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HIV stigma beliefs in context: Country and regional variation in the effects of instrumental stigma beliefs on protective sexual behaviors in Latin America, the Caribbean, and Southern Africa

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ABSTRACT

Does the relationship between the expression of HIV stigma beliefs and the practice of protective sexual behaviors vary by social context? To answer this question, we apply multilevel techniques to Demographic and Health Survey data from seven low HIV prevalence Latin American and Caribbean countries and seven high HIV prevalence Southern African countries to examine contextual variation in this relationship. We examine whether the relationship between stigma beliefs and sexual behaviors differs across these two sets of countries and across regions within each set of countries. We first find that in high prevalence Southern African countries, one unit increases in HIV stigma beliefs are associated with 8% declines in the odds of practicing protective sexual behaviors. Conversely, in low prevalence Latin American and Caribbean countries, unit increases in HIV stigma beliefs are associated with 8% increases in the odds of those same sexual behaviors. Second, the relationship between stigma beliefs and protective sexual behaviors varies across regions within each set of countries, with a wider variance in regional stigma effects located in Southern Africa than in Latin America and the Caribbean. Third, in Southern Africa, the negative effect of stigma beliefs is even more negative in regions where conservative stigma beliefs are pronounced. Overall, our findings demonstrate the importance of taking country and regional context into account when examining the degree to which HIV beliefs affect personal sexual behaviors, which in turn, can contribute to the spread of HIV. Importantly, the implications of our results offer potential guidance to experts who wish to design policies and programs aimed at reducing the expression of negative HIV beliefs towards those infected with HIV.

1. Introduction

Although medical advances have increased life expectancy for people who are HIV positive, HIV prevalence remains high in several countries, especially in Southern Africa. One of the main consequences of having HIV is living with the social stigma attached to the disease. We define social stigma as an ideology which suggests that people with HIV are different from others in "normal" society and that this difference goes beyond merely being infected with the disease (Deacon 2005; 2006; Joffe 1999; Link and Phelan 2001). Stigmatized individuals often face discrimination and isolation, leading to and exacerbating poor health outcomes. Consequently, they are less likely to practice several protective sexual behaviors (PSBs) such as condom use and sexual fidelity, which slow the spread of HIV (Clum, Chung, and Ellen 2009; Hatzenbuehler et al., 2011). This literature provides valuable insight into the health and behavioral consequences of *being stigmatized* (Dlamini et al., 2009; Greeff and Phetlhu 2007; Herek and Capitanio 1997; Holzemer et al., 2007; Mahajan et al., 2008; Malcolm et al., 1998).

While these findings are clear, we know surprisingly little about how being a *stigmatizer* – or holding stigmatizing beliefs toward those infected with HIV – affects the PSBs of those doing the stigmatizing in sub-Saharan Africa and elsewhere. Except for the one study described below, no work has systematically examined the relationship between expressing stigmatizing beliefs and PSBs. The studies that do exist treat

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stigma beliefs as a control variable, not a variable of conceptual importance (Gazimbi and Magadi 2017; Magadi and Desta 2011; Stephenson 2009). Focusing on stigmatizers is important because although stigma is associated with harmful health practices, it is unclear whether participating in stigmatizing ideologies is also associated with unhealthy sex practices.

To address this gap in the literature, Cort and Tu (2018) use Demographic and Health Surveys (DHS) to examine the relationship between HIV stigma beliefs and PSBs among unpartnered individuals across 34 sub-Saharan African countries. They find that across these 34 countries, unpartnered stigmatizers are less likely to practice safer PSBs than riskier ones. This negative relationship is most pronounced in Southern and Eastern African countries, where HIV prevalence is highest, implying that social context can alter the strength of important biomedical and social relationships.

In this paper, we extend that work in two ways. First, we determine whether the finding of contextual differences in the relationship between stigma beliefs and PSBs is confined to Africa or can be more broadly applied to regions *outside of* the continent. If we find broader applicability of that contextual finding, this will provide more support for Cort and Tu's (2018) results. Indeed, they argue that in African countries where HIV prevalence is low, people have less exposure to the social consequences of HIV than those in high-prevalence countries, making weak or positive relationships unsurprising. We choose Latin American and Caribbean (LA&C) countries as our comparison, where HIV prevalence remains low (García and Cárcamo 2014). However, LA&C still contains several countries (like Haiti, the Bahamas, and Guyana) where the epidemic is still an epidemiological concern for several vulnerable demographic groups, like men who have sex with men. Moreover, they are, for the most part, culturally conservative countries, a characteristic shared by many sub-Saharan African countries.

Importantly, even though we choose LA&C countries as a comparison to Southern African countries, we understand that there are characteristics of these groups of countries – beyond the their differing levels of HIV prevalence – that could explain any differences in the pattern of the relationship between stigma beliefs and PSBs. We are not arguing that HIV prevalence is the *only* characteristic that explains differences the relationship between stigma beliefs and PSBs. We are using LA&C countries as a comparison to Southern African countries to provide a starting point for discussion concerning the extent to which differences in the relationship pertain only to sub-Saharan African, or if they can be more broadly generalized outside that continent. As such, we intend to treat our results as speculative, providing a foundation for future research.

Second, we determine whether the relationship between stigma beliefs and PSBs varies across regions or provinces *within* countries, and the extent of this variation. We do so because groups of countries that are similar in terms of overall HIV prevalence and other unmeasured factors likely contain internal variation in HIV prevalence, which may affect how stigma determines behavior. We aim to develop theoretically grounded hypotheses about the contextual effects of stigma beliefs. This is an important innovation because although there is a literature on the contextual effects of various factors on PSBs (see Ward-Peterson et al., 2018), much of it, with just a few notable exceptions (Benefo 1995; 2006; 2008; Burgard and Lee-Rife 2009; Gazimbi and Magadi 2017), does not use sociological theories to construct hypotheses about the contextual effects of critical independent variables.

