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# Associations Between Lifetime Traumatic Experiences and HIV-Risk Behaviors Among Young Men Living in Informal Settlements in South Africa: A Cross-Sectional Analysis and Structural Equation Model

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**Background:** Qualitative research emphasizes men's experiences of trauma increase HIV risk. We seek to understand associations between experience of traumatic events and HIV-risk behaviors among heterosexual men in 2 trials in urban informal settlements in South Africa.

**Methods:** Cross-sectional surveys among men in Johannesburg and Durban, South Africa, enrolled in intervention trials. Adjusted logistic regression and structural equation modeling assessed associations between men's experiences of poverty and traumatic events, and HIV-risk behaviors (inconsistent condom use, transactional sex, and number of sex partners). We explored mediated pathways from trauma to HIV risk through mental health and alcohol, and gender attitudes.

**Results:** Among 2394 men, in adjusted logistic regression, transactional sex and 4 or more sex partners were associated with witnessing the murder of a family member, witnessing a murder of a stranger, experiencing excessive pain, been kidnapped, and witnessing a rape. More consistent condom use was associated with witnessing the murder

of a family member, being kidnapped, and witnessing a rape. In 3 separate structural equation modeling pathways were consistent, trauma directly increased transactional sex, and past year sexual partners, and increased consistent condom use. Risk was increased through mental health pathways, and gender inequitable attitudes and practices.

**Conclusion:** Men's HIV-risk behaviors in this population emerge at the confluence of poverty, traumatic experiences, and gender inequalities. Effective HIV-prevention interventions needs to reduce men's experiences of poverty and trauma, transform gender norms, and reduce the mental health impact of trauma.

**Key Words:** gender, structural drivers, masculinity, trauma, mental health, South Africa

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## INTRODUCTION

Gender inequitable masculinities are a key factor driving HIV-risk behaviors among men and contributing to the global burden of HIV.<sup>1–3</sup> Globally, studies highlight how gender inequitable masculinities, characterized by inequitable gender attitudes, controlling behaviors, the use of intimate partner violence (IPV), and nonpartner rape, tend to cluster together with other sexual risk behaviors.<sup>4,5</sup> For men, sexual behaviors that increase HIV risk include having more sexual partners, limited and inconsistent condom use, and engaging in transactional sex.<sup>6,7</sup>

Most research on gender inequitable masculinities has drawn on Connell's<sup>8</sup> notion of hegemonic masculinity and argues that gender inequitable behaviors are a key way that men "perform" hegemonic masculinity.<sup>9</sup> This argument suggests men's HIV-risk behaviors are intimately tied to male power, emerging from a position of power and control over women. Recognition of the inequitable masculinities and HIV-risk relationship has driven a major focus on interventions working with men and boys to "transform masculinities" and specifically hegemonic masculinity as a way to reduce HIV transmission.<sup>10,11</sup> Evidence reviews have highlighted that such focus has merits, suggesting interventions "transforming masculinities" can reduce HIV-risk behaviors.<sup>3,10,12</sup>

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A major critique of the masculinities literature, particularly in how it has been drawn on in the health field,<sup>13</sup> is that it focuses far too much on men's power, without recognizing how many men, particularly in the global south, are also subjected to structural adversity and high levels of violence themselves.<sup>13,14</sup> In particular, the disproportionate level of violence and death that poor, young, black men experience,<sup>15</sup> and the ways in which men's emotional vulnerabilities are denied.<sup>16</sup> Qualitative research has traced how specific configurations of masculinity—in turn shaping HIV-risk behavior—are constructed in contexts of poverty, adversity, and experiences of trauma, and social norms legitimating the use of violence, rather than from a position of power.<sup>17–20</sup> The masculinity emerging in these contexts, while potentially being numerically dominant, cannot be considered hegemonic but are rather subordinated masculinities.<sup>9,14</sup> Such subordinated masculinities seek to establish their authority in relation to women, and other men, through an exaggerated form of heterosexual masculinity, often using overt demonstrations of power and violence, and control over women, including in sexual relationships,<sup>4,19,21,22</sup> has been termed by some “hypermasculinity.”<sup>23</sup>

