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UNDERSTANDING HIV TRANSMISSION AND ILLNESS STIGMA: A RELATIONSHIP REVISITED IN RURAL RWANDA

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Integrating an understanding of HIV transmission with structural-behavioral prevention approaches remains a priority in low prevalence rural regions in Africa. Many national indicators use categorical survey responses which do not capture the cultural nuances of HIV transmission knowledge that potentially reify stigmatizing treatment of persons living with HIV (PLHIV). We examined the relationship between quantitative and qualitative measures of HIV knowledge and four forms of stigma (individual attitudes, felt normative, social distance, and stigma perceived by PLHIV) among 200 rural residents in Rwanda. Forty-two percent qualitatively reported concurrent accurate and partial knowledge of HIV transmission. Being more knowledgeable about HIV transmission was associated with less desire for social distancing from PLHIV. Our findings highlight the continued importance of reinforcing an accurate understanding of HIV transmission and correcting misinformation by drawing on quantitative and qualitative assessments of HIV knowledge as critical arms of HIV stigma reduction programs in low prevalence rural regions.

On the cusp of renewed optimism to reduce the number persons newly infected with HIV by 2020 (United Nations Programme on HIV/AIDS [UNAIDS], 2016) a combination prevention paradigm that integrates behavioral, structural, and biomedical approaches has gained increased attention and outpaced efforts to primarily address knowledge about HIV prevention and treatment especially in low-income and middle-income countries (LMIC; Parker et al., 2016). This is not surprising given that knowledge about sexual transmission of HIV has improved markedly in urban regions of Africa. However, many national HIV knowledge indicators assessed biomedical knowledge of HIV by using categorical response scales such as yes, no, or don't know to survey items (e.g., "Coughing and sneezing do not spread HIV"),

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which do not permit respondents to reference their own terms to demonstrate what they actually know about HIV transmission (de Bruin & Fischhoff, 2000). Furthermore, this closed question format arguably does not capture the situated knowledge of HIV, which Gould (2016) argued has been "filtered by culture" (p. 275). Early studies that reported high levels of HIV knowledge in Rwanda, for example, also acknowledged the importance of considering how cultural scripts related to gender, bodily fluids, and sexuality shaped the translation of knowledge to perceived susceptibility to HIV infection and perceptions of persons living with HIV (PLHIV; Feldman, Friedman, & Des Jarlais, 1987; Lindan et al., 1991).

This is particularly noteworthy in many low prevalence rural regions where misconceptions of HIV transmission remained problematic especially given findings that erroneous assumptions are associated with heightened stigma towards PLHIV (Chung & Rimal, 2015; Panda, Das, Maruf, & Pahari, 2015), poor antiretroviral treatment (ART) adherence, increased HIV risk behavior (VanLandingham, Grandjean, Supraset, & Sittitrai, 1997) and lowered rates of HIV-antibody testing. In these regions, direct interactions with PLHIV and public discourse about HIV occurred less frequently, which then likely contributed to the propagation of local misinformation about HIV risk, prevention, and treatment. Even in regions with high levels of HIV awareness and literacy, there remained poor knowledge of HIV transmission. In Malawi, for example, 45% and 37% of female and male respondents in a population-based health survey in 2010 endorsed at least one of three misconceptions (e.g., HIV can be spread through witchcraft and other supernatural means; HIV can be spread through mosquito bites; a healthy-looking person cannot be infected with HIV; Sano et al., 2016). This suggested that prevention strategies that focused on the factual biomedical knowledge of HIV may not have sufficiently dispelled false assumptions of HIV transmission that are culturally laced.