To theoretically support our analyses, we engage recent work that argues that *both* HIV positive and negative individuals participate in stigmatizing discourses toward people who are infected with HIV (Cort and Tu 2018; Deacon 2005; 2006; Joffe 1999). We then develop competing hypotheses about the effects of HIV stigma beliefs on PSBs (Cort and Tu 2018). Empirically, we use DHS data from seven Southern African countries (Lesotho, Malawi, Mozambique, Namibia, Swaziland, Zambia, and Zimbabwe) and seven LA&C countries (Bolivia, Columbia, Dominican Republic, Guatemala, Guyana, Haiti, and Honduras), and multilevel analyses to test all of our hypotheses.

2. Background and theory

2.1. Background

Over the past two decades, scholars have informed our understanding of the social and epidemiological consequences of experiencing HIV stigma beliefs and broadened our knowledge about the relationship between stigma beliefs and PSBs (Burkholder et al., 1999; Clum, Chung, and Ellen 2009; Greeff and Phetlhu 2007; Herek and Capitanio 1997; Holzemer et al., 2007; Mahajan et al., 2008; Malcolm et al., 1998; Preston et al., 2007). Yet, this literature lacks a systematic focus on the effects of holding stigmatizing beliefs. In one notable exception, Cort and Tu (2018) examine the relationship between HIV stigma beliefs and PSBs among unpartnered individuals across sub-Saharan Africa. Their findings suggest that increases in stigmatizing beliefs are associated with decreases in the likelihood of practicing safe sexual behaviors.

Cort and Tu (2018) also find that this negative relationship is most pronounced in Southern and Eastern African countries, where HIV prevalence is highest. Outside of Southern and Eastern Africa – where HIV prevalence is relatively low – the relationship is either non-existent or positive. This suggests that although people's attitudes about HIV-infected individuals can negatively affect their sexual behaviors, that pattern may not be uniform across all geographic spaces in sub-Saharan Africa. Differences in HIV prevalence can alter the nature and strength of this relationship between individuals' stigma beliefs and their sexual behaviors. However, if the geographic context can indeed alter the nature and strength of such an important biomedical relationship, then the pattern should also be apparent if comparisons are made in high and low-prevalence social contexts *outside of Africa* and in geographic contexts that are *smaller than* countries. We examine this possibility in the pages that follow.

2.2. Theorizing the relationship between stigma beliefs & PSBs

With the exception of Cort and Tu (2018), the sociology and public health literatures have failed to theorize the relationship between stigma beliefs and PSBs. Following Cort & Tu's preliminary theorizing, we suggest that the social psychological concepts of splitting and projection may explain how HIV-positive *and* negative individuals stigmatize and how the effects of these stigmatizing beliefs could be either negative or positive with regard to PSBs (Crawford 1994; Joffe 1999). Through splitting, people place themselves into ingroups and those they perceive as different into outgroups. Once this occurs, ingroup members project the risk of infection from themselves onto outgroups by linking the presence of HIV to behaviors they define as negative (e.g. homosexuality and promiscuity). Consequently, HIV positive or negative stigmatizers use stigma as an emotional response to the perceived threat of HIV. These boundary-making actions help ingroup members feel safer. Consequently, we argue that *anyone* in the population, regardless of disease status, can express stigmatizing beliefs and participate in boundary-making social processes (Deacon 2006; Joffe 1999).

In response to the dearth of theoretical work in this area, we offer Cort & Tu's competing theoretical possibilities about the direction of the relationship between HIV stigma beliefs and PSBs. The first, the *Avoidance Response*, asserts that the more people stigmatize, the *more likely* they are to practice PSBs. This could occur because when people associate negatively defined behaviors (such as unsafe sex) with HIV infection, they will distance themselves from people who practice these negative behaviors, leading to more vigilant safe sex practices.

The second possibility is that stigmatizers gain a type of psychological payoff when they stigmatize, the *Safety Response*. They experience some psychological and social protection from placing themselves into an ingroup and HIV positive people into an outgroup. This misplaced

feeling of safety from membership in the ingroup and the process of boundary making that makes such membership possible may lead people to be less vigilant about their private sexual practices. This reasoning implies that the more people stigmatize, the *less likely* they are to practice PSBs.

3. Hypotheses

3.1. Contextual variation across countries

The Avoidance and Safety Response Hypotheses imply that relationships between stigma beliefs and PSBs are *uniformly* negative or positive. However, the direction of this relationship may depend on the social context in which it occurs. After all, context matters for various biomedical and social outcomes (Barber 2004; Pescosolido et al., 2008; Ruiter and De Graaf 2006; Yang et al., 2007).

Since we argue that social contexts matter, we expect that the relationship between stigma beliefs and PSBs are *partially* due to differences in HIV prevalence and will therefore vary between Southern African and LA&C countries. On the one hand, when people stigmatize, they experience a misplaced feeling of safety from membership in the uninfected ingroup and are less vigilant about their own sexual practices. We follow Cort & Tu's reasoning and hypothesize that this relationship will be most pronounced in countries with more exposure to HIV and its social consequences. We use this reasoning to propose the following hypothesis:

H1a. High individual HIV stigma beliefs will be associated with low likelihoods of practicing PSBs in Southern African Countries, where HIV prevalence is high.

On the other hand, it is possible that stigmatizers associate negatively defined behaviors with HIV infection, reason that HIV is primarily transmitted through those behaviors, and are therefore more vigilant about their sex practices. We hypothesize that this pattern will be more pronounced in countries where HIV prevalence is low or in countries where there is less exposure to the HIV epidemic's social consequences. Using this logic, we propose the following hypothesis:

H1b. High individual HIV stigma beliefs will be associated with high likelihoods of practicing PSBs in LA&C countries, where HIV prevalence is low.

3.2. Contextual Variation across Regions

While Hypotheses 1a and 1b replicate and extend Cort & Tu's analyses to countries outside of the African context, we also wish to determine whether the relationship between stigma beliefs and PSBs varies across smaller geographic contexts within Southern Africa and Latin America and the Caribbean. Indeed, there is evidence that social contexts affect attitudes, belief formation, and behaviors across small geographies such as provinces or regions within countries (Benefo 2008; Burgard and Lee-Rife 2009). As such, we propose the following hypothesis:

H2. The relationship between individual HIV stigma beliefs and PSBs will vary across regions within Southern African and LA&C countries.