Despite critiques of the masculinities literature as over-emphasizing how all masculinities are constructed from positions of power, there has been virtually no quantitative research exploring the impact of men's experiences of poverty and their own experiences of violence and its relationship with HIV risk. Some extant research explores how childhood traumas, including physical, sexual, emotional abuse, and neglect, before the age of 18 years shape men's subsequent risk of IPV perpetration, and HIV-risk behaviors, and HIV acquisition.<sup>24,25</sup> This literature highlights how adult depression and alcohol use are also driven by childhood traumas.<sup>24–27</sup> In one analysis, Jewkes and Morrell<sup>28</sup> using Latent Class Analysis showed the most violent South African men had more gender inequitable attitudes, and greater sexual risk behaviors. They also showed, using Structural Equation Modeling (SEM), that experiences of trauma in childhood impacted psychological factors, in turn shaping their violence practices. Another set of research has focused on the impact of conflict/war-related traumas and its impact on mental health, IPV, and HIV-risk behaviors.<sup>29–31</sup> Few studies have explored among nonconflict affected populations the impact of traumatic events on men's mental health, or HIV-risk behaviors, and those that do, suggest a relationship.<sup>32,33</sup>

In this article, we aim to understand the relationship between men's experiences of traumatic experiences in their life and HIV-risk behaviors. We seek to test 3 hypotheses: (1) that men who experience traumatic events have increased HIV-risk behaviors; (2) that there is a dose response between traumatic events and HIV-risk behavior; and, (3) that the pathways between trauma experienced outside the home and HIV-risk behavior are both direct, but also mediated through poorer mental health, alcohol use, and gender inequitable masculinities.

## METHODS

### Design

Data comes from 2 cross-sectional studies comprising baselines for the Stepping Stones and Creating Futures (SS/

CF) intervention cluster-randomized control trial<sup>34</sup> in eThekweni Municipality, South Africa, and the CHANGE cluster randomized control trial<sup>35</sup> in Gauteng Province, South Africa. Studies were designed to enable combining of data. Both study sites are in periurban, informal settlements, characterized by poor access to services, high rates of unemployment, and limited educational opportunities.

In both studies, men were recruited, with support from the local NGOs delivering the intervention, and focused on men normally resident in the communities. The SS/CF trial had 34 clusters with between 19 and 21 participants per cluster, with data collected between October 2015 and September 2016, and specific criteria of age 18–30 years. The CHANGE trial had 18 clusters with between 120 and 150 men per cluster, with data collected between January and July 2016, aged 18–40 years. For this study, we focused on younger men, with an age restriction of 18–30 years.

After recruitment, participants signed written informed consent before being interviewed. Questionnaires were self-completed on tablets, with inbuilt logic and skip patterns. In SS/CF, questionnaires could only be read, while in the CHANGE trial, questionnaires had audio assist. Further information on the studies is available elsewhere.<sup>34,35</sup>

### Measures

As a proxy for HIV risk, we measured 3 different constructs associated with HIV prevalence among men: past year transactional sex, past year consistent condom use, and past year number of sexual partners. Past year transactional sex was assessed through 5 questions developed for, and previously used, in South Africa.<sup>6</sup> These asked about whether men thought a casual or once-off sexual partner had had sex with them because she may receive a range of items (eg, cell phone, gifts, and food). A positive answer to any item was coded as engaging in transactional sex, and a sum score was also created. A single item assessed condom use over the past year, with responses never, occasionally, sometimes, always, without reference to type of sex partners. Men were asked 3 questions about the number of sexual partners in the past year, specifically the number of main sexual partners, causal sexual partners, and once-off sexual partners. This was summed into a score for total number of sexual partners.

Men were asked about 8 types of potential traumatic experiences in their lifetime, including witnessing the death of a family member or friend, feeling or being close to death, and witnessing a rape. Participants could respond either yes or no. Traumatic experience exposure was based on the Harvard Trauma Questionnaire and previous South African surveys.<sup>36</sup>

Other measures included education level, age, and the length of time the participant had lived in the community. Household food insecurity in the past month,<sup>37</sup> as a proxy for poverty, was assessed with 3 items, specifically, how often in the past month was there no food to eat, any member of your household go to sleep hungry, and not eating for whole day and night, because there was no money or food. A direct sum was derived (range 0–6). Depressive symptoms were assessed with the Center for Epidemiological Studies Depression scale,<sup>38</sup> with a simple score being derived ( $\alpha = 0.89$ ). Alcohol

use was assessed with the Alcohol Use Disorders (AUDIT) scale,<sup>39</sup> again with a score being derived.

