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Measurement invariance of the Childhood Trauma Questionnaire by gender, poverty level, and HIV status

Violeta J. Rodriguez^{a,b,c}, Pablo D. Radusky^d, Mahendra Kumar^a, Charles B. Nemeroff^a, Deborah Jones^{a,*}

^aDepartment of Psychiatry and Behavioral Sciences, University of Miami Miller School of Medicine, Miami, FL, United States

^bDepartment of Psychology, University of Georgia, Athens, GA, United States

^cFord Foundation Fellowship, National Academies of Sciences, Engineering, and Medicine, Washington, DC, United States

^dDepartment of Psychology, University of Buenos Aires, Argentina

Abstract

Background—Assessing traumatic childhood events has important implications for treatment, due to increased high-risk behaviors, treatment nonadherence, and all-cause mortality. As such, it is important to ensure that screening tools used to measure traumatic childhood events are invariant across groups. The focus of this study was to examine measurement invariance across gender, poverty level, and HIV status in a commonly used childhood trauma screening tool, the Childhood Trauma Questionnaire – Short Form (CTQ-SF).

Method—Participants were N= 473 HIV-infected and uninfected men and women who completed a demographic questionnaire, the CTQ-SF, and underwent HIV testing.

Results—Participant age was an average of 36 years (SD= 9.40); 51% of participants were male, and 49% were female. Forty-three percent of participants were below the poverty level, and 36% were HIV-infected. Configural invariance was supported by gender, poverty level, and HIV status; scalar and strict invariance were not supported by gender, poverty level, and HIV status. Neither full nor partial metric invariance could be established by gender and income; however, the scale was invariant at the metric level by HIV status.

*Corresponding author at: Department of Psychiatry and Behavioral Sciences, University of Miami Miller School of Medicine, Dominion Towers Suite 404, 1400 NW 10th Avenue, Miami, FL 33136, United States., d.jones3@med.miami.edu (D. Jones).

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmip.2018.10.002>.

Discussion—Given the measurement bias identified in gender, poverty level, and HIV, practitioners and researchers must use caution when drawing conclusions regarding childhood trauma when using the CTQ-SF. Findings also suggest that statistical inferences and implications for practice based on comparisons of observed means will be distorted and may be misleading, and as such, established cutoffs may not apply similarly for these groups, suggesting an avenue for further research.

1. Introduction

Assessing traumatic childhood events should be a routine component in medical and psychological care settings, due to associated increased high-risk behaviors [1–3], treatment nonadherence, choice of treatment, particularly of psychiatric disorders, and increased all-cause mortality [4–6]. Individuals with a history of childhood abuse and neglect are at increased risk for psychiatric disorders, including major depression, bipolar disorder, and post-traumatic stress disorder (PTSD) in addition to subthreshold symptoms of PTSD. In fact, traumatic events experienced in childhood have been associated with the development and unremitting symptomatology of several major mental health disorders [7,8]. Therefore, medical and psychological practice guidelines recommend screening for childhood trauma to inform the provision of trauma informed care. Trauma-informed care refers to the provision of a safe environment to individuals who may have learned to mistrust authority figures or experience discomfort with certain medical procedures as a result of traumatic experiences in childhood [9].

Traumatic childhood events and subsequent adult experiences of chronic stress and trauma are highly prevalent among HIV-infected individuals [10], with HIV diagnosis itself being considered a traumatic event [11]. Among those with HIV, childhood trauma has been linked to increased AIDS-related mortality, all-cause mortality, and a greater incidence of opportunistic infections [12]. Childhood trauma is also associated with decreased adherence to antiretroviral therapy and increased sexual risk behaviors (i.e., unprotected sex) among people living with HIV, thereby increasing the risk of HIV transmission [13]. HIV-infected patients with a history of childhood trauma have greater levels of healthcare utilization, defined as a greater number of hospitalizations and emergency department visits, as well as longer hospital stays [13]. Given these negative outcomes associated with childhood trauma among those living with HIV, assessing traumatic childhood events in HIV care settings specifically may have important implications for treatment.

The psychometric properties of screening tools are an important component of ensuring accuracy when screening for childhood trauma. One important psychometric property is measurement invariance, which refers to a similar interpretation of constructs across groups independent of factors that are unrelated to the constructs of interest [14]. For instance, research has shown that women interpret childhood trauma statements differently than men, such that women may be more likely to respond to items with the word “abuse” in them [15,16]. Items aimed at evaluating neglect that reference economic resources may be biased against those of low socioeconomic status, thereby leading to a lack of measurement invariance between those in different economic classes [17]. HIV status may also influence the interpretation of items due to decreased cognitive functioning among those living with

HIV, even in those with long term viral suppression [18]. In addition, as HIV diagnosis and treatment (i.e., medication) may be traumatic, repeated exposure to HIV stressors may lead HIV-infected individuals to respond differently to retrospective reports of traumatic events in childhood.