3.3. Explaining regional variation

One explanation for regional variation in the effects of stigma beliefs may involve ambient levels of stigma in their home regions. Residence within high and low-prevalence countries and in regions where stigmatization is either high or low can produce differing expectations for the relationship between stigma beliefs and PSBs. We present and explain those differing expectations in Table 1 below.

When individuals live in high-prevalence countries *and* in regions where the overall level of stigmatization is high, the effects of stigma beliefs on PSBs would be similar to the Safety Response detected across high-prevalence countries. When ingroup/outgroup distinctions are pronounced, or when overall levels of regional stigmatization are high, these distinctions provide social distance and an added feeling of safety, leading individuals to refrain from taking strict precautions to protect themselves from sexually transmitted diseases. Using this reasoning, we propose the following hypothesis:

Table 1
Hypothesized differential effects of stigma beliefs.

Regional levels of Stigma Beliefs	High Prevalence Countries Southern Africa	Low Prevalence Countries Latin America/ Caribbean
Regions with high levels of stigmatizing beliefs	Safety Response	Neutral Effect
Regions with low levels of stigmatizing beliefs	Neutral Effect	Avoidance Response

H3a. In Southern African countries, high individual HIV stigma beliefs will be associated with low likelihoods of PSBs in regions where residents' average stigmatizing beliefs are high.

Alternatively, when ingroup/outgroup distinctions are not pronounced, or when overall levels of regional stigmatization are low, the effects of stigma beliefs on PSBs would be similar to what we expect to find across low-prevalence countries. People would be more likely to believe that people become infected with HIV when they do not practice safe sex and distance themselves from infected people. We, therefore, hypothesize a relationship between stigma beliefs and PSBs that is similar to the Avoidance Response detected across low-prevalence countries:

H3b. In LA&C countries, high individual HIV stigma beliefs will be associated with high likelihoods of PSBs in regions where residents' average stigmatizing beliefs are low.

These hypotheses presume that the relationship between stigma beliefs and PSBs occurs in social contexts that are similar. Hypotheses 3a occurs in contexts where country-level prevalence and regional-level stigmatization are high, while Hypothesis 3b occurs when country-level prevalence and regional-level stigmatization are both low. However, what happens to the relationship between stigma and PSBs if regional and national contexts differ? We reason that such differences may cancel each other out and produce null or neutral effects:

H4a. In Southern African countries, the relationship between individual HIV stigma beliefs and PSBs will be non-significant in regions where residents' average stigmatizing beliefs are low.

H4b. In LA&C countries, the relationship between individual HIV stigma beliefs and PSBs will be non-significant in regions where residents' average stigmatizing beliefs are high.

4. Data and methods

4.1. Data

Our data come from the Demographic and Health Surveys (DHS), nationally representative repeated cross-sectional household surveys designed to document demographic and health indicators in developing countries. The DHS collects data every few years for most countries, but some countries are only collected once. These data include two important components for our study. First, they contain measures of HIV stigma and PSBs. Second, for some countries, they have the region or state of residence for each sampled individual. Given our interest in the relationship between HIV stigma and PSBs in different contexts, we use the available data from seven countries in LA&C and seven countries in Southern Africa that have been collected at least once since 2003 and include HIV test results. Although data for South Africa is now available,

it does not contain measures of stigma beliefs. We restrict our sample to post-2003 because that is the first year the DHS collected data on stigma beliefs. Information containing country sample sizes and corresponding data collection years can be obtained from authors upon request.

To draw our analytic LA&C sample, we begin with 285,366 respondents interviewed with the DHS between 2003 and 2016 across seven countries. We remove 154,888 respondents who indicated they were either married or cohabiting, which left us with 130,478 non-partnered respondents. We focus only on unpartnered respondents because of the possibility that the meaning of condom use varies by partnership status. In the Southern Africa sample, we begin with 271,445 respondents, discarding 157,469 who are partnered, leaving us with 113,976 non-partnered respondents.

The dependent variable (PSBs) is a five-category ordinal measure. We construct this variable using information from questions the DHS asks respondents about their past sexual history. These questions help us identify four kinds of PSBs: (1) virginity, or whether respondents have ever had sexual intercourse, (2) whether respondents were abstinent in the past 12 months if non-virgins, (3) condom use with the last and second-to-last sexual partner if non-abstinent, (4) and the practice of sexual fidelity if non-abstinent. We combine these four types of PSBs into a five-category ordinal variable that essentially measures the risk of HIV infection or the degree to which a particular combination of sexual behaviors is protective from HIV infection. Higher values on this variable denote *decreasing* risk of HIV infection or, sexual behaviors that are *increasingly* protective in nature:

1. Very High Risk of Infection: Non-Abstinent – Don't use condom and not practicing sexual fidelity
2a. High Risk of Infection: Non-Abstinent – Don't use condom and practicing sexual fidelity
2b. High Risk of Infection: Non-Abstinent – Used condom and not practicing sexual fidelity
3. Moderate Risk of Infection: Non-Abstinent – Used condom and practicing sexual fidelity
4. Low Risk of Infection: Has sexual experience but abstinent in last 12 months
5. Very Low Risk of Infection: Having no sexual experiences

Our independent variable of interest is instrumental stigma, a dimension of HIV stigma beliefs characterized by the misplaced fear of infection through everyday contact with people who are HIV positive. We use instrumental stigma rather than other forms of stigma because this is the only stigma dimension captured in the DHS data. The process for constructing the independent variable differs slightly across our two samples. For both stigma indexes, we start with four questions that measure respondents' fear of infection from everyday contact with people infected with HIV. Each question is dichotomous and asks: 1) if the respondent would be willing to care for a family member who had AIDS in their home, 2) if a teacher diagnosed with HIV, but not sick, should be allowed to continue teaching, 3) whether the respondent would purchase fresh vegetables from a vendor who has the HIV virus, and 4) whether a family should keep secret an AIDS infection of a family member. After, coding items so that high numbers represent more stigmatizing responses, we use exploratory factor analysis in both samples to determine if these items loaded on one or more constructs of stigma.