Eight items asked about male controlling behaviors in relation with female partners, with a 4-point Likert scale ( $\alpha = 0.81$ ), based on the sexual relationship power scale, which had been adapted for South Africa.<sup>40</sup> Higher scores indicated more controlling behavior. Gender inequitable attitudes were assessed using 10 items based on the gender equitable men's scale, which had been modified for South Africa,<sup>40</sup> with a 4-point Likert scale response. Higher scores indicated more gender inequitable attitudes ( $\alpha = 0.86$ ).

### Analysis

All analyses were conducted in STATA14.1/IC, and took into account the structure of the data, and clustering. We first present summarized statistics for the sample presenting percentages and mean values and 95% confidence intervals (95% CI). Second, we assess whether there is an independent association between each HIV-risk behaviors [past year transactional sex (yes/no), past year condom use (never/occasionally vs sometimes/always), past year number of sexual partners (0–3 vs 4 or more)], and individual traumatic events, and whether there was a dose response (0 vs 1–2 vs 3–4 vs 5–6 events). We used logistic regression to estimate first unadjusted odds ratios (ORs) and then adjusted ORs (aORs), controlling for age, education, time in the community, food insecurity, controlling behaviors, depression, and study arm (intervention vs control) and study, using the survey commands in STATA. We report ORs, aORs, 95% CIs, and *P*-values.

Second, we conducted SEM. We built 3 models (one for each HIV risk), with continuous outcomes of score of transactional sex (0–5), number of sexual partners, and condom use (1–4). We constructed a latent variable for food insecurity using 3 items of the household hunger scale. This was constructed through factor analysis of items comprising the latent variable, and then building latent models and testing for goodness of fit. To build the SEM, we used 3 techniques, we used theoretical assumptions about pathways, regressed each variable to one another in the pathways (eg, hunger with traumatic experiences score), and using these estimates, built the SEMs. We then fitted the structural model, and removed pathways that were nonsignificant ( $P < 0.05$ ). Finally, we assessed Goodness of Fit.

### RESULTS

Data from 2394 men were included in the analysis (Table 1). A total of 15.5% of men were aged 18–20 years, just under half (46.5%) were aged 21–25 years, and the rest (38.1%) were 26–30 years. Only a small proportion (6.1%) had primary education only, half (51.3%) had secondary but had not completed, whereas 42.6% had completed secondary. Almost three-quarters had lived in the informal settlement for 10 years or less, with just over a quarter (28.6%) living there for 11 or more years. For HIV-risk behaviors, two-thirds (66.3%) reported transactional sex in the past year, a quarter reported using condoms sometimes or always in the past year

(27.7%), and just over half (56.3%) reported 4 or more sexual partners in the past year (Table 1).

Experiences of traumatic events in men's life were common (Table 1). Nearly a quarter, (22.4%) had witnessed the murder of a friend or family member in their life and 30.4% the murder of someone else. A third (34.0%) had witnessed an armed attack, and a quarter (26.5%) had experienced excessive physical pain and hurt from others. A total of 39.9% had been robbed at gun or knifepoint, 8.4% reported being kidnapped, and a third (33.6%) had felt or been close to death. A further 10.1% reported witnessing a rape. Just under two-thirds (64.2%) of men reported experiencing any traumatic event. A fifth (19.8%) had experienced 3 of 4 events, and 15.5% had experienced 5 or more events.

**TABLE 1.** Sample Descriptive Data

	n	Mean, % (95% CI)
Age		
18/20	370	15.5 (14.1–17.0)
21/25	1113	46.5 (44.5–48.5)
26/30	911	38.1 (36.2–40.0)
Education		
Primary only	141	6.1 (5.2–7.1)
Secondary (not complete)	1192	51.3 (49.3–53.4)
Secondary (completed)	989	42.6 (40.6–44.6)
Time in community		
0/1 yr	282	11.9 (10.7–13.2)
2/5 yrs	855	36.1 (34.2–38.1)
6/10 yrs	554	23.4 (21.8–25.1)
11+ yrs	676	28.6 (26.9–30.3)
Study		
Durban	677	28.3 (28.3–28.3)
Gauteng	1716	71.7 (71.7–71.7)
HIV-risk behaviors		
Transactional sex in past year (yes)	1123	66.3 (64.0–68.5)
Consistent condom use (never/occasional vs always/sometimes)	611	27.7 (25.9–29.6)
Four or more sexual partners past year (yes)	1222	56.3 (54.2–58.4)
Trauma exposures		
Murder of family or friend	531	22.4 (20.8–24.2)
Murder of stranger or someone you know	720	30.4 (28.6–32.3)
Witnessed armed attack	805	34.0 (32.1–35.9)
Experienced excessive physical pain and hurt from others	628	26.5 (24.8–28.3)
Been robbed at gun or knife point	944	39.9 (37.9–41.8)
Ever kidnapped	198	8.4 (7.3–9.5)
Ever been or felt close to death	797	33.6 (31.8–35.5)
Ever witnessed someone being raped	240	10.1 (9.0–11.4)
Any trauma (yes)	1488	64.2 (62.3–66.1)
Range of traumas		
None	829	35.8 (33.9–37.7)
One or 2	670	28.9 (27.1–30.8)
Three or 4	458	19.8 (18.2–21.4)
Five or more	360	15.5 (14.1–17.1)