The co-occurrence of correct and incorrect beliefs about HIV transmission highlight the importance of reinforcing knowledge of documented modes of transmission and correcting erroneous ones (Boer & Emons, 2004; London & Robles, 2000). A person can, for example, endorse that consistent condom use *and* not sharing meals with PLHIV are protective measures against HIV infection. London and Robles (2000) argued that "as people 'know' more, they are able to fear more; inaccurate beliefs of HIV transmission emerge when new information is introduced . . . and assimilated into existing cultural frameworks for understanding contagion and disease" (p. 1277). In a nationally representative cross-sectional study in Bangladesh, for example, 64% of women who reported ever hearing about HIV responded that using condoms during sex reduced the risk of HIV infection and 56% reported that HIV can be transmitted by sharing food with a person who has AIDS (Yaya, Bishwajit, Danhoundo, Shah, & Ekholuenetale, 2016). Notwithstanding the longevity of the epidemic, this further showed that comprehensive HIV knowledge in the public en masse remains a priority, most notably in low HIV–prevalence rural regions where HIV may not be an integral part of social discourse.

HIV EPIDEMIOLOGY AND PREVENTION EFFORTS IN RWANDA

The estimated HIV prevalence in Rwanda, a densely landlocked country in continental Africa, has been 3% between 2005 and 2010 for adults aged 15 to 40 years old. Kigali, the capital of Rwanda, has the highest prevalence at 7.3% while the

prevalence rate in all other provinces remain below 3% (Rwandan Biomedical Center, 2014). In a nationally representative, prospective study conducted in Rwanda in 2013–2014, HIV incidence was higher in urban (0.65 per 100 persons) than in rural areas (Nsanzimana et al., 2017). Although HIV infection rates declined in Kigali between 1998 and 2003, prevalence rates showed no decline in rural regions where 80% of the national population reside (Kayirangwa, Hanson, Munyakazi, & Kabeja, 2006). The Government of Rwanda initiated the national antiretroviral treatment (ART) program in January 2004 and by 2013 91% of eligible[1] adults and children had received free treatment (Rwandan Biomedical Center, 2014).

In a Rwandan national household survey of 13,564 women and 6,249 men (15–59 years old) conducted in 2014, 89% of women and 92% of men were aware that the risk of contracting HIV can be reduce by limiting sex to one uninfected partner who had no other partners (National Institute of Statistics of Rwanda [NISR] & Ministry of Health [MH], Rwanda, 2015). Some Rwandan adults held common misconceptions about HIV transmission as evidenced by 22% of women and 23% of men endorsing that the AIDS virus can be transmitted by mosquito bites and by sharing food with someone with AIDS. Residents in urban areas had higher levels of comprehensive knowledge[2] about HIV (77% for men and 76% for women) than those in rural areas (67% for men and 65% for women). To assess for attitudes towards PLHIV, respondents were also asked about their willingness to buy fresh vegetables from an HIV-infected shopkeeper, to let others know of an infected family member, and to take care of relatives who had AIDS in their own household. They were also asked whether an HIV-positive female teacher who was not sick should be allowed to continue teaching. More men and women living in urban areas (69% and 49%, respectively) expressed accepting attitudes on all four indicators compared to rural men and women (62% and 51%, respectively).

HIV KNOWLEDGE AND STIGMA

Despite ART scale-up in sub-Saharan African countries, the anticipation of being stigmatized based on one's HIV serostatus, regardless of whether a stigmatizing event actually occurred, has increased in the general population (Chan & Tsai, 2016). Chan and colleagues posited that biomedical innovations may be limited in challenging negative biases towards PLHIV, and might in fact heighten stigma if one perceived treatment advances as granting license for PLHIV to engage in more frequent HIV risk behaviors that are deemed socially unacceptable.

Knowledge about HIV transmission potentially reifies or challenges stigmatizing attitudes towards PLHIV by tapping into fears of casual HIV infection. Based on their analysis of population census data between 2005 and 2011, for example, Girma et al. (2014) found that being more knowledgeable about HIV transmission and prevention measures was associated with less stigmatizing attitudes towards

1. National guidelines recommended ART for individuals who met the following criteria: (1) WHO HIV stage 4, (2) WHO HIV stage 3 with a CD4 cell count < 350, or (3) WHO stage 1 or 2 with a CD4 cell count of < 200 cells.

2. Comprehensive knowledge about AIDS was indicated by knowledge that both condom use and limiting sex partners to one uninfected person are HIV and AIDS prevention methods, they are aware that a healthy-looking person can have HIV, and they reject the two most common local misconceptions, HIV transmission by mosquito bite and by sharing food.