In the LA&C sample, factor analyses indicate that underlying items 1–3 (listed above) measure the same construct with a corresponding Cronbach's Alpha of .60. Additional tests for reliability suggest that these three items provide similar levels of reliability for each country. Consequently, we use items 1–3 for the LA&C stigma index. In the Southern Africa sample, questions 1–3 again measure the same underlying construct. However, additional tests for reliability suggest that different combinations of these three questions (i.e. 1&2, 2&3, or 1&3) provided varying levels of reliability for each of the seven African countries. For the Southern Africa sample, we therefore use country-specific combinations of underlying items to produce the instrumental stigma index.

In addition to our main independent variable of interest, we also include three kinds of individual-level controls: demographic factors, socioeconomic resources, and knowledge of HIV transmission. Demographic controls for both samples include sex, age (range: 15–64), number of children (range: 0–27), partnership status (never married vs. separated and widowed or divorced), and religion (Christians vs. all other religions). We only include religion as a control for Southern Africa because although this information is available in all those countries, it is not available in Bolivia and Colombia. We therefore omit it as a control from LA&C countries. Sensitivity analyses that drop those two countries while including this control do not change any of our results. We include two controls for socioeconomic resources: 1) an indicator measuring whether respondents' wealth is in the lowest wealth quintile; 2) years of completed education (range: 0–25). Lastly, we control for respondents' knowledge of HIV transmission using individual knowledge items including: 1) Can you reduce chances of AIDS by having one uninfected sex partner who has no other partners?; 2) Can you reduce chances of AIDS by always using condoms during sex?; 3) Can you reduce risk of AIDS by not having sex at all. In addition to these three groups of controls, we also include a control for year of survey in all our models, but refrain from showing the effects of this control in multivariate tables. While it is possible that HIV serostatus can affect sexual behavior, we do not include this as a control for Southern African countries because our underlying conceptual argument is that background factors affect sexual behavior, which in turn affects one's infection status.

We include four regional-level controls. The first, HIV prevalence, is only available for Southern African countries. These data come from the printed reports for each country included with each release of the DHS. For all other countries, we include three controls that we calculate from individual-level data: (1) the average level of instrumental stigma for respondents from each region, (2) the average years of education for all respondents from each region, and (3) the percentage of persons within a region who fall in the bottom income quartile relative to their country.

4.2. Methods

Given that we hypothesize individual and cross-level interaction effects using an ordinal dependent variable, we use a series of multilevel ordered logistic regression models to estimate likelihoods of PSBs (Raudenbush and Bryk 2002; Snijders and Bosker 1999). We distinguish two levels of analysis for each country. Level 1 is the lowest level and consists of 130,478 respondents in LA&C countries and 113,976 respondents in Southern African countries. Level 2 consists of 94 regions within LA&C countries and 60 regions within Southern African countries. Other scholars have utilized a three-level model in which individuals are clustered in regions, which are then clustered in counties (Magadi and Desta 2011) or survey year (Duncan, Jones, and Moon 1996; Frye and Bachan 2017; Ruiter and De Graaf 2006). Sensitivity analyses suggest that a simpler specification produced very similar results to three-level specifications. We, therefore, decide to use the two-level model, but include survey year as a control.

We estimate these multilevel ordered logistic regressions separately for the LA&C and for the Southern African sample. For the sake of space, we do not present the full equations here; these can be obtained from the authors upon request. For each set of countries, we estimate five models that contain only main effects. Specifically, we model the odds of practicing PSBs as a function of a random intercept (model 1), stigma beliefs (model 2), all individual-level covariates (model 3), and all individual- and regional-level covariates (model 4). In model 5, we allow the effect of instrumental stigma to vary across regions.

To determine whether the relationship between individual-level instrumental stigma and PSBs depends on regional-level instrumental

stigma, we estimate cross-level interactions between individual-level stigma and regional-level stigma. We control for HIV prevalence (in the Southern African sample) to rule out the possibility that differences in the effects of stigma are due to high HIV prevalence in some regions. We cannot, however, rule out this possibility in the LA&C sample. Finally, when estimating our models, we grand mean centre all continuous variables and utilize full maximum likelihood techniques.

5. Results

5.1. Descriptive findings

In Tables 2 and 3, we present weighted means and percentages for all variables used in our models by country group. Since a major focus of our study is contextual effects of HIV stigma beliefs, we examine the mean of instrumental stigma for both groups of countries and contrast that measure with HIV prevalence rate. Analyses show that when LA&C countries are compared to those in Southern Africa, instrumental stigma rates are *higher* in LA&C countries, where HIV rates are the *lowest*.

5.2. Multivariate findings: main effects

While this preliminary result is important, our main concern is contextual effects in the relationship between instrumental stigma and PSBs. Tables 4 and 5 show the results of several multilevel models, with no interactions, for each set of countries. In Model 1, we begin with null models that contain no covariates. We use these models to establish whether the odds of PSBs vary across regions. We ascertain this initial random variation using variance components. Any statistically significant variance component provides evidence that the distribution of PSBs varies across regions in both sets of countries. In addition, the variance partition components (or VPC) measure the proportion of residual variation in the propensity to use PSBs that is attributable to unobserved regional characteristics.

In Model 2, we use instrumental stigma as an initial baseline covariate (along with the year of survey, which we do not present in the table). Contrasting results surface from Models 2 and 3 - in Tables 4 and 5 - which collectively suggest that geographical context alters the nature of the relationship between stigma beliefs and PSBs. In Table 4, results for LA&C countries suggest that this relationship is positive. Increases in stigma beliefs are associated with increases in the likelihood of practicing PSBs. This finding persists even when individual-level controls (Model 3) and contextual controls (Model 4) are included. For example, for every index unit increase (i.e., from 0 to 0.10) in instrumental stigma beliefs, the odds of practicing PSBs in LA&C countries increase by about 8%.

Results from Southern African countries – displayed in Table 5 – suggest that increases in instrumental stigma are negatively related to PSBs. Although the baseline effect of instrumental stigma is positive, the sign of the coefficient reverses in Models 2–4. We find in those models that the relationship between stigma beliefs and PSBs is statistically significant and negative. For every index unit increase in instrumental stigma beliefs, the odds of practicing PSBs in Southern African decrease by about 8% (1–0.92).

