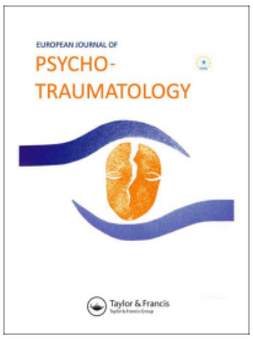

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BASIC RESEARCH ARTICLE

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Screening PTSD in clinical populations within East Africa: results from the first follow-up study of NeuroGAP-psychosis

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ABSTRACT

Background: Given the high burden of trauma in Sub-Saharan Africa, there is a critical need for scalable tools to screen for trauma and posttraumatic stress disorder (PTSD) symptoms, especially in low-resource settings.

Objective: This study aimed to evaluate the utility, reliability, and validity of the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) administered over the telephone to individuals previously enrolled in the Neuropsychiatric Genetics of African Populations-Psychosis study (NeuroGAP-Psychosis) study in Uganda ($N = 4,921$) and Kenya ($N = 3,149$).

Method: Cases with psychosis and controls without psychosis (patients, caretakers, or employees) were recontacted from the NeuroGAP-Psychosis study and enrolled in a follow-up study. This follow-up included a phone-based assessment of trauma and PTSD using the Life Events Checklist for DSM-5 (LEC-5) and the PC-PTSD-5, followed by an in-person assessment of PTSD using the PTSD Checklist for the DSM-5 (PCL-5). All interviews were conducted in local languages and by trained research assistants.

Results: High rates of participant recontact and completion were achieved, with 60% of participants in the Ugandan cohort and 85% in the Kenyan cohort successfully completing the trauma and PTSD assessment over the phone. In both countries, approximately 80% of those screened by phone also completed the in-person interview. The PC-PTSD-5 demonstrated overall good to acceptable reliability ($\alpha = 0.85/\omega = 0.86$ in Ugandan cohort; $\alpha = 0.76/\omega = 0.77$ in Kenyan cohort), across both cases with psychosis and controls without psychosis, and across the different study languages. Furthermore, evaluation of the PC-PTSD-5 against the PCL-5 in Uganda revealed strong performance based on both sensitivity (91%) and specificity (77%).

Conclusions: The first follow-up study in NeuroGAP-Psychosis successfully demonstrates the feasibility of a hybrid telephone and in-person PTSD screening protocol in Sub-Saharan Africa. The results are a first step in establishing the research and clinical use of brief, scalable PTSD screening instruments in low-resource settings and in populations affected by psychosis.

Cribado de TEPT en poblaciones clínicas de África Oriental: resultados del primer estudio de seguimiento de NeuroGAP-psychosis

Antecedentes: Dada la alta carga de trauma en África Subsahariana, existe una necesidad crítica de herramientas escalables para el cribado de síntomas de trauma y trastorno de estrés postraumático (TEPT), especialmente en entornos de bajos recursos.

Objetivo: Este estudio tuvo como objetivo evaluar la utilidad, fiabilidad y validez del Cribado de TEPT en Atención Primaria para DSM-5 (PC-PTSD-5 por sus siglas en ingles), administrado telefónicamente a personas previamente inscritas en el estudio de Genética Neuropsiquiátrica de Poblaciones Africanas-Psicosis (NeuroGAP-Psychosis) en Uganda ($N = 4.921$) y Kenia ($N = 3.149$).

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KEYWORDS
Post-traumatic stress disorder; psychotic disorders; PC-PTSD-5; PCL-5; screening; validity; sensitivity and specificity; Sub-Saharan Africa; Uganda; Kenya

PALABRAS CLAVE
Trastorno de estrés postraumático; trastornos psicóticos; PC-PTSD-5; PCL-5; cribado; validez; sensibilidad y especificidad; África subsahariana; Uganda; Kenia

HIGHLIGHTS

- This study demonstrates large-scale recontact, consent, and PTSD screening via telephone and in-person in the NeuroGAP-Psychosis study in Uganda and Kenya.
- Studies focused on trauma or PTSD symptom assessments can successfully combine phone and in-person methods to facilitate research in low-resource settings and clinical screenings.
- The PC-PTSD-5 can be used as an effective first-step screening tool across different local languages and among individuals with and without psychosis in this cohort.

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Método: Se contactó nuevamente a casos con psicosis y controles sin psicosis (pacientes, cuidadores o empleados) del estudio NeuroGAP-Psychosis y se los inscribió en un estudio de seguimiento. Este seguimiento incluyó una evaluación telefónica de trauma y TEPT utilizando la Lista de Verificación de Eventos Vitales para el DSM-5 (LEC-5) y el PC-PTSD-5, seguida de una evaluación presencial de TEPT utilizando la Lista de Verificación de TEPT para el DSM-5 (PCL-5). Todas las entrevistas se realizaron en los idiomas locales y fueron realizadas por asistentes de investigación capacitados.
Resultados: Se lograron altas tasas de recontacto y finalización de la entrevista por parte de los participantes: el 60% de los participantes de la cohorte ugandesa y el 85% de la cohorte keniana completaron con éxito la evaluación del trauma y el TEPT por teléfono. En ambos países, aproximadamente el 80% de los participantes evaluados por teléfono también completaron la entrevista presencial. El PC-PTSD-5 demostró una fiabilidad general entre buena y aceptable (α = 0,85/ω = 0,86 en la cohorte ugandesa; α = 0,76/ω = 0,77 en la cohorte keniana), tanto en casos con psicosis como en controles sin psicosis, y en los diferentes idiomas del estudio. Además, la evaluación del PC-PTSD-5 frente al PCL-5 en Uganda reveló un rendimiento sólido, tanto en sensibilidad (91%) como en especificidad (77%).
Conclusiones: El primer estudio de seguimiento de NeuroGAP-Psychosis demuestra exitosamente la viabilidad de un protocolo híbrido de cribado telefónico y presencial del TEPT en África subsahariana. Los resultados constituyen un primer paso para establecer la investigación y el uso clínico de instrumentos breves y escalables de cribado del TEPT en entornos de bajos recursos y en poblaciones afectadas por psicosis.