Because of the potential sources of bias associated with screening for childhood trauma in a variety of settings, it is important to ensure that screening tools are invariant across groups. Therefore, the focus of this study was to examine measurement invariance across gender, income, and HIV status in a commonly used childhood trauma screening tool, the Childhood Trauma Questionnaire – Short Form [19,20]. To the best of our knowledge, studies have not assessed measurement biases by HIV status, despite its importance to HIV care settings. Based on past research and theory, it was hypothesized that measurement invariance would not be supported across gender, poverty level, and HIV status.

2. Methods and materials

2.1. Participants and procedures

Prior to study initiation, approval from the University of Miami Institutional Review Board was obtained. Potential participants were recruited from December 2014 to March 2018 in Miami, Florida, and were required to be between the ages of 18–50 years to participate in the study. Further recruitment detail has been previously described [21]. In total, N = 473 participants were enrolled and assessed in a private office, face-to-face by a clinician who entered participants' responses on a web-based data collection software, Qualtrics. Participants were compensated USD\$50 for time and transportation.

2.2. Measures

2.2.1. Demographic characteristics—Participants completed a questionnaire assessing demographic characteristics. Demographic questions included age, gender, race, and current household income. Income was dichotomized into being below or above the poverty level according to national poverty guidelines, which account for the number of people living in the household.

2.2.2. Childhood Trauma Questionnaire—The Childhood Trauma Questionnaire – Short Form (CTQ-SF) [19,20], a 28-item Likert scale (1 = *never true*, 2 = *rarely true*, 3 = *sometimes true*, 4 = *often true*, 5 = *very often*), assesses emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, and denial and minimization and denial about abuse and neglect in childhood. Items in this scale include “People in my family said hurtful or insulting things to me” and are asked in the context of “when I was growing up...”. Other items include statements about being hit and bruised, or people saying mean or hurtful things. Total scores for this scale range from 28 to 140, with higher scores indicating more frequent traumatic events in childhood.

2.2.3. HIV status—HIV testing was performed using the rapid test OraQuickADVANCE® Rapid HIV-1/2 Antibody Test among those who self-reported being HIV-uninfected. HIV-infected participants provided documentation to confirm their HIV

status. The clinician conducting HIV testing and assessment was a trained HIV counselor and provided pre-and post-test counseling to participants.

2.3. Data analyses

2.3.1. Descriptive statistics—Scale reliability was evaluated using McDonald's ω coefficient of scale reliability, calculated in R's psych package [22]. Bivariate correlations were used to examine associations between latent variables. Univariate statistics – means and standard deviations – were utilized to describe the subscales. The distribution of the observed data were examined using skewness and kurtosis; values between -1 and 1 suggest a normal univariate distribution [23]. Multivariate outliers were identified using Mahalanobis distance in order to determine the appropriate estimation procedure. The cut-off for Mahalanobis distance was calculated as $\chi^2 = 58.30$, with $df = 29$ (number of items plus 1) and $\alpha = 0.001$ [23]. If Mahalanobis distance for each of the subjects is greater than this cutoff, the value is considered a multivariate outlier. To further explore multivariate normality, Mardia's multivariate normality test was conducted in the MVN package in R [24].

2.3.2. Factor structure—A preliminary step in testing measurement invariance was to ensure that the factor structure of the CTQ-SF was consistent across gender, HIV status, and poverty level. The five-factor structure of the CTQ-SF was used based on previous research and theory and included the following factors 1) emotional abuse, 2) physical abuse, 3) sexual abuse, 4) emotional neglect, and 5) physical neglect. In order to retain the original factor structure of the scale conceptualized by the developers and used in previous research, no alternative factor structures were tested.

2.3.3. Model fit—Model fit was evaluated using multiple fit indices recommended in previous research, including the χ^2 statistic [25]. Because the χ^2 statistic is influenced by sample size, other fit indices considered were the root mean square error of approximation (RMSEA), the weighted root mean square residual (WRMR), the comparative fit index (CFI), and the Tucker-Lewis Index (TLI). Weighted root mean square residual values of approximately 1, CFI and TLI values of approximately 0.90 or greater [26], and RMSEA values of approximately 0.06 or lower [26,27] indicate acceptable fit. The CFI and RMSEA values have been shown to be good indicators of model fit independently of sample size [28].