In Model 5 of both Tables, we allow the effect of instrumental stigma to vary across regions. In both sets of countries, this produces main effects of stigma that are statistically insignificant, tempting us to conclude that there is no regional variation of the stigma effect. However, statistically significant random effects of stigma beliefs – shown at the bottom of Tables 4 and 5 – and additional analyses discussed below establish that there is indeed wide regional variation in both sets of countries. The results suggest that the negative and positive effects of stigma vary across regions in magnitude *and* direction. We come to this conclusion by estimating Model 5 and then producing a separate dataset containing the region-specific log odds and odds ratios that estimate the effects of stigma on PSBs. We then create upper and lower bounds for these effects. We identify the ten most negative and positive stigma effects (i.e. log odds and odds ratios) for each group of countries and place them in Table 6.

Across LA&C countries, the 94 region-specific stigma odds ratios vary between 0.79 and 1.38, while they vary between 0.51 and 2.03 across the 60 regions in Southern African countries. Results displayed in

Table 2
Weighted descriptive statistics. DHS 2003–2016: [a]Latin American & Caribbean countries.

Variables	All Countries	Bolivia	Colombia	Dominican Republic	Guatemala	Guyana	Haiti	Honduras
Dependent Variable[b]								
Very High HIV Risk	2.65	5.68	3.24	2.69	.78	.61	2.59	1.43
High HIV Risk	29.87	26.93	37.09	33.89	16.60	22.70	26.12	23.64
Moderate HIV Risk	17.00	6.01	20.37	20.43	9.99	22.67	17.90	10.58
Low HIV Risk	16.63	17.96	12.56	14.33	20.22	18.97	20.15	23.57
Very Low HIV Risk	33.85	43.42	26.74	28.66	52.41	35.05	33.24	40.78
Level 1 Variables								
Instrumental Stigma	.33	.32	.28	.35	.37	.24	.44	.27
Males	.44	.42	.48	.54	.31	.45	.41	.23
Age	24.95	23.55	25.73	25.90	23.76	25.18	23.21	25.00
Number of Children	.89	.55	.60	1.59	.62	.70	.54	.90
Never Married	.74	.83	.75	.64	.81	.78	.84	.68
Poor	.14	.06	.15	.18	.11	.14	.13	.12
Years of Education	9.04	10.82	9.91	9.27	7.93	10.16	6.84	8.39
Have One Sex Partner	1.77	1.61	1.70	1.79	1.77	1.80	1.87	1.83
Always Use Condoms	1.71	1.66	1.73	1.77	1.57	1.78	1.75	1.59
Refrain from Sex	1.42	1.45	1,49	1.47	1.01	1.72	1.27	1.61
Level 2 Variables[c]								
Instrumental Stigma	.35	.32	.32	.35	.38	.23	.45	.31
Percent Poor	.20	.07	.23	.26	.12	.16	.16	.18
Average Years of Education	8.68	10.87	9.35	8.77	7.89	10.28	6.50	8.08
Country HIV Prevalence[d]	.98	.38	.40	1.39	.50	1.32	2.25	.50
Sample Sizes	130,478	10,300	35,954	34,527	14,308	5497	18,442	11,450

Notes:
[a] Level 1 (Individuals, $N_1 = 130{,}478$); Level 2 (Regions, $N_2 = 94$).
[b] Categories represent protective sexual behaviors, which carry decreasing risk of contracting HIV.
[c] Average across regions within countries.
[d] Not included as control in multivariate models.

Table 3
Weighted descriptive statistics. DHS 2003–2016[a]: southern African countries.

Variables	All Countries	Lesotho	Malawi	Mozambique	Namibia	Swaziland	Zambia	Zimbabwe
Dependent Variable[b]								
Very High HIV Risk	1.89	3.80	.88	4.96	.45	.98	2.25	.51
High HIV Risk	23.68	24.68	21.67	39.69	22.26	22.44	24.84	14.58
Moderate HIV Risk	18.06	23.17	13.53	14.18	38.88	23.29	15.07	16.09
Low HIV Risk	22.07	19.10	27.38	20.13	17.45	16.51	24.55	20.33
Very Low HIV Risk	34.29	29.25	36.55	21.04	20.95	36.78	33.28	48.49
Level 1 Variables								
Instrumental Stigma	.25	.29	.28	.23	.09	.16	.18	.28
Males	.40	.35	.27	.29	.33	.50	.51	.51
Age	23.78	24.72	23.00	25.24	26.12	23.26	22.95	23.03
Number of Children	.98	.80	1.21	1.56	1.10	.91	.86	.64
Never Married	.75	.77	.69	.61	.91	.89	.80	.77
Christians	.79	.93	.78	.60	.64	.87	.86	.86
Poor	.14	.12	.19	.14	.14	.15	.13	.13
Years of Education	7.53	7.49	6.51	4.73	8.95	8.11	8.10	9.12
Have One Sex Partner	1.74	1.75	1.67	1.56	1.86	1.85	1.84	1.77
Always Use Condoms	1.61	1.73	1.45	1.51	1.79	1.80	1.63	1.64
Refrain from Sex	1.38	1.43	.132	1.23	1.59	1.89	1.73	1.24
Level 2 Variables[c]								
Instrumental Stigma	.23	.28	.27	.24	.10	.15	.17	.27
Percent Poor	.16	.14	.18	.18	.16	.14	.13	.15
Average Years of Education	7.08	7.49	6.51	4.73	8.95	8.11	8.10	9.13
HIV Prevalence	15.28	22.71	10.18	15.70	13.66	18.68	12.08	16.23
Country HIV Prevalence[d]	15.40	23.54	10.64	13.57	14.10	27.70	12.73	15.92
Sample Sizes	113,976	15,103	26,802	15,358	9035	5793	19,010	22,875

Notes:
[a] . Level 1 (Individuals, $N_1 = 113{,}976$); Level 2 (Regions, $N_2 = 60$).
[b] . Categories represent protective sexual behaviors, which carry decreasing risk of contracting HIV.
[c] . Average across regions within countries.
[d] . Not included as control in multivariate models.