1. Introduction

Posttraumatic stress disorder (PTSD) is a commonly occurring mental health consequence of exposure to traumatic events such as combat, sexual assault, natural disasters, and serious accidents. The African continent faces a disproportionately high burden of trauma exposure and PTSD symptoms. A systematic review of the prevalence of PTSD in ten Sub-Saharan African (SSA) countries found that the overall prevalence of PTSD was 22% (95% CI 13%–32%), ranging from 8% in conflict un-exposed regions to 30% in conflict-exposed regions (Ng et al., 2020). Despite these high prevalence rates and the existence of effective psychological interventions, PTSD remains undertreated in SSA (Ntlantsana et al., 2022). Many factors contribute to this treatment gap, including limited access to mental healthcare, shortage of mental health professionals, stigma and cultural attitudes toward mental illness, as well as the limited evidence on culturally validated screening tools for the early identification of individuals at risk for developing PTSD symptoms. This study aims to address this gap by examining the psychometric properties and utility of the PC-PTSD-5, a commonly used screening tool for PTSD among a clinical sample with and without psychosis in East Africa.

The Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) is a five-item screening tool designed to identify probable PTSD in primary care settings that demonstrates strong diagnostic accuracy in both veteran and civilian populations in high-income countries (Bovin et al., 2021; Prins et al., 2016). Less is known about its performance in low- and middle-income countries, especially in the African context. Of the eleven studies we identified that used the PC-PTSD-5 to assess posttraumatic symptoms in SSA, six focused on persons with HIV, three on healthcare workers, one on internally displaced people, and one on those seeking treatment for depression. For example, the PC-PTSD-5 screener has been utilized to assess probable PTSD in adolescents and young people living with HIV in South Africa, Uganda, Zimbabwe, and Mozambique (Di Gennaro et al., 2022; Haas et al., 2020; Webb et al., 2022). These studies reveal higher PTSD symptoms in persons with HIV (Di Gennaro et al., 2022) and positive associations between higher PTSD scores and both viral load (Haas et al., 2020) and HIV risk behavior (Webb et al., 2022). The PC-PTSD-5, paired with the Patient Health Questionnaire - 9 (PHQ-9) and the Generalized Anxiety Disorder - 7 (GAD-7), has also been utilized as a quick way to assess mental health among vulnerable populations such as healthcare workers during the COVID-19 pandemic in Malawi (Maliwichi et al., 2024) and Kenya (Kwobah et al., 2021) and internally displaced people in the north region of Mozambique (Manafe et al., 2024).

Furthermore, to our knowledge, only three studies have evaluated the psychometric properties of the PC-PTSD-5 in SSA. One study of 957 participants in Mozambique (Massinga et al., 2025) validated the Portuguese version of the PC-PTSD-5 against the Mini International Neuropsychiatric Interview (MINI) PTSD module and found high internal consistency, moderate sensitivity (67%), and high specificity (83%) when using a screening cutoff of ≥ 3. Similarly, the performance of the PC-PTSD-5 has also been validated against the MINI in South Africa (Stockton et al., 2024) in a sample of 1,885 adults from primary care facilities. This study, administered in English and isiXhosa, revealed good internal consistency for the PC-PTSD-5 (Cronbach's alpha = 0.83; McDonald's

Omega = 0.83), 62% sensitivity, and 82% specificity when using a cutoff score of ≥ 4. In East Africa, the psychometric properties of the Swahili version of the PC-PTSD-5 were evaluated in 1,431 adults within Nairobi, Mombasa, and Kwale counties in Kenya (Mwangala et al., 2024). This study found that the PC-PTSD-5 had good internal consistency, with Cronbach's alpha and McDonald's Omega values both above 0.7 in addition to good convergent and discriminant validity as measured against the PHQ-9, GAD-7, and WHO wellbeing index.

Although the PC-PTSD-5 has been used in the SSA context, there are several limitations to its wider application. First, the tool has only been administered during in-person interviews, and its utility over the phone has not been assessed. Given that in-person screening efforts can be time-consuming, expensive, and biased towards people seeking medical care, establishing the validity of conducting phone screens would be useful for research on the continent by expanding recruitment efforts and reducing participant burden. Mobile phone usage is extremely common across SSA and serves as the predominant form of connectivity (Pew Research Center, 2015; Silver & Johnson, 2018), reflecting the promise of mobile phone-based screening. Second, while the PC-PTSD-5 screener has been applied to diverse populations such as youth and adults living with HIV (Di Gennaro et al., 2022; Haas et al., 2020; Kekibiina et al., 2021) and adults with major depression (Meffert et al., 2024), it has not been administered nor formally tested in people with psychosis.. Tools to assess PTSD in people with psychosis, including those reflected in the Neuropsychiatric Genetics in African Populations-Psychosis (NeuroGAP-Psychosis) study, are critical given the established bi-directional link between trauma exposure and psychosis in such populations, including in the African context (Stevenson et al., 2024). Finally, the PC-PTSD-5 has not yet been systematically assessed in Uganda, where there is vast diversity in languages and important historical context due to political and geographical difference across regions. Psychometric evaluations of the screener are needed in multiple Ugandan languages including Lugbara and Acholi-Luo, two languages common to northern Uganda and spoken by approximately 2.6 million people in the region. More generally, given the diversity of the SSA region, additional evaluations of the psychometric properties of the PC-PTSD-5 are needed to complement the three existing in the region.

The present study aims to address three goals. *First*, we aim to determine the extent to which NeuroGAP-Psychosis participants recruited in Uganda and Kenya, both with and without psychosis, can be recontacted, screened for trauma and PTSD by phone, and assessed in person. *Second*, we aim to evaluate the reliability and validity of the PC-PTSD-5 in persons with and without psychosis and across six study languages: English, Kiswahili, Luganda, Lugbara, Runyakole, and Acholi-Luo. *Third*, we aim to assess whether the PC-PTSD-5 can adequately screen for probable PTSD as measured by the PTSD Checklist for DSM-5 (PCL-5) in our sample population. The outcomes of this study will allow researchers to better implement efficient and resource-sensitive screening procedures for PTSD symptoms, thereby contributing to more efficient assessment in clinical samples.

2. Methods

2.1. Study setup and training

This study recruited participants from the NeuroGAP-Psychosis study, a genetic case–control study of psychotic disorders across four African countries. Information and details on inclusion and exclusion criteria, participant recruitment, training, and ethics for the NeuroGAP-Psychosis study can be found in our protocol paper (Stevenson et al., 2019). This NeuroGAP-Psychosis follow-up study was conducted at Makerere University in Kampala, Uganda and at Moi University and Moi Teaching and Referral Hospital in Eldoret, Kenya. In Uganda, participants were recruited at Butabika National Mental Health Referral Hospital, China-Uganda Friendship Hospital Naguru, Arua Regional Referral Hospital, Mbarara Regional Referral Hospital, and Gulu Regional Referral Hospital. Study materials were forward-translated to Luganda, Lugbara, Runyankole or Acholi-Luo, and back-translated to English. In Eldoret, Kenya, the recruitment sites included the Moi Teaching and Referral Hospital, as well as six associated clinics in the towns of Webuye, Kakamega, Kapenguria, Kitale, Kapsabet, and Iten. Recruitment and study materials were forward and back translated between Kiswahili and English.