Unadjusted and aORs of associations between trauma experience and the 3 HIV-risk behaviors are reported in Table 2. In adjusted analysis, past year transactional sex was associated with witnessing the murder of a family member or friend, the murder of another person, witnessing an armed attack, experiencing excessive pain from another, being kidnapped, feeling close to death or witnessing a rape. In addition, reporting any trauma and experiencing 3 or 4, or 5 or more traumas were also associated in adjusted analysis with transactional sex. More consistent condom use was associated with witnessing the murder of a family member or friend, being kidnapped, or witnessing a rape. Reporting 4 or more sexual partners was associated with witnessing the murder of a family member or friend, witnessing the murder of another person, experiencing excessive pain from another, being kidnapped, or witnessing a rape, and reporting any trauma, and reporting 5 or more traumas (Table 2).

The 3 SEMs showed a consistent set of associations, but also some variation (Figs. 1–3, see Tables 1–3, Supplemental Digital Content, <http://links.lww.com/QAI/B291>). In all 3 SEMs, food insecurity was associated with increased experiences of trauma. Food insecurity was also associated with more depressive symptoms, and more gender inequitable attitudes. In all models, more gender inequitable attitudes were associated with the HIV risk (ie, more transactional sex, a greater number of sexual partners, and reduced condom use). Gender inequitable attitudes were also associated with more controlling behaviors (Figs. 1–3).

The coefficients between trauma and past year transactional sex, and number of partners indicated that more traumas were associated with increased reporting of these (Figs. 1 and 3); however, there was an inverse association for condom use in the past year, whereby increased traumas was associated with increased consistent condom use (Fig. 2).

In all models, poor mental health mediated pathways from trauma to HIV risk. Trauma was associated with increased depressive symptoms and alcohol use, and depression was associated with increased alcohol use. For condom use, depression and alcohol use, both decreased consistent condom use (Fig. 2), and alcohol use was associated with increased number of past year sex partners (Fig. 3).

For all models, another set of pathways, linked to masculinity, mediated the relationship between trauma and HIV risk. More trauma was associated with more controlling behaviors, which was in turn associated with greater alcohol use. In the models gender inequitable attitudes were directly associated with more transactional sex, reduced condom use and a greater number of sex partners. All SEMs had satisfactory Goodness of Fit statistics (see Tables, Supplemental Digital Content, <http://links.lww.com/QAI/B291>).

## DISCUSSION

The analysis supports the hypothesis that men's experiences of lifetime traumatic events are overall associated with increased transactional sex and numbers of sexual partners. First, in adjusted logistic regression, transactional sex and number of sexual partners were associated with experience of traumatic events, and there was also a dose response to more traumatic

events. Second, in the SEMs, more traumatic events were directly associated with more transactional sex and a greater number of sexual partners. And these were exacerbated in the context of household food insecurity.

We also showed a dose response between traumatic events and transactional sex and number of sexual partners, supporting the second hypothesis. Previous work on childhood traumas (typically related to violence and abuse in the home, or at school) has shown they increase men's subsequent risky sexual behaviors<sup>25</sup> as have men's experiences of trauma during conflict.<sup>30</sup> This study focused on a broader measure of overall trauma in men's lives, outside of conflict settings, the home or before the age of 18 years, suggesting that overall contexts of violence, both witnessing and experiencing it, are central in understanding some of men's sexual risk behaviors.