Table 4
Multilevel ordered logistic regression models of protective sexual behaviors: Latin American & Caribbean countries.[a]

Independent Variables	Model 1		Model 2		Model 3		Model 4		Model 5[b]	
	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.
Level 1 Variables										
Instrumental Stigma			1.28**	1.24, 1.32	1.08**	1.03, 1.13	1.08**	1.04, 1.12	1.02	.96, 1.08
Demographic Controls										
Age					.97**	.97, .98	.97**	.97, .98	.97**	.97, .98
Sex (1 = males)					.34**	.33, .34	.33**	.33, .34	.33**	.33, .34
Number of Children					.91**	.90, .92	.91**	.90, .92	.91**	.90, .92
Never Married					3.51**	3.38, 3.63	3.51**	3.40, 3.63	3.51**	3.40, 3.63
Socioeconomic Status										
Poor (1 = Yes)					.99	.96, 1.02	.99	.96, 1.02	.99	.96, 1.02
Years of Education					.92**	.92, .93	.92**	.92, .93	.92**	.92, .93
Knowledge of HIV Transmission Methods										
Have One Sex Partner					.99	.98, 1.02	.99	.98, 1.02	.99	.98, 1.02
Always Use Condoms					.86**	.85, .88	.86**	.85, .88	.86**	.85, .88
Refrain from Sex					1.04**	1.02, 1.06	1.04**	1.02, 1.06	1.04**	1.02, 1.06
Level 2 Variables										
Instrumental Stigma							.60	.16, 2.28	.63	.16, 2.41
Percentage Poor							.88	.54, 1.39	.87	.55, 1.40
Average Education							.98	.92, 1.05	.99	.92, 1.01
Random Effects	V.C.[c]	V.P.C[d]	V.C.	V.P.C	V.C.	V.P.C	V.C.	V.P.C	V.C.	V.P.C
Intercept	.15**	.04	.16**	.05	.11**	.03	.10**	.03	.11**	.03
Instrumental Stigma Slope									.03**	.01

*p < .05; **p < .01.
Notes
[a] Level 1 (Individuals, $N_1 = 130{,}478$); Level 2 (Regions, $N_2 = 94$).
[b] Instrumental stigma allowed to vary across regions.
[c] Variance component.
[d] Variance partition component.

Table 6 show significant regional variation in stigma effects, even within single countries that have either high or low HIV prevalence. For example, two regions in high-prevalence Namibia simultaneously have *the* most negative and positive effects of stigma beliefs in Southern Africa. For every one unit increase in stigma beliefs, the odds of practicing PSBs decrease by 49% (1–0.51) in Kunene province. Conversely, the odds of practicing PSBs increase by 103% in Omsati province. Similarly, the effects of stigma beliefs are 0.80 in the Aire Metropolitaine

Table 5
Multilevel ordered logistic regression models of protective sexual behaviors: Southern African countries.[a]

Independent Variables	Model 1		Model 2		Model 3		Model 4		Model 5[b]	
	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.
Level 1 Variables										
Instrumental Stigma			1.10**	1.06, 1.14	.93**	.89, .96	.96*	.92, .98	1.03	.94, 1.14
Demographic Controls										
Age					.97**	.97, .98	.97**	.97, .98	.97**	.97, .98
Sex (1 = males)					.52**	.51, .54	.52**	.51, .53	.52**	.51, .53
Number of Children					.97**	.96, .97	.97**	.96, .98	.97**	.96, .98
Never Married					2.66**	2.56, 2.76	2.67**	2.58, 2.77	2.67**	2.57, 2.77
Christian					1.09**	1.07, 1.12	1.09**	1.06, 1.12	1.08**	1.05, 1.12
Socioeconomic Status										
Poor (1 = Yes)					.93**	.90, .96	.93**	.90, .96	.93**	.90, .96
Years of Education					.95**	.95, .96	.95**	.95, .96	.95**	.95, .96
Knowledge of HIV Transmission Methods										
Have One Sex Partner					.91**	.90, .93	.91**	.90, .93	.92**	.90, .93
Always Use Condoms					.86**	.84, .87	..85**	.84, .87	.86**	.84, .87
Refrain from Sex					1.09**	1.07, 1.11	1.09**	1.06, 1.11	1.08**	1.06, 1.11
Level 2 Variables										
HIV Prevalence							1.04**	1.03, 1.05	1.04**	1.03, 1.05
Instrumental Stigma							10.81**	1.84, 63.56	14.85**	2.25, 97.93
Percentage Poor							1.49	.45, 5.00	1.46	.45, 4.79
Average Education							1.22**	1.13, 1.32	1.24**	1.15, 1.35
Random Effects	V.C.[c]	V.P.C[d]	V.C.	V.P.C	V.C.	V.P.C	V.C.	V.P.C	V.C.	V.P.C
Intercept	.30**	.08	.30**	.08	.37**	.10	.30**	.08	.29**	.08
Instrumental Stigma									.10**	.03

*p < .05; **p < .01.
Notes:
[a] Level 1 (Individuals, $N_1 = 113{,}976$); Level 2 (Regions, $N_2 = 60$).
[b] Instrumental stigma allowed to vary across regions.
[c] Variance component.
[d] Variance partition component.

Table 6
Extreme regional effects of stigma beliefs.