PLHIV in rural Ethiopia. Similar findings in Namibia (Chung & Rimal, 2015) and Black townships in South Africa (Govender, Bowen, Edwards, & Cattell, 2016; Kalichman & Simbayi, 2004) highlighted the importance of reinforcing an understanding of HIV transmission that will challenge fears of interacting with PLHIV. Such fears coupled with negative regard for PLHIV accounted for public reluctance to consume food products sold by PLHIV in Pretoria, South Africa (Chao, Szrek, Leite, Ramlagan, & Peltzer, 2017).

Maintaining social and physical distances from PLHIV (conscious or unconscious) have also been associated with poor knowledge of HIV-related risk factors (Shapiro, 2005). Unfounded fears of infection and narrowly confining HIV susceptibility to groups that illicit moral disgust (Leiker, Taub, & Gast, 1995) dampen desires and motivation to meaningfully engage PLHIV (Herek & Capitanio, 1999). Pryor, Reeder, Teadon, and Hesson-McInnis (2004) proposed that decisions to interact with PLHIV can be influenced by an automatic (impulsive) and controlled (deliberative) process. Deciding whether or not to purchase produce from a vendor who is HIV-positive, for example, can be a spontaneous reaction based on fears of having contact with anything touched by PLHIV and a deliberate one of challenging the misconception of casual HIV transmission—both can be shaped and reinforced in part by one's knowledge of HIV transmission (Pryor et al, 2004).

HIV stigma is not limited to overt individual mistreatment of PLHIV but extends to perceptions of HIV stigmatizing attitudes in the community and the extent to which these attitudes are considered normative (Steward et al., 2008). Goffman (1963) argued that "*society* establishes the means of categorizing persons" (p. 2) and definition of in- and out-group membership. Perceptions of shared beliefs about PLHIV in the broader social arena therefore matter. When PLHIV internalize these scripts of social devaluation, for example, they are more inclined to exhibit poor self-regard and isolation, even in the absence of overt discrimination (Campbell & Deacon, 2006). Despite how expectations of public regard towards PLHIV can potentially normalize behavior and attitudes that stigmatize PLHIV (Martin, Lang, & Olafsdottir, 2008), few studies have examined how this is shaped by personal knowledge of HIV transmission.

This study extends prior work on the relationship between HIV knowledge and various dimensions of stigma towards PLHIV, including personal attitudes towards PLHIV, perceptions of how the community-at-large would treat PLHIV (felt normative stigma), and willingness to personally interact with PLHIV. We will examine how quantitative and qualitative measures of knowledge influence HIV stigma dimensions among a convenience sample of 200 residents in two rural districts in Rwanda who participated in a conflict-transformation intervention for survivors and perpetrators of the 1994 genocide against the Tutsi. Our findings carry implications for integrating HIV education with programs designed to reduce HIV stigma in low prevalence rural African regions.

METHODS

PARTICIPANTS

Two hundred survivors and perpetrators of the 1994 genocide against the Tutsi living in two districts (Kamonyi & Ruhango) in the southern province of Rwanda were interviewed between July 2015 and September 2015. Participants were members of local support groups which were established as part of a larger conflict trans-

formation program (*Cows for Peace*) for survivors and perpetrators of the 1994 genocide. This program was conceived and implemented by a Rwandan faith-based community organization in Kigali. The inclusion criteria for participation were (a) adults older than 18 years old, (b) spoking Kinyarwanda, and (c) being directly exposed to genocide events in 1994. Written informed consent was obtained before the interview. This study was reviewed and approved by the institutional review board at the primary author's research institution.