Before the study was implemented, all research assistants (RAs) were trained on data collection procedures, including research ethics, informed consent, interview procedures, and study instrument administration. Training protocols were originally developed and have been detailed in the parent study (Stevenson et al., 2019). All research was performed in accordance with ethical approval from local and national IRBs in Uganda (The Makerere University School of Medicine Research and Ethics Committee (#Mak-SOMREC-2022-325)) and in Kenya (Moi University College of Health Sciences/Moi Teaching and Referral Hospital Institutional Research and Ethics Committee (IREC: #0004101) and Kenya National Council of Science and Technology (#NACOSTI/P/22/17303)), as well as the Harvard T. H. Chan School of Public Health (IRB #22-1002).

2.2. Recruitment, study procedures, and measures

The NeuroGAP-Psychosis parent study collected information on participants' willingness to be recontacted for future research. In Uganda, $N = 11{,}281$ (94.0%) of participants from the full cohort ($N = 12{,}000$) agreed to be recontacted in the future. In Kenya, $N = 5{,}131$ (98.7%) of the full cohort ($N = 5{,}200$) agreed to be recontacted. During our study period (June 2022–May 2025), RAs recontacted eligible participants by telephone to invite them to participate in this follow-up study ($N_{\text{Uganda}} = 8{,}268$; $N_{\text{Kenya}} = 3{,}676$). Participants were excluded if they (1) exhibited acute, intrusive levels of psychiatric symptoms, (2) were inpatient or under acute medical care for acute levels of alcohol or substance abuse, (3) were involuntarily detained or (4) were admitted as inpatients at the time of recontact. All recruitment conversations were conducted in the participant's preferred language by an RA trained in human subjects research.

This study was conducted in two phases: step 1 was performed over the telephone, and step 2 was performed in person at a hospital or research clinic. During step 1, an RA contacted the participant via telephone and verified the participant's identity by requesting sex, year of birth, and last name. If responses aligned with the recorded responses in the NeuroGAP-Psychosis study, the RA explained the purpose and procedures of the research and collected verbal consent. For those eligible and interested in participation, the RA administered a phenotypic battery, which included a modified version of the Life Events Checklist for DSM-5 (LEC-5) (Gray et al., 2004), a 17-item measure designed to screen for exposure to lifetime traumatic events. Next, the RA administered a modified version of the PC-PTSD-5, which included questions not only for the past month but also lifetime. The tool provides an initial screening item to assess if the participant had any lifetime trauma exposure. For those who did not endorse trauma exposure, participants were skipped out of the itemized PC-PTSD-5 and were automatically given a score of '0'. If the participant responded yes to the trauma screen, the RA administered the 5 items of the PC-PTSD-5 to measure lifetime and past month probable PTSD (Bovin et al., 2021; Prins et al., 2016). For the PC-PTSD-5, scores range from 0 to 5, with scores of 3 or greater indicating a positive screen for probable PTSD (Prins et al., 2016), requiring further assessment. This total process via telephone lasted roughly 15–20 minutes, with the PC-PTSD-5 screening taking roughly 5 minutes. We defined completion of step 1 as full completion of the PC-PTSD-5.

At the end of step 1, participants were invited by the RA to schedule their step 2 in-person study visit at the hospital or local clinic. In the Ugandan cohort, all interested participants, regardless of their PC-PTSD-5 score, were invited to return for step 2. In the Kenyan cohort, due to an IRB recommendation, only participants who scored a 3 or higher on the PC-PTSD-5 screener were invited for the step 2 interview ($N = 2{,}449$). During the step 2 in-person visit, an RA reviewed the purpose and procedures of the study and recorded written consent. Following consent, the RA collected demographic information and administered a modified version of the PCL-5, which assesses both lifetime and past month PTSD symptoms (Sampson et al., 2022; Weathers, Litz, et al., 2013). The PCL-5 has been validated in two countries in SSA (Niyonsenga et al., 2021; Verhey et al., 2018), and cutoff scores above 33 are generally indicative of clinically significant post-traumatic stress symptoms (Weathers, Blake, et al., 2013). The consent and patient interview for step 2 took approximately 30–45 minutes and participants were compensated for their time and travel expenses. We defined completion of step 2 as full completion (i.e. complete responses) of the PCL-5 tool.

2.3. Additional measures

In addition to the demographics, trauma, and PTSD measures outlined above, relevant variables collected during the NeuroGAP-Psychosis study interview (2018–2022) were utilized in this study. These included case/control status (where cases were defined as having a clinical diagnosis of psychosis (i.e. schizophrenia, bipolar disorder or schizoaffective disorder) and controls were defined as having no clinical diagnosis for psychosis), and language in which consent was given.

2.4. Data analysis

All analyses were completed separately for the Uganda and Kenya cohorts. We utilized modified versions of the PC-PTSD-5 and PCL-5 that assessed lifetime symptoms prior to past-month symptoms and all analyses in this paper focused only on lifetime symptoms. For the PC-PTSD-5, we used a cutoff score of 3, dividing participants into two groups: (1) '*negative PTSD screeners*' (PC-PTSD-5 score of 0–2) and (2) '*positive PTSD screeners*' (PC-PTSD-5 score $\geq$ 3). For some descriptive analyses, we further separated negative PTSD screeners according to whether they endorsed a traumatic event. For the PCL-5 20-item checklist, we stratified participants into three groups based on their distribution scores: (1) '*low PTSD symptoms* group (PCL-5 scores between 0 and 14), (2) '*moderate PTSD symptoms*' group (PCL-5 scores between 15 and 32), and (3) '*high PTSD symptoms*' group (PCL-5 scores 33 and above). The cutoff score of 33 was

used to identify probable PTSD (Weathers, Blake, et al., 2013).