The association between past year condom use and traumatic events was inverse. For 3 traumatic events, witnessing the murder of a family member or friend and witnessing a rape were associated with more consistent condom use in the past year. And in the SEM, there was also a direct association, whereby more traumatic events were associated with more consistent condom use. The association between trauma and more consistent condom use parallels that seen in some studies of women experiencing IPV, who report higher contraceptive use, than women not experiencing IPV.<sup>41</sup> It may be that the impact of experiences of trauma is emotionally distancing, and in contexts where condoms are markers of emotional separation,<sup>42</sup> use of condoms more consistently may therefore be a separation strategy and an instrumental response.

All 3 behaviors, transactional sex, more condom use, and a greater number of sex partners can all be conceptualized as men's emotional disengagement in relationships, and a response to trauma. Research has emphasized men with greater psychopathic tendencies (specifically lack of emotions) are more likely to rape<sup>43</sup> and require viewing women in instrumental, rather than emotional terms. In the context of trauma, the numbing of emotions is clearly a common response, which could shape all these behaviors.

The analysis is supportive of the third hypothesis that traumatic events have mediated pathways through mental health, and masculinities that increase HIV-risk behaviors, although not all the hypothesized pathways were significant for all HIV-risk behaviors. One set of pathways was through poorer mental health, whereby greater traumas increased depressive symptoms and alcohol use, condom use was decreased through increased depressive symptoms and alcohol use, and alcohol use was associated with increased number of sex partners. The importance of unresolved trauma, manifesting itself in depression and alcohol use, for increasing some HIV risk for men, is rarely considered in HIV-prevention programming. Typically men's alcohol use is conceptualized solely as an expression of a gender inequitable masculinity; however, this model suggests the importance of resolving men's trauma, depression, and alcohol use, to reduce HIV-risk behaviors for men.

A second set of pathways showed how poverty and trauma intersected with gender attitudes and practices to increase HIV-risk. Men's experiences of trauma were

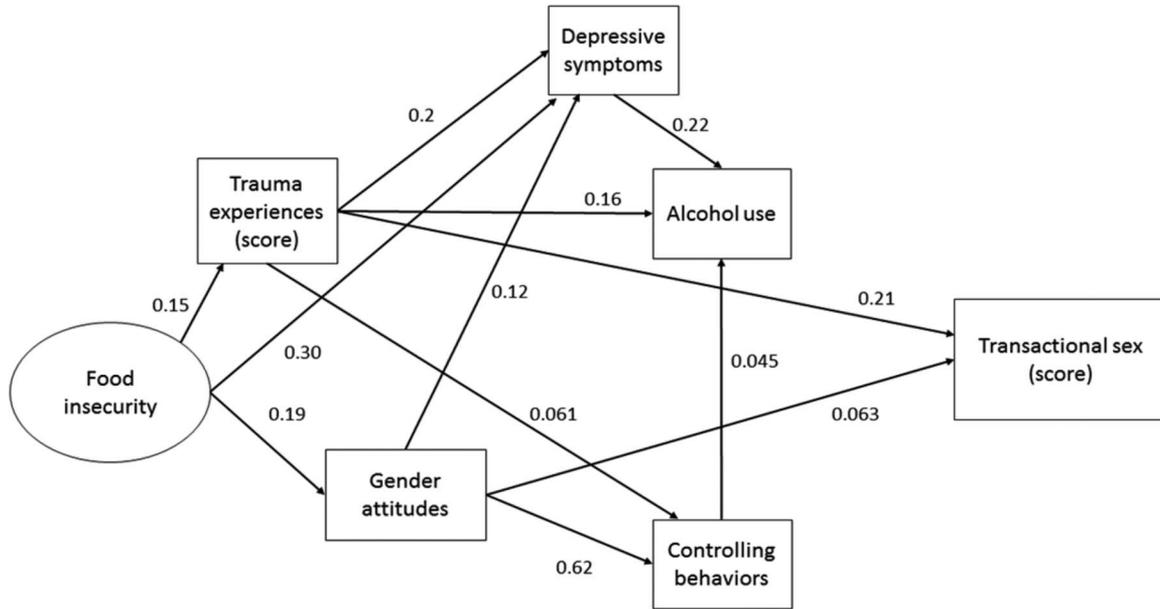
**TABLE 2.** Unadjusted and Adjusted Associations Between HIV-Risk Behaviors and Men's Traumatic Experiences