PROCEDURE

Individual interviews were conducted in a designated meeting area in the village. Study participants did not receive any monetary incentive. Two Rwandan interviewers (genocide survivors) were trained to administer a 45- to 60-minute individual survey in Kinyarwanda at private meeting areas in each village. Interviewers entered the participants' responses on an electronic tablet with a mobile data collection application (http://home.magpi.com). Published instruments used in HIV prevention studies conducted in low-income and middle-income countries were translated from English to Kinyarwanda and back-translated to English by a second independent translator. Participants were informed before the interview that they would be asked questions about HIV and their feelings towards PLHIV, and that they could forgo answering any questions or discontinue the interview if they were uncomfortable. They were further assured that declining to participate would not by any means jeopardize the services they received from the organization.

MEASURES

HIV Stigma. HIV stigma was measured with the following instruments that assessed individual and community attitudes towards PLHIV:

1. Individual attitudes towards PLHV were measured by a 22-item questionnaire that assessed different dimensions of stigma that included: negative attitude and blame towards PLHIV, perceived risk of HIV infection due to casual contact, endorsement of restrictive legislation for PLHIV, enacted discrimination against PLHIV and their families (Genberg et al., 2008). Higher scores on a 4-point Likert scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree) indicated endorsement of stigmatizing views. This instrument was field tested in Zimbabwe and Thailand and yielded item to total correlations ranging from 0.30 to 0.60. In our study Cronbach's alpha was .68.
2. Felt Normative Stigma (Steward et al., 2008) was a 10-item measure of participants' estimation of how many people in their community would discriminate against PLHIV (e.g., In your community, how many people would not share dishes or glasses with someone who has HIV?). Participants reported on a 4-point Likert scale ranging from 1 (No One) to 4 (Most People) with higher scores indicating higher perceptions of community-wide held stigma towards PHIV. Cronbach's alpha was .89.
3. Social distance was measured by three items from the Rwanda Demographic and Health Survey (RDHS; National Institute of Statistics of Rwanda, Ministry of Health, Rwanda, & ICF International, 2015), a national survey administered by the Rwandan Ministry of Health to monitor the progress of national healthcare programs and policies. The RDHS item selection was based on Chan and

Tsai's (2017) analysis of the Demographic and Health Surveys (DHS) and AIDS Indicator Surveys (AIS) to examine HIV-related stigma in 26 African countries between 2003 and 2008. Participants indicated if they would interact with PLHIV in different contexts by responding yes (scored 1), no (scored 0), or don't know (scored 0). Items included: If a member of your family became sick with AIDS, would you be willing to care for her or him in your own household?; Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?; and If a female teacher has the AIDS virus but is not sick, should she be allowed to continue teaching in the school? Higher scores indicate more willingness to interact with PLHIV (less social distance). Since there was insufficient reason to believe that responses measured a single underlying construct, calculations of inter-item reliability were not appropriate.

4. Stigma perceived by PLHIV (Berger, Ferrans, & Lashley, 2001) was measured by a 40-item survey. Participants who self-reported testing HIV seropositive indicated their level of agreement with statements regarding personalized stigma, disclosure concerns, negative self-image, and concerns about public attitudes about PLHIV. Higher scores on a 4-point Likert scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree) indicated report of perceived stigma. In our study Cronbach's alpha was .96.

HIV Disclosure. Participants indicated if they had ever been tested for HIV, when their most recent test was, and the result. Those who were HIV-positive indicated whether they had personally disclosed their HIV-positive serostatus to the following targets: spouses (partner), parents, siblings, extended relatives, grandparents, friends, and support group members (Simoni et al., 1995). For those who were HIV-negative or had never been tested for HIV, they indicated to whom they would disclose their HIV status if they tested HIV seropositive.

HIV Knowledge. Knowledge of HIV transmission and prevention was measured with 11 questions from the Rwanda Demographic and Health Survey (RDHS, 2010) to which participants responded yes, no, or don't know. One-point was assigned to each correct response and don't know responses were scored 0. In our study, Cronbach's alpha was .68. In order to prevent participants from extracting cues from the structured quantitative questions, participants were first asked an open-ended question, "how does a person get the AIDS virus?" Verbatim responses were handwritten by the interviewers who were trained to probe for detailed elaboration (e.g., if respondents stated that HIV can be transmitted through sex, they were asked to elaborate how).