2.3.4. Measurement invariance—After the same factor structure is shown to apply to the groups of interest, then tests of measurement invariance can be performed. Measurement invariance tests consist of increasingly restrictive levels, starting with configural invariance (H_{form}), followed by equality of factor loadings or metric invariance ($H_o: \Lambda_1 = \dots \Lambda_G$), equality of indicator thresholds or scalar invariance ($H_o: \tau_1 = \dots \tau_G$), and equality of indicator residual variances or strict invariance ($H_o: \theta_1 = \dots \theta_G$) [14]. The suggested order of examining these increasingly restrictive levels of measurement invariance is as follows: 1) configural invariance, 2) metric invariance, 3) scalar invariance, and 4) strict invariance [14].

Configural invariance tests whether the overall constructs are equivalent across groups. If configural invariance holds, then the next level of invariance, metric invariance, can be tested. To test metric invariance, factor loadings are constrained to be equal in both groups, and then tested against the initial model (configural invariance). As such metric invariance tests whether the matrix of factor loadings applies to both groups. If metric invariance holds, it may be concluded that the groups interpret the items similarly; scalar invariance can then be tested [14]. Scalar invariance is a test of equality of item thresholds; equality of item thresholds indicates that the mean levels of the latent constructs are equivalent between groups. If scalar invariance holds, then strict invariance can be tested, which tests the equality of residual variances across groups. When strict invariance is supported, it suggests that the measurement error in both groups is equivalent. If invariance is not supported at any of these levels, partial invariance can be tested. In testing partial invariance, *some* of the constraints of factor loadings, indicator thresholds, or residual variances are freed [29] according to modification indices or differences in individual item parameters between groups. Because the models for each level of invariance are nested within the earlier models, they are compared using the change in fit indices. Therefore, models were compared by evaluating the χ^2 change from one model to the subsequent model. Comparative fit index changes will also be used in conjunction with χ^2 ; decreases of 0.01 or lower in CFI values can also suggest invariance [14].

All analyses were performed using Mplus v7.4 [30] and SPSS v24 [31] and R for Macintosh operating system. The cutoff for statistical significance was $p < 0.05$.

3. Results

3.1. Demographic characteristics

Participant age was an average of 36 years (SD = 9.40); 51% of participants were male, and 49% were female. Nearly one-tenth (11%) of participants identified as Caucasian, 61% were African American, 3% Caribbean, 20% Hispanic White, 2% Hispanic Black, and 3% identified as biracial or multiracial. Forty-three percent of participants were below the poverty level; 57% were above the threshold. Nearly one-third of participants (36%) were HIV-infected; the remaining participants, 64%, were HIV-uninfected.

3.2. Descriptive statistics

Means, standard deviations, McDonald's ω coefficient of reliability, and correlations among latent variables are shown in Table 1. Skewness for the subscales ranged from 0.147 to 1.772, and kurtosis from -0.993 to 2.974, suggesting a non-normal distribution. Several multivariate outliers ($n = 50$) were identified using the Mahalanobis distance cutoff of $\chi^2 = 58.30$, based on $df = 29$ (number of items plus 1) and $\alpha = 0.001$ [23]. The results of Mardia's multivariate normality test also revealed non-normal multivariate data (Mardia's estimation of multivariate skewness = 192.63, skewness $\chi^2 = 15,153.57$, $p < 0.001$; Mardia's estimation of multivariate kurtosis = 1,237.80, kurtosis $z = 105.43$, $p < 0.001$). Therefore, a WLSMV (mean and variance adjusted weighted least squares) estimator with theta parameterization was used, given that it does not assume a normal distribution, and is the preferred method for modeling ordinal data [14].

The overall five-factor structure for the whole sample, with standardized factor loadings and standard errors, is presented in Fig. 1. Because the tetrachoric correlation between items 24 (“molested”) and 27 (“sexually abused”) was $r_{tet} = 0.99$, item 24 was excluded from all subsequent analyses. This five-factor structure solution had an acceptable fit to the data, $\chi^2_{(242)} = 918.567$ ($p < 0.001$), RMSEA = 0.077 (0.072–0.082), WRMR = 1.349, CFI = 0.98, and TLI = 0.98.