Our first analysis goal was to determine whether participants from the NeuroGAP-Psychosis study could successfully be recontacted by phone to consent, enroll, and be assessed for trauma and PTSD symptoms. For each cohort, we determined the number and percentage of participants at each step of the study. Participants were further grouped by their step 1 responses, specifically by those who responded yes to experiencing a trauma exposure on the PC-PTSD-5 screener and those who then screened positive on the PC-PTSD-5. Lastly, we tracked the number and percentage of participants who returned in person to complete step 2, and those who endorsed probable PTSD as assessed by the PCL-5. We compared key demographic variables between three groups: (1) all eligible NeuroGAP-Psychosis participants, (2) participants who completed step 1 of the study over the phone, and (3) participants who completed step 2 of the study in person. These variables included psychosis case status, sex, age, study site, and consent language. We computed means and standard deviations for continuous variables, and counts and percentages for categorical variables.

Our second goal was to examine the reliability and validity of the PC-PTSD-5. We computed Cronbach's alpha (α) and McDonald's omega (ω) coefficients to assess the internal consistency reliability of the PC-PTSD-5 screener. Prior work (Mwangala et al., 2024) has suggested a one-factor solution and thus, we also specified a one-factor solution for omega calculations. We also assessed reliability by case status and across the five study languages used in Uganda and two study languages used in Kenya to investigate whether the PC-PTSD-5 demonstrated reliability among subsamples of participants with severe mental illness and across different language translations. To assess the construct validity of the PC-PTSD-5 in Uganda, we examined the proportion of positive PTSD screener outcomes across the different research sites in Uganda: Arua and Gulu (Northern Uganda), Mbarara (Southern Uganda), and Kampala (capital city). Considering the history of decades-long political violence in Northern Uganda, we expected higher rates of positive screens in this region. Observing such regional differences provide preliminary evidence of known-groups (construct) validity for the PC-PTSD-5 across Uganda (Ng et al., 2020; Vinck et al., 2007). Because participants were recruited from the same catchment area in Eldoret, Kenya, we were not able to assess the validity of the PC-PTSD-5 in the Kenyan cohort.

Our third goal was to assess whether the PC-PTSD-5 can adequately screen for PTSD using the PCL-5. To test the associations between the PC-PTSD-5 and PCL-5, we cross-tabulated the number of participants scoring above and below the cut-off score of 3 on the PC-PTSD-5 against the number of participants scoring in the low, moderate and high PTSD symptom categories of the PCL-5. Additionally, in the Ugandan cohort, we calculated the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and Cohen's Kappa of the PC-PTSD-5 against the PCL-5, using cut-offs of 3 on the PC-PTSD-5 and 33 on the PCL-5. We repeated these analyses stratifying by psychosis case status and ran a sensitivity analysis using a cut-off score of 4 on the PC-PTSD-5. Unless clearly stated otherwise, a negative PC-PTSD-5 trauma screener includes those who did not endorse trauma exposure and those who endorsed trauma exposure but scored less than 3 on the follow-up questions.

3. Results

3.1. Recontact and follow-up of NeuroGAP-Psychosis study participants

Table 1 outlines relevant demographic information. Participant ages at the phone interview ranged from 19–88 years (mean = 38.7; SD = 11.7) in the Ugandan cohort and 19–82 years (mean = 40.4; SD = 12.0) in the Kenyan cohort. The sample included 4,147 controls ($N_{\text{Uganda}} = 2{,}557$, $N_{\text{Kenya}} = 1{,}590$), and 3,923 cases ($N_{\text{Uganda}} = 2{,}364$, $N_{\text{Kenya}} = 1{,}559$). Participants enrolled in this follow-up study were demographically similar to the overall NeuroGAP-Psychosis study in endorsement of psychosis disorders, sex, age, and consent language.

Figure 1 shows how participants moved throughout the research study and their trauma and PTSD endorsements. During the phone interview (step 1), 3,121 (63.4%) participants in the Ugandan cohort and 2,885 (91.6%) participants in the Kenyan cohort endorsed experiencing a traumatic event, as assessed by the PC-PTSD-5 screener. For those with any trauma exposure, 1,862 (59.7%) participants in the Ugandan cohort and 2,449 (84.9%) participants in the Kenyan cohort endorsed 3 or more items on the PC-PTSD-5, defined in our study as screening positive. Among all PC-PTSD-5 respondents, 37.8% and 77.8% screened positive in Uganda and Kenya, respectively. A subsample of participants who completed the phone interview in step 1 returned for an in-person interview as a part of step 2 (Figure 1). In the Ugandan cohort, 3,807 (77.4%) of step 1 participants came to the clinic and were administered the PCL-5 (Table 2). In the Kenyan cohort, only those who screened positive (≥3) on the PC-PTSD-5 were invited to come into the clinic or hospital for the step 2 interview. Of these eligible participants, 1,923 (78.5%) came to the hospital or clinic in person and received the PCL-5(Table 2). At sites in both countries, demographic variables, including sex,

Table 1. Demographics of the PTSD follow-up study participants across Uganda and Kenya.

	Uganda			Kenya		
	Eligible to Participate in PTSD F/U from Parent Study (*N* = 11281) *N* (%)	Step 1[a] (*N* = 4921) *N* (%)	Step 2[a] (*N* = 3807) *N* (%)	Eligible to Participate in PTSD F/U from Parent Study (*N* = 5131) *N* (%)	Step 1[a] (*N* = 3149) *N* (%)	Step 2[a] (*N* = 1923) *N* (%)
Controls (Without Psychotic Disorders)	5616 (49.8)	2557 (52.0)	1943 (51.0)	2568 (50.0)	1590 (50.5)	1008 (52.4)
Cases (With Psychotic Disorders)	5665 (50.2)	2364 (48.0)	1864 (49.0)	2563 (50.0)	1559 (49.5)	915 (47.6)
Schizophrenia + Psychosis NOS	*2485 (43.9)*	*884 (37.4)*	*704 (37.8)*	*1490 (58.1)*	*876 (56.2)*	*511 (55.8)*
Bipolar + Mania NOS	*3088 (54.5)*	*1444 (61.1)*	*1134 (60.8)*	*1052 (41.0)*	*670 (43.0)*	*396 (43.3)*
Schizoaffective Disorder	*92 (1.6)*	*36 (1.5)*	*26 (1.4)*	*21 (0.8)*	*13 (0.8)*	*8 (0.9)*
Study Sites for Uganda[b]						
Arua	1792 (15.9)	725 (14.7)	697 (18.3)	–	–	–
Gulu	2538 (22.5)	1092 (22.2)	835 (21.9)	–	–	–
Mbarara	1724 (15.3)	865 (17.6)	551 (14.5)	–	–	–
Kampala	5227 (46.3)	2239 (45.5)	1724 (45.3)	–	–	–
Sex						
Male	5261 (46.6)	2370 (48.2)	1853 (48.7)	2638 (51.4)	1593 (50.6)	924 (48.0)
Female	6020 (53.4)	2551 (51.8)	1954 (51.3)	2493 (48.6)	1556 (49.4)	999 (52.0)
Age Group[c]						
18–29	3930 (34.8)	1248 (25.4)	1243 (32.7)	1794 (35.0)	679 (21.6)	589 (30.6)
30–44	4711 (41.8)	2249 (45.7)	1696 (44.5)	2106 (41.0)	1422 (45.2)	862 (44.8)
45–64	2401 (21.3)	1303 (26.5)	819 (21.5)	1119 (21.8)	928 (29.5)	434 (22.6)
65+	239 (2.1)	121 (2.5)	49 (1.3)	112 (2.2)	120 (3.8)	38 (2.0)
Consent Language[c]						
Acholi-Luo	2079 (18.4)	878 (17.8)	678 (17.8)	0 (0)	0 (0)	0 (0)
English	4743 (42.0)	2273 (46.2)	1711 (44.9)	2732 (53.2)	1871 (59.4)	1140 (59.3)
Kiswahili	0 (0)	0 (0)	0 (0.0)	2399 (46.8)	1278 (40.6)	783 (40.7)
Luganda	2228 (19.8)	871 (17.7)	717 (18.8)	0 (0)	0 (0)	0 (0)
Lugbara	1078 (9.6)	380 (7.7)	369 (9.7)	0 (0)	0 (0)	0 (0)
Runyankole	1153 (10.2)	519 (10.5)	332 (8.7)	0 (0)	0 (0)	0 (0)