Traumas	Transactional Sex Past 12 mo			
	OR (95% CI)	P	aOR (95% CI)*	P
Murder of family or friend	2.42 (1.86–3.17)	<0.0001	1.82 (1.37–2.42)	<0.0001
Murder of stranger or someone you know	1.74 (1.38–2.19)	<0.0001	1.52 (1.18–1.95)	0.001
Witnessed armed attack	1.51 (1.21–1.88)	<0.0001	1.37 (1.07–1.74)	0.012
Experienced excessive physical pain and hurt from others	2.01 (1.58–2.56)	<0.0001	1.57 (1.21–2.03)	0.001
Been robbed at gun or knife point	0.97 (0.79–1.20)	0.792	0.93 (0.74–1.18)	0.574
Been kidnapped	2.31 (1.51–3.52)	<0.0001	1.97 (1.24–3.15)	0.004
Ever been or felt close to death	1.29 (1.04–1.61)	0.023	1.18 (0.92–1.51)	0.185
Ever witnessed someone being raped	2.29 (1.56–3.36)	<0.0001	1.88 (1.23–2.87)	0.004
Any trauma	1.51 (1.19–1.90)	0.001	1.37 (1.05–1.79)	0.019
Range of traumas: None	Ref		Ref	
1 or 2	1.17 (0.89–1.53)	0.253	1.19 (0.88–1.60)	0.263
3 or 4	1.58 (1.16–2.13)	0.003	1.44 (1.03–2.02)	0.031
5 or more	2.40 (1.70–3.38)	<0.0001	1.78 (1.22–2.59)	0.003

Traumas	Condom Use Consistency Past Year				No. of Sexual Partners Past Year (0–3 vs 4 or More)			
	OR (95% CI)	P	aOR (95% CI)*	P	OR (95% CI)	P	aOR (95% CI)*	P
Murder of family or friend	1.29 (1.03–1.61)	0.025	1.45 (1.13–1.87)	0.004	1.94 (1.56–2.40)	<0.0001	1.67 (1.31–2.12)	<0.0001
Murder of stranger or someone you know	1.03 (0.84–1.26)	0.785	1.07 (0.84–1.35)	0.581	1.66 (1.37–2.01)	<0.0001	1.49 (1.20–1.84)	<0.0001
Witnessed armed attack	0.98 (0.80–1.21)	0.882	1.13 (0.90–1.42)	0.299	1.41 (1.18–1.70)	<0.0001	1.21 (0.98–1.48)	0.076
Experienced excessive physical pain and hurt from others	1.20 (0.97–1.49)	0.089	1.26 (0.99–1.62)	0.062	1.70 (1.39–2.08)	<0.0001	1.51 (1.20–1.90)	<0.0001
Been robbed at gun or knife point	0.86 (0.70–1.04)	0.122	0.97 (0.77–1.22)	0.788	1.21 (1.02–1.45)	0.031	1.03 (0.84–1.26)	0.763
Been kidnapped	2.13 (1.55–2.94)	<0.0001	2.11 (1.44–3.10)	<0.0001	2.00 (1.41–2.82)	<0.0001	1.76 (1.18–2.63)	0.006
Ever been or felt close to death	0.96 (0.78–1.18)	0.708	1.00 (0.78–1.27)	0.976	1.24 (1.03–1.49)	0.02	1.02 (0.83–1.27)	0.835
Ever witnessed someone being raped	1.50 (1.11–2.02)	0.008	1.59 (1.12–2.26)	0.01	1.74 (1.28–2.35)	<0.0001	1.58 (1.11–2.24)	0.011
Any trauma	0.87 (0.71–1.07)	0.198	1.06 (0.83–1.36)	0.633	1.70 (1.42–2.04)	<0.0001	1.31 (1.06–1.63)	0.014
Range of traumas: None			Ref		Ref		Ref	
1 or 2	0.79 (0.61–1.01)	0.057	0.95 (0.72–1.27)	0.747	1.51 (1.22–1.88)	<0.0001	1.20 (0.94–1.54)	0.151
3 or 4	0.84 (0.63–1.10)	0.199	1.05 (0.76–1.44)	0.765	1.65 (1.30–2.11)	<0.0001	1.25 (0.94–1.65)	0.122
5 or more	1.11 (0.83–1.48)	0.466	1.36 (0.97–1.91)	0.079	2.24 (1.70–2.95)	<0.0001	1.75 (1.27–2.41)	0.001