3.3. Measurement invariance

3.3.1. Measurement invariance by gender—As shown in Table 2, the five-factor structure of the CTQ-SF was supported in men and women, $\chi^2_{(484)} = 1189.843$ ($p < 0.001$), RMSEA = 0.079 (0.073–0.084), WRMR = 0.061, CFI = 0.98, and TLI = 0.98. As such, metric invariance was tested by constraining factor loadings to be equal by gender. Metric invariance by gender was not supported, CFI = 0.00, $\chi^2_{(19) diff} = 46.159$, $p < 0.001$. As such, scalar and strict invariance were not tested. Partial metric invariance was tested, however, which showed that freeing factor loading constraints for items 4, 1, and 26 individually, partial metric invariance was supported, CFI = 0.00, $\chi^2_{(16) diff} = 30.547$, not significant. Thus, it could not be concluded that partial invariance held.

3.3.2. Measurement invariance by poverty level—As described in Table 3, configural invariance held between participants below the poverty level and those above the poverty level, as the original five-factor structure of the CTQ-SF was supported in both groups, $\chi^2_{(484)} = 1173.220$ ($p < 0.001$), RMSEA = 0.078 (0.072–0.083), WRMR = 1.554, CFI = 0.98, and TLI = 0.98. Because configural invariance was established, metric invariance was then tested by constraining factor loadings to be equal in between participants below the poverty level and those above the poverty. Equality of factor loadings was not supported, CFI = 0.00, $\chi^2_{(19) diff} = 32.510$, $p < 0.05$. Partial metric invariance was not tested given that modification indices were all below the suggested cutoff to release parameters.

3.3.3. Measurement invariance by HIV status—As presented in Table 4, the five-factor CTQ-SF structure held by HIV status, $\chi^2_{(484)} = 1131.132$ ($p < 0.001$), RMSEA = 0.075 (0.069–0.081), WRMR = 1.538, CFI = 0.98, and TLI = 0.98. Because configural invariance was supported, equality of factor loadings between HIV-infected and uninfected participants was tested. Metric invariance by HIV status was supported, CFI = 0.00, $\chi^2_{(19) diff} = 27.032$, not significant. Then, constraining indicator thresholds to be equal between HIV-uninfected and HIV-infected participants, scalar invariance was not supported, CFI = 0.00, $\chi^2_{(91) diff} = 120.946$, $p < 0.05$. Therefore, strict invariance was not tested. Partial scalar invariance was also not tested for HIV status given that modification indices were all below the suggested cutoff to release parameters.

4. Discussion

This study examined the configural, metric, scalar, and strict invariance of the CTQ-SF [19,20] by gender, poverty level, and HIV status. It was hypothesized that measurement invariance would not hold across gender, poverty level, and HIV status based on previous research and theory [15–18]; this hypothesis was partially supported. Configural invariance was supported by gender, poverty level, and HIV status; metric invariance was only supported by HIV status, but not by gender and poverty level. Neither scalar nor strict invariance was supported by gender, poverty level, and HIV status. The lack of scalar invariance suggests that group members differing by gender, poverty across groups. This may also suggest measurement bias as latent mean level, and HIV cannot be compared meaningfully because they interpret differences across groups were not represented identically in observed these items differently. In addition, the absence of strict invariance means. Further, partial invariance by gender, poverty level, and by HIV suggests that factor indicators are not measured with the same precision status could not be achieved, suggesting that the lack of scalar invariance was largely due to widespread measurement bias across these groups.

Contrary to the current study, previous psychometric evaluations of the CTQ-SF have found support for partial measurement invariance of this instrument by gender [16]. Partial invariance suggests that the lack of invariance results from a specific number of items, but not all. A lack of scalar invariance of the CTQ-SF has been previously reported, although partial invariance was established by freeing constraints on some items [16]. In this study, neither full nor partial scalar invariance by gender held, suggesting that constraining item thresholds to be equal across groups did not represent an acceptable fit to the data. Previous studies have found differences in the factor structure between men and women, suggesting that both groups have a particular way to interpret and respond to the scale [32]. The lack of measurement invariance by gender was also observed in cross-cultural adaptations of the CTQ-SF [33]. Nevertheless, these studies showed differences in specific items or factors within the scale, in contrast with the widespread invariance obtained in our results. Epidemiological data illustrates that although the prevalence of exposure to trauma is higher in men, women are more likely to develop PTSD symptoms following a traumatic event, especially when exposed to assaultive violence [34]. Women also differ in their predisposition to rumination rather than distraction in response to trauma, which may introduce bias in their responses by facilitating later memory retrieval [35]. The ruminative and depressive states seen in PTSD may thus be more prevalent among women, which may also facilitate memory reconsolidation and resistance of memories associated with trauma in women [36]. Thus, interpretation of CTQ-SF scores may differ between men and women as a result of differences in rates of PTSD and rumination influencing memory. This should be explored in future research.