[a]Step 1 refers to completion of the phone-based PC-PTSD-5 screener. Step 2 refers to completion of the in-person PCL-5.
[b]Study site is from the parent study.
[c]Age and consent language for 'Eligible' are from the parent study, while age and consent language for both Step 1 and Step 2 are from Step 1 of current follow-up study.

age, consent language, and recruitment site (Uganda only) and ratios between psychosis cases and controls remained largely consistent between participants who completed step 1 over the phone and participants who visited the clinic for the step 2 in-person interview (Table 1).

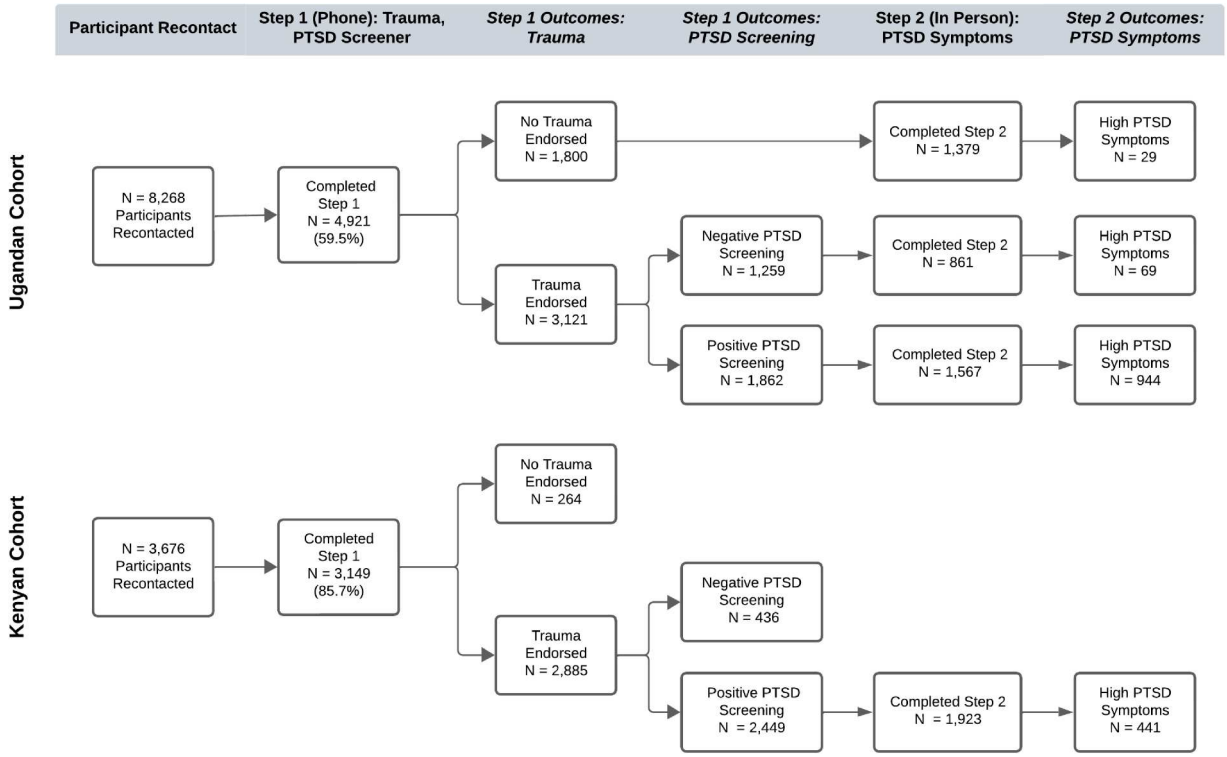

Figure 1. An Overview of participation and Trauma and PTSD outcomes in the Ugandan and Kenyan cohorts.

Table 2. Lifetime PTSD symptoms grouped by PC-PTSD-5 screening thresholds among PTSD follow-up study participants.

	Uganda				Kenya			
	PLC-5 Category				PCL-5 Category			
PC-PTSD-5 Category[a]	Total *N* = 3807 *N* (%)	Low PTSD Symptoms[b] *N* = 2073 *N* (%)	Moderate PTSD Symptoms[c] *N* = 692 *N* (%)	High PTSD Symptoms[d] *N* = 1042 *N* (%)	Total *N* = 1923 *N* (%)	Low PTSD Symptoms[b] *N* = 192 *N* (%)	Moderate PTSD Symptoms[c] *N* = 1290 *N* (%)	High PTSD Symptoms[d] *N* = 441 *N* (%)
No Trauma Endorsed	1379 (100)	1304 (94.6)	46 (3.3)	29 (2.1)	–	–	–	–
Endorsed Trauma; Negative Screener	861 (100)	590 (68.5)	202 (23.5)	69 (8.0)	–	–	–	–
Endorsed Trauma; Positive Screener	1567 (100)	179 (11.4)	444 (28.3)	944 (60.2)	1923 (100)	192 (10.0)	1290 (67.1)	441 (22.9)

[a]A positive screening score is ≥ 3 on the PC-PTSD-5; questions on the PC-PTSD-5: 1. Have you ever had nightmares about the event(s) or thought about the event(s) when you did not want to?; 2. Have you ever tried hard not to think about the event(s) or went out of your way to avoid situations that reminded you of the event(s)?; 3. Have you ever been constantly on guard, watchful, or easily startled?; 4. Have you ever felt numb or detached from people, activities, or your surroundings?; 5. Have you ever felt guilty or unable to stop blaming yourself or others for the event(s) or any problems the event(s) may have caused?
[b]PCL score of 0–14.
[c]PCL score 15–32.
[d]PCL score 33 or greater.