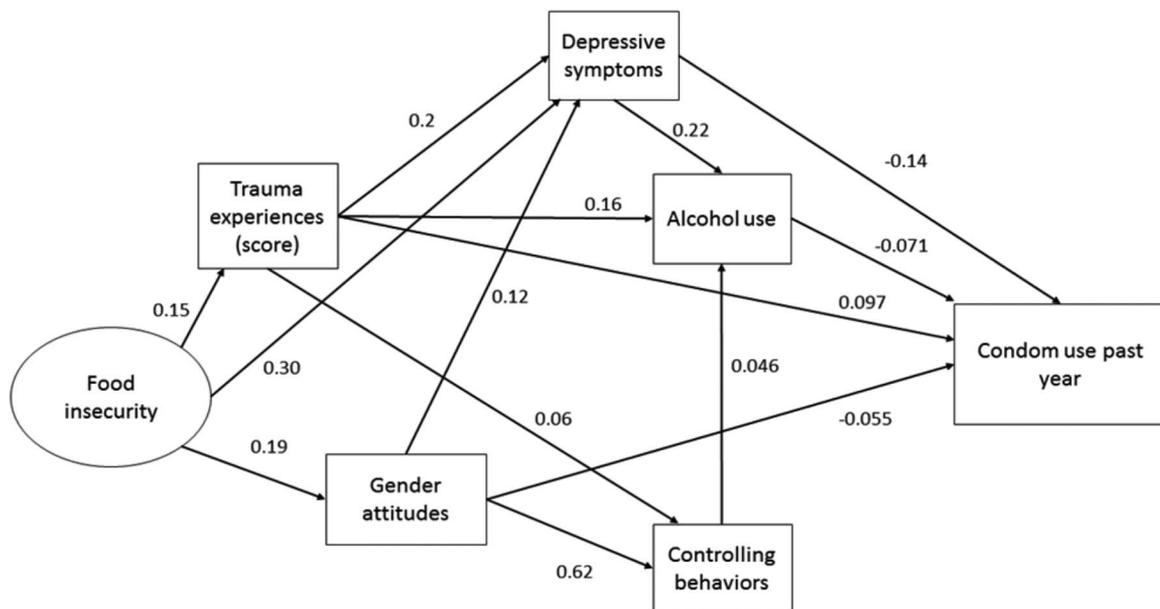
\*All models adjusting for age, education, time living in the community, food insecurity, controlling behaviors, depression, and clustering.



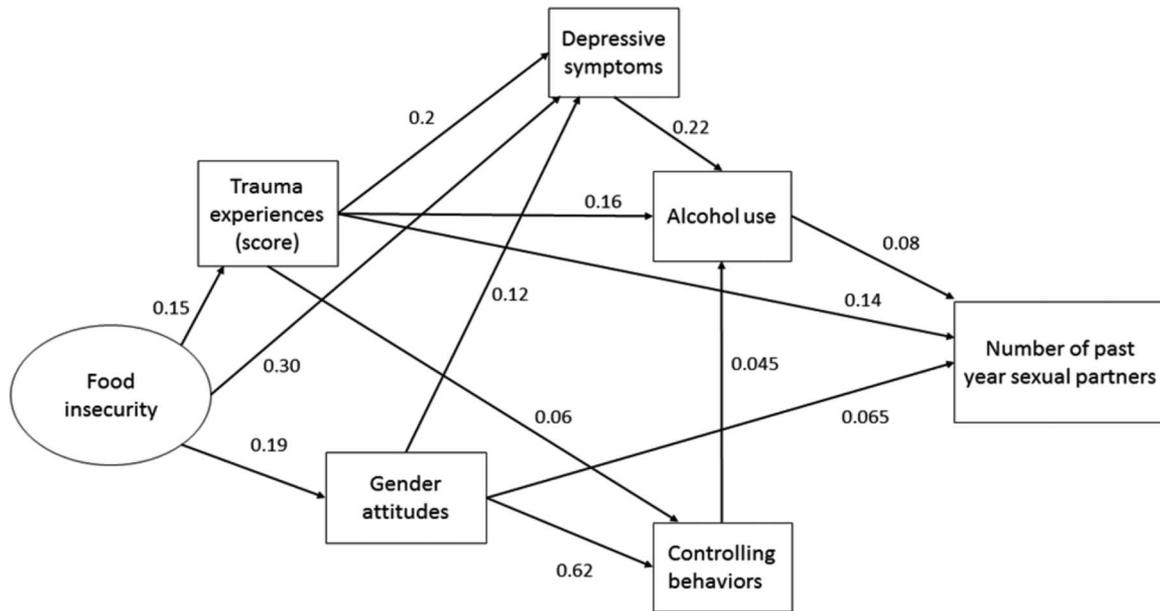
**FIGURE 1.** Structural equation model showing pathways between food insecurity, trauma, and transactional sex.