Similarly, and consistent with expectations, invariance by poverty level was not supported at the metric, scalar, and strict invariance levels. Several authors have expressed concern about the invariance of the CTQ-SF with regard to poverty level, as low socioeconomic status can bias responses, leading to a biased detection of neglect among people of low socioeconomic backgrounds [37,38]. Because the CTQ-SF includes several items that reflect socioeconomic

status, such as material possessions and healthcare access, it is not surprising that widespread bias would be identified in the measurement of this construct. Therefore, both clinicians and researchers must use caution in interpreting results from the CTQ-SF without considering individuals' poverty level. Review by content experts may be needed to minimize bias and reduce the influence of construct-irrelevant characteristics in the measurement of child abuse and neglect. It is also possible that poverty level in this study may have been confounded with race; racial factors influencing detection bias of childhood maltreatment have been discussed in the literature [39]. However, invariance by race and ethnicity in this study could not be tested because of small group sizes and should be explored in future research.

Finally, the lack of measurement invariance between HIV-infected and HIV-uninfected individuals was also widespread, suggesting that the groups responded differently to the items and that a bias exists. These findings point to several explanations. Firstly, an HIV diagnosis and the stigma related to it are potent stressors, and a high prevalence of lifetime and HIV-related PTSD has been reported in HIV-positive individuals, especially among those recently diagnosed [40]. In fact, recent evidence suggests that HIV modifies neuronal activity that may lead to increased likelihood of manifesting an anxiety disorder induced by trauma exposure [41]. This greater susceptibility to PTSD associated with HIV may influence memory consolidation and retrieval of traumatic memories [36]. An HIV diagnosis may also trigger intrusive cognitive processing, such as rumination [42], which may impact the recall of traumatic events from childhood. Secondly, decreased cognitive functioning, especially memory, is associated with HIV infection, even among those virally suppressed [43]. Given the retrospective nature of the CTQ-SF, challenges associated with memory retrieval introduce a widespread bias in the responses by HIV status. As with gender, these results indicate that HIV-infected individuals' CTQ-SF scores must be interpreted with caution and in combination with alternative sources of information.

Because childhood trauma has been associated with decreased antiretroviral adherence and increase engagement in sexual risk behaviors among HIV-infected people, careful screening for childhood trauma in this population is merited [13]. To our knowledge, no previous studies have assessed measurement invariance of the CTQ-SF by HIV status, making an important contribution to the assessment of traumatic events in childhood among those living with HIV. Nevertheless, given the lack of research on this topic in the context of HIV care, study findings support replication. A replication of the results would suggest a need for item development, selection, and validation to measure these constructs among HIV-infected populations without the influence of factors that may be unrelated to the measurement of childhood trauma.

4.1. Limitations and future research

Study limitations must be considered in interpreting the poverty level-related results; the current sample was predominantly low income and African American, which may have not provided sufficient economic, racial, and ethnic diversity to adequately test measurement invariance. In addition, the lack of economic, racial, and ethnic diversity may have restricted the generalizability of study findings. Future studies with more diverse samples are needed

to replicate these results, as previous studies have found a lack of invariance in some items by race and ethnicity [16]. However, due to the low number of Non-Hispanic White and Hispanic participants, this could not be tested and should be explored in future research using the full version of the CTQ-SF in a larger sample. Similarly, interaction between gender and HIV status could not be tested due to the sample size; this should be explored in larger samples.

4.2. Conclusions

The present findings have implications for routine screening of childhood trauma in medical and psychological care settings and for research on childhood trauma among HIV-infected populations. In practice, the CTQ-SF should facilitate further questioning regarding traumatic events in childhood, and clinical cutoffs are used to determine the degree of severity of childhood trauma. Based on previous research and this study's findings, practitioners should avoid underestimating histories of traumatic events in childhood without consideration of patient gender [15], poverty level, and HIV status, and future studies comparing gender, poverty level, and HIV status groups must consider the impact of measurement bias. In the absence of scalar invariance for these groups, statistical inferences and implications for practice based on comparisons of observed means will be distorted and may be misleading, and as such, established cutoffs may not apply similarly for these groups.

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Fig. 1.
Five-factor solution of the Childhood Trauma Questionnaire-Short Form.