DATA ANALYSIS

In order to investigate any potential differences in mean response by HIV status, *t* tests were computed for both groups on all variables. The correlations between HIV transmission knowledge and all measures of stigma were computed, along with 95% confidence intervals. Additionally, for those subjects who were HIV-negative, the correlation between HIV transmission knowledge and HIV disclosure was computed. In order to characterize effects, HIV knowledge was regressed on any predictors with significant correlations.

TABLE 1. HIV Transmission Knowledge and Stigma Among Rural Residents in Rwanda Who Received an HIV-Antibody Test (n = 176)

Measure	HIV-negative n = 162	HIV-positive n = 14
HIV Knowledge[a]	8.42 (1.63)	8.21 (1.52)
HIV Stigma and Discrimination[b]	33.91 (8.47)	39.00 (10.43)
Felt Normative Stigma[c]	18.12 (8.35)	20.21 (8.36)
Social Distance[d]	3.04 (.503)	3.14 (.535)
Perceived Stigma by PLHIV[e]	—	92.62 (31.74)

Note. Standard deviations are given in parentheses. [a]Range = 0–11 with higher scores indicating higher knowledge; [b]Range = 22–88 with higher scores indicating higher stigmatizing views towards PLHIV; [c]Range = 10–40 with higher scores indicating higher estimation of how many people in one's community would discriminate against PLHIV; [d]Range = 0–4 with higher scores indicating more willingness to interact with PLHIV (less social distance); [e]Range = 40–160 with higher scores indicating higher perceived stigma by PLHIV.

Qualitative written responses to the open-ended question, "how does a person get the AIDS virus?" were translated from Kinyarwanda to English and coded independently by two raters—the first author and a second rater who was blind to the study hypothesis. Responses were coded 1 (Yes) if responses reflected inaccurate or partial knowledge of HIV transmission and 0 (No) otherwise. An example of partial knowledge was "AIDS is transmitted through sexual intercourse when one is HIV positive and mostly if in the process some injuries have occurred." Note that a single response can reflect both accurate and partial knowledge of HIV transmission.

RESULTS

PARTICIPANT CHARACTERISTICS

Two hundred Rwandans from Kamonyi (84%) and Ruhungo (16%) consented to participate in this study, of whom 63% (n = 125) were female and married (64%, n = 127). The mean age was 51 years old (range = 26–85 years old). Sixty percent completed at least a secondary school education (n = 121). Ninety-nine percent had heard of AIDS, and 88% (n = 176) received HIV testing at least once in their lifetime, of whom 7% (n = 14) self-reported testing HIV seropositive (10 were female and 4 male). Responses from 24 participants who never received an HIV-antibody test were excluded from the analysis.

HIV KNOWLEDGE, STIGMA, AND DISCLOSURE

There were no significant differences in HIV transmission knowledge and HIV stigma scales between HIV seropositive and negative participants (see Table 1). Nor were there differences between male and female participants. Twenty-eight percent of all participants either did not know or incorrectly responded that the risk of HIV infection cannot be reduce by having just one uninfected sex partner; 32% similarly did not know or incorrectly responded that HIV can be transmitted from mosquito bites. Only 48% accurately reported the risk of maternal to infant transmission during pregnancy (see Table 2).

Seventy-eight percent of HIV-negative participants indicated that they would disclose their HIV serostatus to their spouses if they tested HIV-positive; 67% to their children; 55% to their cell group members; 44% to neighbors; 32% to relatives; 19% to parents; 21% to sisters; and 11% to brothers. Among HIV-seroposi-

TABLE 2. Beliefs About HIV Transmission and Treatment Among Residents in Rural Rwanda (n = 176)