3.2. Internal consistency and validity of the PC-PTSD-5

We computed the Cronbach's alpha (α) and McDonald's omega (ω) coefficients to assess the internal consistency reliability of the PC-PTSD-5 screener. In both Kenyan and Ugandan cohorts, there was acceptable internal consistency reliability in the full sample and when separated by psychosis cases and controls (Table 3). When we examined reliability by consent language, we found that internal consistency reliability in the Ugandan cohort ranged from α = 0.75/ ω = 0.75 for Runyankole to α = 0.88/ ω = 0.88 for Luganda. In the Kenyan cohort, internal consistency reliability was α = 0.75/ ω = 0.77 for English and α = 0.77/ω = 0.78 for Kiswahili.

In the Ugandan cohort, we assessed the percentage of participants who screened positive on the PC-PTSD-5 at each study site (Figure 2). While all study sites in Uganda had high levels of endorsement of PC-PTSD-5 ≥ 3, Arua and Gulu had the highest at 78.5% and 41.8%, respectively. Mbarara and Kampala had lower endorsements of PC-PTSD-5 ≥ 3 at 27.5% and 26.7%, respectively.

Table 3. Internal Consistency of the PC-PTSD-5 Among Those with and without Trauma Endorsement.

	Cronbach's α	McDonald's ω
Uganda		
Total (*N* = 4921)	0.85	0.86
Case status		
Cases (*N* = 2364)	0.86	0.86
Controls (*N* = 2557)	0.85	0.85
Consent language		
Acholi-Luo (*N* = 878)	0.77	0.78
English (*N* = 2273)	0.87	0.87
Luganda (*N* = 871)	0.88	0.88
Lugbara (*N* = 380)	0.83	0.85
Runyankole (*N* = 519)	0.75	0.75
Kenya		
Total (*N* = 3149)	0.76	0.77
Case status		
Cases (*N* = 1559)	0.81	0.81
Controls (*N* = 1590)	0.71	0.73
Consent language		
English (*N* = 1871)	0.75	0.77
Kiswahili (*N* = 1278)	0.77	0.78

Those who did not endorse a trauma were included in these calculations and were given 0s on all 5 PC-PTSD-5 questions. Note: one person from Uganda was excluded from these analyses due to missing data on individual questions.

3.3. Evaluation of the PC-PTSD-5 against the PCL-5

Associations between the PC-PTSD-5 and the PCL-5 were examined in participants who completed both the PC-PTSD-5 at step 1 and the PCL-5 at step 2 (N_{Uganda} = 3,807; N_{Kenya} = 1,923). In the Ugandan cohort, approximately 60% (*N* = 944) of participants who screened positive on the PC-PTSD-5 also scored at or above the cut off score of 33 on the PCL-5 (Table 2). Further, 96% (*N* = 2,142) of participants who screened negative on the PC-PTSD-5 (including those with and without trauma endorsement) also scored below the cut off score of 33 on the PCL-5. When we further disaggregated the below threshold PTSD symptoms group into PCL-5 scores of 0–14 (low PTSD symptoms) and 15–32 (moderate PTSD symptoms), we found that 18% (*N* = 692) of the sample in Uganda overall had moderate PTSD symptoms. In the Kenyan cohort, the PCL-5 was only administered to participants who scored at or above a cut-off of 3 on the PC-PTSD-5 screener. Of these, 23% (*N* = 441) scored at or above the cut off score of 33 on the PCL-5 (Table 3a). When we examined the distribution of PCL-5 scores, we found that 67% (*N* = 1290) of those who scored ≥ 3 on the PC-PTSD-5 had moderate PTSD symptoms.

Additionally, we examined the association between the PC-PTSD-5 (using a cut-off of ≥3) and the PCL-5 (using a cut-off of ≥33) in the Ugandan cohort, and found a 91% sensitivity rate, 77% specificity rate, 60% positive predictive value, and 96% negative predictive value. When we stratified by case status, for psychosis cases we found a sensitivity rate of 89%,

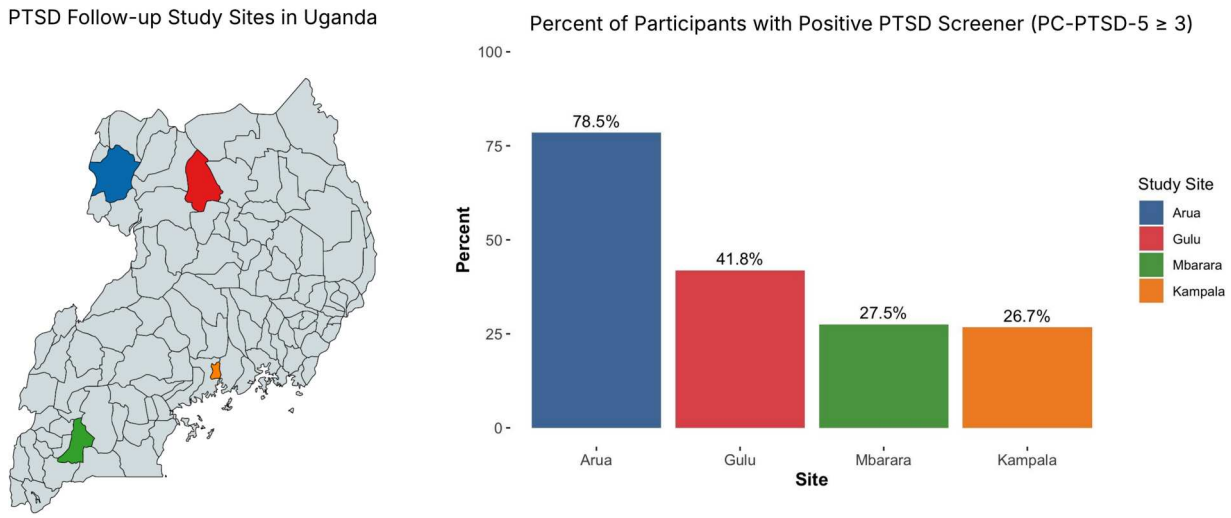

Figure 2. Percent of participants with positive PC-PTSD-5 Screeners across Ugandan Research sites in the PTSD follow-up study.

specificity rate of 77%, positive predictive value of 63%, and negative predictive value of 94%. For controls, we found a sensitivity rate of 93%, specificity rate of 78%, positive predictive value of 57%, and negative predictive value of 97%. Outcomes when using a cut-off of ≥4 are available in Supplementary Table 1. Due to differences in study design, we were unable to calculate the sensitivity, specificity, positive predictive value, and negative predictive value for participants enrolled at sites in Kenya.

