley, E.D., Moore, K., Sorensen, J.L., Tulsky, J.P., Bangsberg, D.R., Neilands, T.B., 2011. Basic subsistence needs and overall health among human immunodeficiency virus-infected homeless and unstably housed women. Am. J. Epidemiol. 174 (5), 515–522.
Riley, E.D., Neilands, T.B., Moore, K., Cohen, J., Bangsberg, D.R., Havlir, D., 2012. Social, structural and behavioral determinants of overall health status in a cohort of homeless and unstably housed HIV-infected men. PLoS One 7 (4), e35207.
Rueda, S., Mitra, S., Chen, S., Gogolishvili, D., Globerman, J., Chambers, L., et al., 2016. Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: a series of meta-analyses. BMJ Open 6 (7), e011453.
Sandelowski, M., Barroso, J., Voils, C.I., 2009. Gender, race/ethnicity, and social class in research reports on stigma in HIV-positive women. Health Care Women Int. 30 (4), 273–288.
Stangl, A.L., Lloyd, J.K., Brady, L.M., Hollan, C.E., Baral, S., 2013. A systematic review of interventions to reduce HIV-related stigma and discrimination from 2002 to 2013: how far have we come? J. Int. AIDS Soc. 16 (3 Suppl 2), 18734.
Stewart, A.L., 1992. Measuring Functioning and Well-being: The Medical Outcomes Study Approach. Duke University Press.
Szymanski, D.M., Stewart, D.N., 2010. Racism and sexism as correlates of African American women's psychological distress. Sex Roles 63 (3–4), 226–238.
Tran, B.X., Ohinmaa, A., Nguyen, L.T., Nguyen, T.A., Nguyen, T.H., 2011. Determinants of health-related quality of life in adults living with HIV in Vietnam. AIDS Care 23 (10), 1236–1245.
UN Women, 2016. Facts and figures: HIV and AIDS. Available from: http://www.unwomen.org/en/what-we-do/hiv-and-aids/facts-and-figures.
UNAIDS, 2014. 90–90–90 - An Ambitious Treatment Target to Help End the AIDS Epidemic.
Vyavaharkar, M., Moneyham, L., Murdaugh, C., Tavakoli, A., 2012. Factors associated with quality of life among rural women with HIV disease. AIDS Behav. 16 (2), 295–303.
Ware, J.E., Kosinski, M., Keller, S.D., 1996. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Med. Care 34 (3), 220–233.
Watkins-Hayes, C., 2014. Intersectionality and the sociology of HIV/AIDS: past, present, and future research directions. Annu. Rev. Sociol. 40 (1), 431–457.
Weiser, S.D., Young, S.L., Cohen, C.R., Kushel, M.B., Tsai, A.C., Tien, P.C., et al., 2011. Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS. Am. J. Clin. Nutr. 94 (6), 1729S–1739S.
Williams, D.R., 1999. Race, socioeconomic status, and health: the added effects of racism and discrimination. Ann. N. Y. Acad. Sci. 896, 173–188.
Williams, D.R., Mohammed, S.A., 2013. Racism and health II: a needed research agenda for effective interventions. Am. Behav. Sci. 57 (8), 1200.
Williams, D.R., Yu, Y., Jackson, J.S., Anderson, N.B., 1997. Racial differences in physical and mental health socio-economic status, stress and discrimination. J. Health Psychol. 2 (3), 335–351.
Wolitski, R.J., Pals, A.L., Kidder, D.P., Courtenay-Quirk, C., Holtgrave, D.R., 2009. The effects of HIV stigma on health, disclosure of HIV status, and risk behavior of homeless and unstably housed persons living with HIV. AIDS Behav. 13 (6), 1222–1232.
Wright, K., Naar-King, S., Lam, P., Templin, T., Frey, M., 2007. Stigma scale revised: reliability and validity of a brief measure of stigma for HIV + youth. J. Adolesc. Health 40 (1), 96–98.