Belief	% "Yes"	% "No"	% "DK"
Can people reduce their chances of getting the AIDS virus by having just one uninfected sex partner who has no other sex partners?	72.5	17.5	10.0
Can people get the AIDS virus from mosquito bites?	15.0	68.0	17.0
Can people reduce their chance of getting the AIDS virus by using a condom every time they have sex?	53.5	38.5	8.0
Can people get the AIDS virus by sharing food with a person who has AIDS?	13.0	80.5	6.5
Can people get the AIDS virus because of witchcraft or other supernatural means?	3.0	90.5	6.5
Is it possible for a healthy-looking person to have the AIDS virus?	94.5	3.5	2.0
Can men reduce their chance of getting the AIDS virus by getting circumcised?	65.0	19.0	16.0
Can the virus that causes AIDS be transmitted from a mother to her baby:			
During pregnancy?	48.0	45.5	6.5
During delivery?	87.5	9.5	3.0
By breastfeeding?	81.0	12.0	7.0
Are there any special drugs that a doctor or a nurse can give to a woman infected with the AIDS virus to reduce the risk of transmission to the baby?	86.0	2.0	12.0

tive participants (n = 14), 93% have disclosed their serostatus to someone, mostly to spouses (71%). The majority of participants (86%–100%) were willing to interact with PLHIV in different community settings (see Table 3). The only form of stigma that showed evidence of correlation with HIV knowledge was social distance (95% CI for p is 0.19, 0.46; see Table 4). For HIV-negative subjects, there was evidence of a low positive correlation between higher HIV knowledge and the number of persons a participant would disclose their HIV status to if infected (95% CI for p is 0.026, 0.32). When HIV knowledge was regressed on both social distance and disclosure only social distance was a significant predictor, Coef = 1.3, p value ~ 0, R^2 = 0.13, $F(2, 173) = 12.42$.

QUALITATIVE

Forty-two percent (n = 84) of participants reported concurrent accurate and partial understanding of HIV transmission modes when asked "How does a person get the AIDS virus?" They correctly identified routes of sexual transmission and endorsed prevailing myths of HIV transmission, as evident in the following response:

> Through unprotected sexual intercourse with an HIV-positive partner, through drug injection using the same needle that has been used to HIV-positive person. Sharing food with an HIV-positive person while he/she has wounds on his/her lips before 30 minutes you can be infected. And if someone deliver a baby at home while she is HIV positive, by the help of midwife, the latter can be infected because of not having appropriate materials.

Other examples of mixed HIV knowledge included: "Having sex without condoms can transmit AIDS, or by sharing a meal with an HIV positive person while having wounds in your mouth, because in most of the case they have wounds in their mouths"; "When you have sex with an infected person you get infected too. AIDS virus is transmitted through clothes. If a woman shares her underwear with an infected woman she can get infected"; "Another way is by washing the underwear of an infected person when you have a wound."

TABLE 3. Social Distance With PWHA Among Residents in Rural Rwanda (n = 176)

Belief	% "Yes"	% "No"	% "DK"
Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?	96.5	3.5	0.0
If a member of your family became sick with AIDS, would you be willing to care for her or him in your household?	99.5	0.5	0.0
In your opinion, if a female teacher has the AIDS virus but is not sick, should she be allowed to continue teaching in the school?	86.0	9.5%	4.5

Participants also reported partially correct responses that described documented routes of transmission but they narrowly focused on an aspect of risk. Their responses were incomplete rather than entirely erroneous. Several participants, for example, described how razors transmitted HIV without specifying how the virus can be transmitted by the exchange of blood (e.g., AIDS is transmitted through being cut by razors and metals that can cause injures.) Another example was attributing HIV infection to sexuality, sleeping around, or sexual intercourse without elaborating on the risk of not using condoms with an HIV-positive sexual partner. Although some participants correctly explained the risk of HIV transmission during unprotected sexual intercourse with an infected partner, they further elaborated that the risk was primarily due to the potential exchange blood incurred from injury rather than through exchange of semen or vaginal fluids. For example, some participants explained that "AIDS is transmitted through sexual intercourse when one is HIV positive and mostly if in the process some injuries have occurred"; "Through sexual intercourse, because blood get mixed with an HIV positive person, if it happens that you get wounded and your blood come to contact with blood of an HIV positive person you can get AIDS."