Region Order	Latin American Countries				Southern African Countries			
	Log Odds	Odds Ratio	Country	Region	Log Odds	Odds Ratio	Country	Region
Negative Effects								
1	-.23	.79	Honduras	Francisco Morazan	-.67	.51	Namibia	Kunene
2	-.22	.80	Haiti	Aire Metro.	-.56	.57	Zambia	Southern
3	-.19	.82	Bolivia	Beni	-.35	.70	Zimbabwe	Harare
4	-.17	.84	Dominican Republic	Valverde	-.35	.71	Lesotho	Mahale's Hoek
5	-.16	.85	Dominican Republic	La Romana	-.32	.72	Lesotho	Quthing
6	-.15	.86	Dominican Republic	Santo Domingo	-.31	.73	Zambia	North Western
7	-.14	.87	Guatemala	Noroccidente	-.29	.75	Malawi	Northern
8	-.14	.87	Dominican Republic	San Cristobal	-.26	.77	Malawi	Southern
9	-.13	.88	Guatemala	Suroriente	-.25	.78	Zambia	Copperbelt
10	-.11	.89	Honduras	Santa Barbara	-.22	.80	Lesotho	Qasha's Nek
Positive Effects								
1	.32	1.38	Guyana	Demerara/Mahaica	.71	2.03	Namibia	Omusati
2	.31	1.37	Colombia	Central	.69	1.99	Mozambique	Tete
3	.31	1.37	Colombia	Atlantica	.56	1.75	Mozambique	Manica
4	.27	1.31	Bolivia	La Paz	.46	1.58	Namibia	Oshana
5	.23	1.26	Haiti	Centre	.41	1.50	Zambia	Lusaka
6	.22	1.25	Colombia	Orinoquia/Amazonia	.40	1.50	Mozambique	Sofala
7	.21	1.23	Colombia	Pacifica	.36	1.44	Mozambique	Cabo Delgado
8	.19	1.21	Colombia	Bogata	.35	1.42	Mozambique	Gaza
9	.19	1.21	Haiti	Norde-Est	.33	1.39	Namibia	Oshikoto
10	.19	1.21	Guyana	East Berbice/Courentyne	.29	1.33	Namibia	Otjozondjupa

region of Haiti, while they are 1.26 in Haiti's Centre region.

5.3. Multivariate findings: cross-level interactions

The previous results suggest that context matters. The main effect of instrumental stigma beliefs depends on the country-group social context in which it occurs. However, we argue above that since HIV prevalence is either very high or low in each group of countries, prevalence is essentially held constant. Therefore, prevalence is less of an explanation for regional variation in the relationship between stigma beliefs and PSBs. An alternative explanation for regional variation may be the amount of overall stigma to which individuals are exposed within their region of residence, even while residing in high or low-prevalence countries. We test this explanation by allowing the varying effect of stigma to depend on the average level of instrumental stigma within regions, separately by country context. We present those results in Table 7.

Our results once more expose strong contextual effects of

Table 7
Non-Additive multilevel ordered logistic regression models of protective sexual behaviors.[a]

Independent Variables	Latin American Countries		Southern African Countries	
	Odds Ratio	C.I.	Odds Ratio	C.I.
Level 1 Variables				
Instrumental Stigma	1.02	.97, 1.08	1.03	.94, 1.12
Level 2 Variables				
Instrumental Stigma	.64	.17, 2,40	10.41**	1.78, 60.99
Interaction Terms				
Stigma X Stigma	.65	.32, 1.33	.26*	.08, .77

*p < .05; **p < .01.
Notes:
[a] Models contain all level 1 and level 2 control variables.

instrumental stigma. We first hypothesized that the effects of stigma would be negative for people who reside in Southern African countries *and* in regions where levels of stigmatization are high. Second, we proposed that the effects of stigma would be positive for individuals who live in LA&C countries *and* regions where levels of stigmatization are low. Coefficients in Table 7 show that the effect of instrumental stigma is negative and statistically significant (i.e. 0.27 = 1.03 × 0.26) for individuals who reside in Southern Africa and in regions where overall levels of stigmatization are high. Conversely, the conditional effect of stigma for Latin Americans and Caribbeans who live in low-stigmatizing regions is positive (i.e. 1.02), but statistically insignificant.

Finally, we examine the possibility that individual-level stigma effects will be non-significant in contexts where country-group prevalence is high and regional stigma low, or where country-group prevalence is low and regional stigma high. We find support for both possibilities in Table 7. The effects of stigma for people who reside in LA&C countries within high stigmatizing regions is 0.66 (i.e. 1.02 × 0.65) and statistically insignificant. Similarly, the stigma effect for Southern Africans who reside in low stigmatizing regions is 1.96 and statistically insignificant.

6. Discussion, limitations, and conclusions

6.1. Discussion

We find that instrumental stigma rates are *higher* in LA&C countries, where HIV rates are the *lowest*, compared to those in Southern Africa. This preliminary finding suggests that Latin Americans and Caribbeans who, compared to Southern Africans, have had less experience interacting with HIV positive people, and dealing with the HIV epidemic may be less understanding of those who live with the disease. While this country-region finding regarding instrumental stigma levels is important, we are much more interested in the contextual effects of the relationship between stigma and PSBs between and within both LA&C and Southern African countries.

Overall, we uncover evidence that social context matters when examining the effects of instrumental stigma beliefs on PSBs. First, we find that the effects of stigma depend on the country context in which individuals reside. Stigma effects are negative in high-prevalence country contexts and positive in low-prevalence country contexts (see Models 2 and 3 in Tables 4 and 5). For the LA&C countries, the relationship between stigma and PSBs is positive, providing strong support for the Avoidance Hypothesis, or Hypothesis 1B (See Table 4). Results from Southern African countries, on the other hand, suggest that increases in instrumental stigma are negatively related to PSBs. In other words, we find strong support for the Safety Response Hypothesis, or Hypothesis 1A, in the Southern African context (see Table 5). When we use a more localized measure of context, our results also suggest that the effects of stigma vary across regions within countries and depend on the level of stigmatization individuals experience within those regions, supporting Hypothesis 2 (see Table 6).

The previous analyses are motivated by a paucity of scholarship examining the relationship between the expression of HIV stigma beliefs and the practice of PSBs in developing countries. While we know much about how experiencing stigma can lead to negative health outcomes, we know little about the behavioral consequences of expressing HIV stigma beliefs. Recent work by Cort and Tu (2018) serves as a notable exception. They find that unpartnered stigmatizers in sub-Saharan Africa are less likely to practice safer PSBs than riskier ones. More importantly, this negative relationship is most pronounced in Southern and Eastern African countries, where HIV prevalence is highest. In low-prevalence western and central Africa, the relationship is either non-existent or positive.

In this paper, we extend Cort and Tu's (2018) past work in three ways. First, we determine whether a positive or non-existent relationship between stigma beliefs and PSBs could be observed in low-prevalence social contexts *outside of* Africa. We argue that if the pattern of this relationship indeed depends on whether it occurs in a high or low-prevalence social context, then differences in the pattern should not be confined to high or low-prevalence social contexts within the African continent. Using data from LA&C and Southern Africa, we find that in seven Southern African countries (where HIV prevalence is high), individuals' odds of practicing PSBs declined by about 8% for each one-unit unit index increase in instrumental stigma beliefs. Meanwhile, in seven LA&C countries (where HIV prevalence is low), individuals' odds of practicing PSBs increase by the same magnitude (8%) for one-unit increases in instrumental stigma beliefs.