Table 1

Reliability, Correlations, and Descriptive Statistics for the Childhood Trauma Questionnaire Subscales.

	Emotional Abuse	Physical Abuse	Sexual Abuse	Emotional Neglect	Physical Neglect
1. Emotional Abuse	–				
2. Physical Abuse	0.882***	–			
3. Sexual Abuse	0.787***	0.677***	–		
4. Emotional Neglect	0.792***	0.729***	0.538***	–	
5. Physical Neglect	0.705***	0.727***	0.476***	0.871***	–
<i>M</i>	10.19	9.74	8.67	11.38	8.04
<i>SD</i>	5.61	5.13	6.12	5.32	3.98
<i>McDonald's</i> ω	0.90	0.90	0.91	0.98	0.87

Note. N=473. Estimated Correlation Matrix for the Latent Variables.

 $p < 0.001$.

Table 2

Tests of Measurement Invariance of the Childhood Trauma Questionnaire by Gender.

	χ^2	df	χ^2_{diff}	df	RMSEA (90% CI)	WRMR	CFI	TLI
Measurement Invariance								
Equal form (Configural Invariance)	1189.843 ***	484			0.079 (0.073–0.084)	1.576	0.98	0.98
Equal factor loadings (Metric Invariance)	1121.829 ***	503	46.159 ***	19	0.072 (0.066–0.078)	1.688	0.98	0.98
Equal factor loadings except item 4 (Partial Metric Invariance)	1126.487 ***	502	42.847 ***	18	0.073 (0.067–0.078)	1.676	0.98	0.98
Equal factor loadings except items 4 and 1 (Partial Metric Invariance)	1130.632 ***	501	39.607 **	17	0.073 (0.067–0.079)	1.667	0.98	0.98
Equal factor loadings except items 4, 1, and 26 (Partial Metric Invariance)	1116.729 ***	500	30.547 *	16	0.072 (0.067–0.078)	1.646	0.98	0.98

Note. N=473; n=243 males and n=230 females. χ^2_{diff} = nested difference. RMSEA= root mean square of error approximation. 90% CI=90% confidence interval for RMSEA. WRMR=weighted root mean square residual. CFI=comparative fit index. TLI=Tucker-Lewis Index. Equal indicator thresholds and error variances was not tested.

* $p < 0.05$

**

* $p < 0.01$

* $p < 0.001$.

Table 3

Tests of Measurement Invariance of the Childhood Trauma Questionnaire by Income Level.

	χ^2	<i>df</i>	χ^2_{diff}	<i>df</i>	RMSEA (90% CI)	WRMR	CFI	TLI
Measurement Invariance								
Equal form (Configural Invariance)	1173.220	484			0.078 (0.072–0.083)	1.554	0.98	0.98
Equal factor loadings (Metric Invariance)	1067.245	503	32.510*	19	0.069 (0.063–0.075)	1.636	0.98	0.99
Equal indicator thresholds (Scalar Invariance)	–	–	–	–	–	–	–	–
Equal indicator error variances (Strict Invariance)	–	–	–	–	–	–	–	–

Note. N=473; n=202 below the poverty level and n=271 above the poverty level. χ^2_{diff} = nested difference. RMSEA=root mean square of error approximation. 90% CI=90% confidence interval for RMSEA. WRMR=weighted root mean square residual. CFI=comparative fit index. TLI=Tucker-Lewis Index. Equality of indicator thresholds and error variances was not tested.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Table 4
Tests of Measurement Invariance of the Childhood Trauma Questionnaire by HIV Status.

	χ^2	df	χ^2_{diff}	df	RMSEA (90% CI)	WRMR	CFI	TLI
Measurement Invariance								
Equal form (Configural Invariance)	1131.132	484			0.075 (0.069–0.081)	1.538	0.98	0.98
Equal factor loadings (Metric Invariance)	1029.283	503	27.032	19	0.067 (0.061–0.072)	1.605	0.98	0.98
Equal indicator thresholds (Scalar Invariance)	1132.489	594	120.946*	91	0.062 (0.056–0.067)	1.661	0.98	0.98
Equal indicator error variances (Strict Invariance)	–	–	–	–	–	–	–	–

Note. N=473; n=302 HIV-uninfected and n=171 HIV-infected. χ^2_{diff} = nested difference. RMSEA=root mean square of error approximation. 90% CI=90% confidence interval for RMSEA. WRMR=weighted root mean square residual. CFI=comparative fit index. TLI=Tucker-Lewis Index. Equality of error variances was not tested.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$.