In addition to attributing HIV infection to biomedically documented and misinformed routes of transmission, a few participants (< 1%) paired sexual transmission of HIV with what they deemed as immoral decisions and behavior. Rather than identifying the behavior per se that placed a person at risk for HIV infection (i.e., sexual intercourse with an infected partner without a condom), few participants implicitly condemned the underlying motivation to engage in that high-risk sexual activity: "When you do not have good discipline. Like how not having discipline can be a channel to get HIV. Like indulging yourself in sexual activities." Some participants attributed HIV infection specifically to "sins that people do like adultery" when asked to elaborate their understanding of sexually transmitted HIV (e.g., "AIDS virus is transmitted through sexual intercourse. How? When a person commits adultery, and have sex with an infected person then he gets infected too"), or "a man can transmit HIV by having sex with another man."

DISCUSSION

In addition to contributing towards the United Nations (UN) goal of reducing new infections below 500,000 by 2030, the reinforcement of HIV transmission and treatment knowledge also addresses the UN goal of eliminating HIV-based stigma and discrimination (UNAIDS, 2014). The relationship between HIV knowledge and stigma was supported by our quantitative findings among rural residents in Rwanda. Specifically, being more knowledgeable about HIV transmission was associated with

TABLE 4. Correlations Between HIV Knowledge, Attitudes Towards PLHIV, Felt Normative Stigma, and Social Distance (n = 176)

Measure	HIV Knowledge	Attitudes Towards PLHIV	Felt Normative Stigma	Social Distance
HIV Knowledge	1.00	0.02	–0.08	0.33*
Attitudes Towards PLHIV	0.02	1.00	0.50	–0.28
Felt Normative Stigma	–0.08	0.50	1.00	–0.43
Social Distance	0.33	–0.28	–0.43	1.00

*$p < .00$.

less desire for social distancing from PLHIV, that is, a greater willingness to personally engage and interact with PLHIV in the community. Similarly, a study of 26 African countries between 2003 and 2008 found that more informed knowledge about HIV transmission encouraged more frequent interaction with PLHIV which in turn challenged socially engrained fears of casual HIV transmission (Chan & Tsai, 2017). Although our findings cannot conclusively determine the causal links between higher HIV knowledge, decreased social distancing, and lowered public regard of PLHIV, they grant further merit to the argument that consistent and meaningful interpersonal contact with PLHIV, "supported by the institution within which it occurs" (p. 2, Herek & Capitanio, 1999, p. 2), may challenge prejudice and exclusionary practices towards PLHIV. Accordingly, this lends support to integrating HIV-transmission understanding with HIV stigma reduction interventions in efforts to challenge unfounded fears of personally interacting with PLHIV. It also suggests the importance of considering the extent to which HIV knowledge measures (i.e., quantitative and qualitative) fully capture how communities culturally and linguistically frame HIV prevention and treatment information and how this in turn potentially affects the propagation or reduction of HIV stigma.

This is noteworthy because a cursory understanding of HIV transmission routes, which is often measured with categorical response scales (yes, no, or don't know), might not sufficiently capture how some communities weave in local understanding of HIV risk behaviors. This was evidenced by participants in this study who concurrently reported documented and undocumented modes of HIV transmission (e.g., HIV was sexually transmitted primarily through the exchange of blood). Forty-two percent of respondents reported accurate *and* partially accurate routes of HIV transmission. Consistent with previous studies, our findings suggested a co-occurrence of correct and incorrect understanding of HIV transmission (Boer & Emons, 2004; London & Robles, 2000) that have been found to perpetuate fear of public contagion and heighten the need for self-protection (Chen, Choe, Chen, & Zhang, 2007). Such avoidance or minimizing one's interaction with PLHIV due to inaccurate or incomplete understanding of HIV transmission could further reify stigmatizing attitudes towards PLHIV (Chan & Tsai, 2017; Dilger, 2008).