This result suggests that Cort & Tu's past findings are robust and not confined to sub-Saharan Africa. Even in a low-prevalence social context outside of sub-Saharan Africa, we still observe a similar pattern. More importantly, even when we employ a very broad definition of geographic or social context (such as groups of countries), we show that social context matters. Indeed, it has the power to alter the nature of biomedical relationships.

The second way in which we extend the literature is by determining whether the relationship between stigma beliefs and PSBs varies across regions within countries or social contexts that are smaller than groups of countries. We uncover strong evidence of regional variation. Even within groups of countries with similar HIV prevalence levels, the relationship between stigma beliefs and PSBs varies widely. For example, in Southern African countries, regional stigma effects vary between an odds ratio of .51 (a negative effect) to 2.03 (a positive effect). This result follows a large literature which suggests that contextual variation in certain biomedical and social relationships can occur in social contexts that are very large (like groups of countries and countries) and relatively small (like regions within countries). We provide evidence that this literature on contextual variation applies to the previously understudied relationship between people's beliefs about those with HIV and their private sexual behaviors. Importantly, we find that Southern African countries contain a larger variance of stigma effects than LA&C countries. Our best guess at an explanation of this finding is the higher variance in stigma effects within Southern African countries could be related to the fact that HIV is a much more salient problem in those countries.

Moreover, there are certain regions of countries where the disease has had a much more dramatic impact than in others. For example, although South Africa is not in our data, we are aware that in this high-prevalence country, the Western Cape region has much lower HIV prevalence than the Eastern Cape region. As such, we would expect that the effects of stigma beliefs would vary widely across these two regions.

Third, beyond simply establishing regional variation in the relationship between stigma beliefs and PSBs, we offer an explanation. We show that within high-prevalence social contexts, the overall level of stigmatization within individuals' regions of residence may partially explain the relationship between their stigma beliefs and their private sexual practices. When individuals live in high-prevalence countries and in regions where people's stigma beliefs are high, the relationship between stigma beliefs and PSBs is negative. Our explanation for this

pattern is that high-prevalence countries are places in which people have had significant exposure to the social and epidemiological consequences of the HIV epidemic. As such, the feelings of safety that come from the boundary-making processes of splitting and projection should be pronounced. Similarly, ingroup/outgroup distinctions are likely to be acute when regional stigmatization is high. Thus, the combination of residing in a high-prevalence country and a high stigmatizing region may provide an additional feeling of safety that comes from ingroup membership, and an overall reluctance to be vigilant about safe sex practices.

6.2. Limitations

While our results demonstrate the importance of social contexts on the relationship between instrumental stigma and PSBs, we identify three limitations that, if addressed, could strengthen future work. First, we propose an unrefined theoretical explanation for the relationship between stigma and PSBs in contexts where larger social contexts (country groups) and smaller social contexts (regions within countries) suggest differing directions for the relationship between stigma and PSBs. Our findings support a neutralizing effect between the two social contexts, but researchers should continue to empirically and theoretically explore the biomedical consequences of mismatched social contexts.

Second, our models contain several limitations. Given the data available, we could not include controls for important variables like attitudinal measures of sexual behavior, or, in the case of LA&C countries, individuals' HIV status. Since both are important for determining the relationship between stigma and PSBs, their absence represents a form of omitted variable bias. Future researchers should explore these relationships among those living with or without HIV to determine whether self-stigma processes affect the relationships we have presented here. Relatedly, our models only tap one dimension of stigma: instrumental stigma. Other forms of stigma should be explored in future research. Of specific interest would be self-stigma within samples of people with HIV.

Lastly, this project only examines the relationship between stigma and PSBs for unpartnered individuals. Since prior research demonstrates that the meanings of PSBs vary by partnership status, we limit our sample to unpartnered individuals. Future research should explore these processes within samples of partnered individuals.

6.3. Conclusion

This study demonstrates that the relationship between HIV stigma beliefs and the practice of PSBs varies 1) between high and low-prevalence countries, and 2) across regions within these countries. We provide empirical support for both the Safety and Avoidance Response Hypotheses and demonstrate that social contexts determine which theoretical processes guide the relationship between instrumental stigma and PSBs. These findings highlight the importance of context in uncovering how HIV stigma affects individuals' behaviors, which in turn, determine the ongoing spread of HIV.

We believe our results are relevant for experts who wish to design policies that reduce HIV stigma. Much of the focus of HIV stigma reduction campaigns have been on country-wide efforts to reduce the stigma directed towards those infected with HIV. The reasoning behind these campaigns is that if countries create a welcoming and nurturing environment for stigmatized individuals, those individuals will utilize safer sex practices that have been shown to slow the spread of HIV. Our findings do not contradict the logic of these campaigns. However, they do show that people's attitudes about those with HIV negatively affect their own private sexual practices.

Moreover, they also suggest that living in a region where these attitudes are conservative can have similarly negative effects. Importantly, this can occur even in countries where overall HIV prevalence is low, or where the disease has not yet produced widespread epidemiological concern. Therefore, we suggest that policies aimed at changing people's attitudes about those with HIV can likely be more effective if they are tailored to fit the norms, customs, and overall levels of stigmatization that occurs within regions and countries. Region and country-specific campaigns may provide the key to combatting the spread of this serious disease.

Finally, though stigma beliefs have a positive effect on PSBs in certain areas, we are not arguing against stigma reduction campaigns. Indeed, we know that holding stigmatizing beliefs negatively affects the psychological and physical health outcomes of individuals who experience it. Our main focus is on uncovering the mechanisms through which stigma beliefs influence behaviors. We do not support stigmatizing, even though we empirically demonstrate that it has positive effects on sexual behavior. Rather, we hope that studying these stigma processes will uncover the most effective means of both reducing stigma and encouraging PSBs in different social contexts.

Credit author statement

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