Lastly, to assess agreement between the PC-PTSD-5 and PCL-5 scores, Cohen's Kappa was calculated for the Ugandan cohort. Results of Cohen's Kappa were 0.59 [0.56, 0.61]. Additionally, separate Cohen's Kappa values were calculated for cases with psychosis and controls without psychosis to assess differences in interrater reliability between the two groups. Results of Cohen's Kappa yielded values of 0.59 [0.55, 0.63] and 0.58 [0.55, 0.62] for cases and controls, respectively. Results when using a cut-off of ≥4 are available in Supplementary Table 1. Due to differences in study design, we were unable to calculate Cohen's Kappa for sites in the Kenyan cohort.

4. Discussion

In this first follow-up study of NeuroGAP-Psychosis (Stevenson et al., 2019), we demonstrated our ability to recontact and enroll a large number of participants originally recruited in Uganda and Kenya, screen them for trauma and PTSD by phone, and assess them for PTSD symptoms in person. Among participants who were recontacted, approximately 60% and 85% of the Ugandan and Kenyan cohorts, respectively, were successfully screened by phone using the PC-PTSD-5. Nearly 80% of those screened by phone were brought back for in-person evaluation via the PCL-5 in both countries. Demographic characteristics of these respondents, both during the phone interview and in-person interview, were largely similar to those of the NeuroGAP-Psychosis parent study. Furthermore, we established good to acceptable reliability and validity of the PC-PTSD-5 in persons with and without psychosis in the Ugandan and Kenyan cohorts. In our sample population, we found that accuracy of the PC-PTSD-5 was strong as assessed by sensitivity and specificity, and moderate when correcting for chance agreement. Overall, these results underscore the promise of large-scale hybrid screening strategies for trauma and PTSD via the PC-PTSD-5 in Eastern Sub-Saharan Africa, utilizing both in-person and phone-based assessments.

We were able to recontact a large number of study participants years after their original NeuroGAP-Psychosis enrollment and recruit them to successfully complete a phone-based screen for trauma exposure and PTSD symptoms. This was largely possible due to the high rates of interest from participants for future recontact (94% in the Ugandan cohort and 99% in the Kenyan cohort). Furthermore, we were able to engage the same investigators, sites and hospital partnerships, and maintain the same research team from the parent study for the follow-up study. This ensured consistency in training, deep familiarity with study protocols, and the ability to build rapport with participants. Thus, by capitalizing on the previously established research infrastructure and capacity development initiatives at these research sites through NeuroGAP-Psychosis (Martin et al., 2022), we were able to investigate new phenotypes and develop a longitudinal sub-cohort drawn from the parent study.

Through these efforts, the cohort enrolled in this follow-up study was similar to those who enrolled in the parent study based on key demographic characteristics such as psychosis case status and sex, suggesting that the follow-up study captures an unbiased subsample of the NeuroGAP-Psychosis parent study. Participation rates were 60% in the Ugandan cohort and

86% in the Kenyan cohort. High participation rates are meaningful especially as they are in contrast to other large-scale prospective cohort studies across the globe which report known rates of participation between 5% and 50% (Allen et al., 2024). At both sites, RAs recorded the reasons why eligible participants could not be enrolled into the follow-up study. The majority of participants who could not be successfully recruited back were those who did not respond after three call attempts. In the Kenyan cohort, all NeuroGAP-Psychosis study participants who answered the phone agreed to participate in the follow-up study, while in Uganda, over 99% of those who answered agreed to participate. In addition to the reasons reviewed above, high participation rates may reflect (1) the participant pool of the parent study, which was largely individuals who sought access to medical facilities, their caretakers, or hospital employees, and (2) the application of the UBACC (Jeste et al., 2007), a meticulous informed consent process used as an inclusion criteria in the NeuroGAP-Psychosis study, to assess study specific understanding and comprehension.

Such high participation rates also reflect the potential promise of phone-based approaches for research and screening in similar settings. Among those who participated in the phone-based screener (Step 1) but refused to move forward with an in-person visit (Step 2), transportation related to distance or costs was by far the most cited reason for refusal (84% in Uganda; 90% in Kenya). By administering our screening tools over the phone, we were able to expand access to our research and include a greater number of eligible participants in step 1, especially those living further from the hospital and clinics. This approach was cost-effective while still ensuring participant safety and well-being. Furthermore, these phone-based screeners were performed by research staff who were trained by clinical psychologists but were not themselves clinicians or psychologists. In light of the shortage of mental health professionals in Sub-Saharan Africa (Amu et al., 2024; Nicholas et al., 2022), efforts to train non-specialists to administer trauma and PTSD questionnaires may prove to be a fruitful investment, in line with the larger task-shifting literature (Hoeft et al., 2018; Patel et al., 2018; Purgato et al., 2020). Overall, given the high prevalence of phone ownership across SSA (Pew Research Center, 2015, April 15; Silver & Johnson, 2018, October 9) and the high concordance previously documented between phone-based and traditional paper surveys for PTSD evaluation (Price et al., 2015), phone-based and other digital health approaches may prove to play an increasingly larger role in research and healthcare across SSA, though currently such use for topics of mental health and stress is limited (Aboye et al., 2023).