This is particularly important in low prevalence rural areas where HIV/AIDS is not commonly referenced. Addressing social exclusionary practices which heighten isolation among PLHIV is likely more urgent in rural regions with low HIV prevalence than in urban areas where there are more resources and PLHIV can remain relatively anonymous if they so choose (Kalichman, Katner, Banas, & Kalichman, 2017). Moreover, in a small geographically landlocked country such as Rwanda with a strong communal social structure, maintaining one's HIV serostatus a secret presents unique challenges for PLHIV. Ninety-three percent of PLHIV in our study, for example, had disclosed their HIV serostatus, and 55% of HIV-negative partici-

pants would disclose their serostatus to nonfamily members in their cell groups if they were HIV seropositive.[3]

It was notable that in our study understanding HIV transmission routes was not associated with beliefs or perceptions of how PLHIV should be treated broadly in society. This was potentially accounted for by national public health initiatives in Rwanda that have effectively sustained awareness of HIV prevention and treatment over the decade. In 2014, for example, 89% of women and 92% of men were aware that the risk of contracting HIV can be reduced by limiting sex to one uninfected partner who had no other partners (NISR & MH, 2015). Another explanation that warrants further examination is how post-conflict social dynamics potentially bear on in- and out-group separation—whether the groups are survivors or perpetrators of the 1994 genocide against the Tutsi or PLHIV. In this context, local co-existence necessitated challenging "social cleavages that rendered the genocide possible in the first place" which included any form of exclusionary ideology towards a group such as PLHIV (Buckley-Zistel, 2006, p. 131). Although this question was beyond the scope of our study, others may consider the extent to which the threat of in- and out-group division may curtail acts of stigmatization and subordination towards PLHIV in post-conflict regions such as Rwanda. Fewer respondents attributed HIV transmission to immoral values such as adultery and fornication. This finding was unexpected given the prevalence of beliefs that HIV was spread *primarily* by immoral ideologies and *secondarily* by behaviors that place a person at risk for HIV infection in African countries (Dilger, 2008; Mantell, Correale, Adams-Skinner, & Stein, 2011; Smith, 2003, 2004). Although reassuring, this finding warrants further examination.

LIMITATIONS

Several limitations of this study are noteworthy when interpreting the findings. First, the convenience sample of survivors and perpetrators of the 1994 genocide against the Tutsi who participated in a conflict transformation program may not be representative of the general population residing in rural Rwanda. Moreover, the extent to which PLHIV might be perceived as victims of rape during the genocide and therefore less publically marginalized may render our findings on HIV stigma less generalizable to other nonconflict African contexts (Donovan, 2002). Second, although interviewers were trained, they may not have sufficiently probed participants' responses to open-ended questions about HIV transmission—particularly those who are less motivated or less verbally expressive. However, it is notable that 69% of those who referenced sex as a mode of transmission in the qualitative segment of the interview further elaborated how HIV can be transmitted by an infected partner.

Notwithstanding these limitations, our findings offer several directions for further studies. First, mixed qualitative and quantitative methods should be adopted to provide a more nuanced socio-culturally grounded understanding of HIV transmission and treatment knowledge and how it relates with specific dimensions of stigma. This convergence of quantitative and qualitative information will be more informative in identifying misconceptions and partial understanding of HIV transmission and treatment. This will be instrumental to tailoring prevention and stigma

3. Cell groups are led and organized by survivors of the 1994 genocide and their direct perpetrators, and is part of a larger conflict transformation program.

reduction program particularly in low HIV prevalence regions. Our study also highlights the need for ethnographic studies that explore the "range and types of norms and attitudes (from stigmatizing to affirming)" towards PLHIV (Bluthenthal et al., 2012). Responses to quantitative scaled questions may not adequately capture the nuances of misinformed understanding of HIV transmission and stigmatizing attitudes towards PLHIV. Correctly identifying sexual contact with an HIV-positive partner without a condom as an HIV risk behavior on a closed-ended survey item may not, for example, capture the underlying belief that injury during sex is the primary source of infection. Overall, our findings highlight the continued importance of reinforcing an accurate understanding of HIV transmission and correcting misinformation about transmission as critical programmatic arms of HIV stigma reduction interventions. In addition, prevention programs should identify and address sociocultural scripts that reinforce misinformation about HIV transmission by drawing on quantitative and qualitative assessments of HIV knowledge.

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