associated with more controlling behaviors, and then greater alcohol use, and then HIV risk. Gender inequitable attitudes, partly shaped by poverty, were directly associated with HIV risk and indirectly through increasing controlling behaviors, and then alcohol use. Qualitative research has suggested more gender inequitable forms of masculinity emerge in the contexts of poverty and trauma<sup>18,19</sup> and the SEMs support this, showing the multiple pathways through which this happens. This reinforces the importance of working on transforming masculinities as a central approach to reducing men’s HIV-risk behaviors.<sup>3</sup>

A critique of the health literature on masculinities has been that it has implied that hegemonic masculinity is necessarily associated with men’s use of power and violence.<sup>13</sup> Rather an argument has been put forward that most HIV risk is practiced by a smaller number of men,<sup>28</sup> who construct a “hypermasculinity,”<sup>23</sup> which uses sexual power over women (and violence) as a way to legitimate their identity.<sup>17,19,20</sup> Within Connell’s<sup>8</sup> hierarchy of masculinities, this is a subordinated masculinity, emphasizing how men can both be powerful, but also subjected to intense vulnerability.<sup>13,15,16</sup> The SEMs clearly shows how this particular form



**FIGURE 2.** Structural equation model for pathways between food insecurity, trauma, and past year condom use.



**FIGURE 3.** Structural equation model for pathways between food insecurity, trauma experiences, and past year sex partners.

of masculinity emerges from poverty, and men’s experiences of trauma, and intersects with wider gender inequitable attitudes and practices, shaping their control over women through sex.

The study has a number of limitations. The sample is self-selecting to be part of 2 separate intervention studies, and data are therefore not generalizable, but it is unclear how self-selection would affect the associations. Measures were self-reported, which is “state of the science” for assessing violence and risky sexual behavior, but is considered less rigorous than clinical assessment for mental health. There was also a very high level of reported trauma in the population. We did not include all forms of trauma that men could experience, particularly childhood traumas, which are associated with HIV acquisition, and HIV risk.<sup>25</sup> We only included depression in the analysis, yet other forms of mental health, such as post-traumatic stress disorder, and anxiety, may be important, but we did not assess these. Data are cross-sectional, and the temporality of associations is not necessarily clear, suggesting that future analyses with longitudinal data would be important to confirm the pathways identified here. We did multiple tests of association without adjusting for this in reporting, and future research should formally test these hypotheses with adequate sample sizes. Finally, women experience huge levels of trauma, and this is associated with HIV risk,<sup>24,25</sup> our analysis did not consider women, and this specific analysis is not generalizable to women.

Men living in urban informal settlements in 2 different provinces in South Africa reported high levels of traumatic events, and this was associated directly with transactional sex and a greater number of sexual partners, and more condom use. There were also indirect pathways through gender inequitable attitudes and practices, and poorer mental health. The analysis illustrates how the form of masculinity these young men constructed was a subordinated masculinity

emerging from poverty and adversity, and partly through lack of emotional engagement, used sexual behavior to legitimate their position.<sup>13,18,20,28</sup>

The analysis has a number of important implications for interventions to reduce HIV risk among men. First, interventions “transforming masculinities” need to be more specific about the forms of masculinities they are working on, and the implications of this for practice,<sup>14</sup> specifically, whether the intervention is targeting a hegemonic masculinity and broader constructions of masculinity, or specific formulations, such as a subordinated masculinity. Second, any successful intervention to transform subordinated masculinities needs to work on reducing the violence men experience in their daily life in informal settlements, through working to reduce poverty and eliminating community-level forms of violence. Strategies such as deconcentration and urban upgrading may have positive effects on these,<sup>44,45</sup> but there remains little research on the impact of reducing poverty on men’s HIV-risk behaviors.<sup>46</sup> Third, analysis supports the importance of working to reduce gender inequitable attitudes and practices as central to working with men on reducing HIV risk.<sup>1,3</sup> Finally, the central role of poor mental health in shaping HIV risk requires HIV-prevention interventions to consider programming to improve mental health, be this through working to reduce the impact of traumatic experiences on mental health,<sup>47</sup> or reducing the accessibility of alcohol.<sup>48</sup> Broadly, the work of preventing HIV-risk behaviors among young men living in urban informal settlements cannot be achieved without tackling the wider structural contexts in which men live.

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