In this sample of people with and without psychotic disorders, administration of the PC-PTSD-5 and PCL-5 revealed a high burden of trauma and PTSD symptom endorsement. The reporting of any traumatic life event via the PC-PTSD-5 trauma screen in the Ugandan cohort was similar to endorsement of any trauma via the LEC-5 in the NeuroGAP-Psychosis study (Morawej et al., 2024) (approx. 60%). In the Kenyan cohort, trauma endorsements were higher (approximately 90%) compared to the parent study (60%) which measured trauma endorsements using the LEC-5 (Kwobah et al., 2022). Differences in the Kenyan cohort may be attributable to the differences in the tools administered and to the exclusion of 'other' traumatic events in the parent study analyses. While the PC-PTSD-5 uses a one-item question with a yes/no response, the LEC-5 probes for specific traumatic events one at a time, including a write-in option for 'other' traumatic events not listed. Future work may consider the reliability and validity of the trauma screen itself, against the LEC-5 or other approaches to ascertaining trauma exposure. Nearly 40% and 80% of those administered the PC-PTSD-5 in Uganda and Kenya, respectively, screened positive for possible PTSD, and 27% of those administered the PCL-5 in Uganda endorsed high PTSD symptoms indicative of probable PTSD. An additional 18% reported moderate PTSD symptoms via the PCL-5. Similar evaluations of the PC-PTSD-5 against the PCL 5 could not be made in the Kenyan cohort as the protocol only allowed for participants scoring a 3 or higher on the PC-PTSD-5 to be invited for the Step 2 interview. Such estimates of both PTSD and sub-threshold PTSD are vastly higher than those reported in other countries via the WHO World Mental Health Surveys (McLaughlin et al., 2015) but more aligned with prior reports from Uganda and Kenya, though such estimates vary widely depending on the population (Ainamani et al., 2021; Andualem et al., 2024; Bapolisi et al., 2020; Jenkins et al., 2015; Lambert & Denckla, 2021; Mukabana et al., 2023; Vinck et al., 2007).

The internal consistency of the PC-PTSD-5 was good in the Ugandan cohort ($\alpha = 0.85/\omega = 0.86$) and at minimum acceptable in the Kenyan cohort ($\alpha = 0.76/\omega = 0.77$) including among sub-groups defined by psychosis status and consent language. In the Ugandan cohort, such reliability was similar for both cases with psychosis and controls but was somewhat higher among participants who consented in English or Luganda, relative to Acholi-Luo and Runyankole. In Kenya, internal consistency was somewhat higher among cases than controls and did not vary by language. Our results align with the acceptable internal consistency reported in a psychometric study of the Swahili version of the PC-PTSD-5 in Kenya (Mwangala et al., 2024). Evaluation of known-groups validity via comparison of the

percentage of participants who screened positive across recruitment sites in Uganda revealed the highest prevalence of positive screeners in the Northern Ugandan sites of Arua and Gulu, relative to Mbarara in Southern Uganda and the capital city of Kampala. Such differences across sites provide preliminary evidence of construct validity of the PC-PTSD-5 and were largely expected, given the history of political violence, civil unrest, and mass displacements in Northern Uganda that have not affected the South or the capital city to nearly the same extent (Ng et al., 2020, Vinck et al., 2007). This is the first study to assess the PC-PTSD-5 in Lugbara or Acholi-Luo, two of the most commonly spoken languages in Northern Uganda. Such evidence is critical given the high PTSD symptoms exhibited throughout northern regions of Uganda. Finally, regarding evaluation of the PC-PTSD-5 against the PCL-5 in Uganda, the PC-PTSD-5 resulted in minimal false negatives but substantial false positives, which may be appropriate for a screening instrument that is followed by additional testing for those that screen positive. Furthermore, compared to a PC-PTSD-5 cut-off of 4, our use of a cut-off score of 3 allowed us to prioritize sensitivity for screening purposes. Differences between our study and prior studies, which reported comparable specificity and much lower sensitivity (Massinga et al., 2025; Stockton et al., 2024), may be explained by our use of the PCL-5 symptom scale as a stand in for a gold standard diagnostic tool or by the phone-based mode of administration, but not by our population of individuals with psychosis, given the comparable accuracy observed regardless of psychosis diagnostic status. It is also important to note that we utilized modified versions of the PC-PTSD-5 and PCL-5 that assessed lifetime symptoms prior to past-month symptoms. This represents a modification that may limit direct comparability with studies using the standard 'past month' administration. Asking about lifetime symptoms may potentially contribute to the higher prevalence rates observed in our study compared to global estimates. However, we note that our findings remain consistent with other regional estimates from Uganda and Kenya suggesting the modified tools retained utility within this context.

There are several key limitations to this study. We note that recruitment of participants in the parent study occurred within clinics and hospitals. Thus, while our phone-based screening approach may have facilitated better enrollment of hard-to-reach individuals, the sampling frame of participants for the follow-up study included only healthcare-seeking individuals, their healthcare visit companions, and hospital staff. This is particularly relevant to individuals with psychosis, as those who are engaged in care may be different from those not engaged in care in ways that impact the psychometric performance of the screener. As such, additional psychometric evaluation of the PC-PTSD-5 may prioritize non-clinical recruitment. Second, recruitment protocols differed in the Ugandan and Kenyan cohorts such that we were not able to evaluate the PC-PTSD-5 against the PCL-5 in Kenya. Finally, we did not use a diagnostic assessment to validate the PC-PTSD-5, instead relying on the PCL-5. Additional validation against a structured clinical interview such as the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) may be warranted (Weathers, Blake, et al., 2013). Nevertheless, these results suggest the promise of the PC-PTSD-5 tool as a screener for PTSD symptoms in Uganda and Kenya, including among populations with severe mental illness. Furthermore, this work also highlights the need for future development and testing of digital and online screening protocols.

5. Conclusions

This study represents the first follow-up assessment of the NeuroGAP-Psychosis cohort, highlighting the longevity of the NeuroGAP-Psychosis cohort of participants with and without psychosis, the value of prior investments in research and capacity infrastructure, and the potential for future follow-up studies in this program. Results suggest that the PC-PTSD-5 screener is a moderately reliable and valid way to screen for PTSD symptoms over the phone in Uganda and Kenya, including among people with psychosis. Because the PC-PTSD-5 is quick and can be administered by non-specialists, a relatively higher rate of false positives may be tolerated for screening purposes. Future studies and additional follow-up should focus on community-based assessments and probe the burden of using the PC-PTSD-5 on the healthcare system if phone-based screening were to be scaled up and included in routine care. Furthermore, future studies should prioritize rigorous cross-cultural validation steps for translations, including cognitive interviewing and harmonization to ensure full conceptual equivalence across local languages (Sousa & Rojjanasrirat, 2011). A larger focus should also be placed on understanding the psychometric properties of trauma endorsement and the relationship between psychosis and PTSD in this population.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Data availability statement

NeuroGAP - Psychosis data that support the findings of this study are available in the NIMH Data Archive under collections 4539 and 3805. Data from the follow-up study may be available from the corresponding author (SJ) upon reasonable request.

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