

## Accepted Manuscript

Prevalence of Stressful Life Events and Their Association with Post-traumatic Stress Disorder among Youth Attending Secondary School in Haiti

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PII: S0165-1781(18)30350-0  
DOI: <https://doi.org/10.1016/j.psychres.2018.08.074>  
Reference: PSY 11668

To appear in: *Psychiatry Research*

Received date: 24 February 2018  
Revised date: 28 May 2018  
Accepted date: 17 August 2018

Please cite this article as: David J. Grelotti , Margaret E. Gerbasi , Eddy Eustache , J. Reginald Fils-Aimé , Tatiana Thérosmé , Jennifer Severe , Giuseppe J. Raviola , Sarah Darghouth , Rupinder Legha , Ermaze L. Pierre , Emmeline Affricot , Yoldie Alcindor , Katherine Boyd , Anne E. Becker , Mary C. Smith Fawzi , Prevalence of Stressful Life Events and Their Association with Post-traumatic Stress Disorder among Youth Attending Secondary School in Haiti, *Psychiatry Research* (2018), doi: <https://doi.org/10.1016/j.psychres.2018.08.074>

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**Highlights**

- There is a high burden of traumatic events in earthquake-affected Haitian youth.
- Sexual assault, but not earthquake, showed a significant association with PTSD.
- Interpersonal violence had a greater impact on PTSD than natural disaster.

Prevalence of Stressful Life Events and Their Association with Post-traumatic Stress Disorder  
among Youth Attending Secondary School in Haiti

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### Abstract

The association between earthquakes and youth post-traumatic stress disorder (PTSD) has been well described, but little is known about the relationship between other stressful life events (SLEs) and PTSD among earthquake-affected youth. This study examines a variety of SLEs, including earthquake, and their association with PTSD among school-going Haitian youth following a major earthquake in 2010. In 2013, we assessed 120 students ages 18 to 22 for PTSD and other SLEs using a modified Structured Clinical Interview for DSM-IV (SCID)-based interview and the Stressful Life Events Checklist (SLE Checklist). Only 51.7% of participants on the SLE Checklist and 31.7% in the interview endorsed being affected by the earthquake or another disaster. Sexual assault showed the strongest association with PTSD in multivariable logistic regression. Contrary to our hypothesis, exposure to earthquake or another disaster was not significantly associated with current PTSD. In this population, exposure to interpersonal violence may have had a greater impact on PTSD risk than exposure to natural disaster. These data underscore the need to examine and reduce both acute and chronic stressors among disaster-affected youth.

Keywords: Adolescent; Mental Health; Exposure to Violence; Disasters; PTSD; Trauma; Anxiety Disorders; Sexual Abuse; Sexual Assault; Caribbean Region; Transitional-Aged Youth; High School

## 1. Introduction

In the aftermath of a magnitude 7.0 earthquake in Haiti centered outside of Port-au-Prince in 2010, there was concern about the potential adverse mental health impacts of earthquake-related trauma, including posttraumatic stress disorder (PTSD) (Ben-Ezra et al., 2010; Nemeroff and Goldschmidt-Clermont, 2011). Children and youth were considered at particular risk (Cénat and Derivois, 2014a; Gorry, 2010). Studies of PTSD symptomatology conducted among children and youth who survived major earthquakes supported these assertions (Asarnow et al., 1999; Ayub et al., 2012; Cadichon et al., 2017; Cénat and Derivois, 2014a; Ekşi et al., 2007; Goenjian et al., 2011, 2005, 1995; Gökçen et al., 2013; Hsu et al., 2002; Lau et al., 2010; Parvaresh and Bahramnezhad, 2009; Pynoos et al., 1993; Roussos et al., 2005; Tian et al., 2014; Wang et al., 2012; Ying et al., 2013; Zhang et al., 2012). However, rates of PTSD among children and youth following an earthquake are highly variable. Estimates of PTSD prevalence among children and youth after major earthquakes throughout the world range from 1.2% to 95% (Goenjian et al., 2011, 1995). In Haiti, prevalence estimates of PTSD after the earthquake ranged from 10.8% to 68% (Blanc et al., 2014; Cénat and Derivois, 2014b; Eustache et al., 2017b). In one study of Haitian adults 30 months after the earthquake, it was estimated that youth aged 18-24 had the highest rates of PTSD (42%) (Cénat and Derivois, 2014b). The wide variability in reported prevalence of PTSD after major earthquakes throughout the world has been attributed to earthquake-related factors (e.g., the magnitude of destruction), sociocultural or political factors (e.g., the strength of existing social support systems or the distribution of economic resources), and methodological differences among studies (Fan et al., 2011; Furr et al., 2010; Goenjian et al., 1994; Hsu et al., 2002; Zhang et al., 2012).

Additional factors contribute to risk for PTSD and related symptomatology among children and youth exposed to earthquakes. A greater risk of PTSD is associated with higher levels of exposure to peri-earthquake related traumatic events, including damage to homes or displacement from homes to shelters, injury or death of others, parental distress, and financial loss (Asarnow et al., 1999; Ayub et al., 2012; Cénat and Derivois, 2014a; Ekşi et al., 2007; Furr et al., 2010; Goenjian et al., 2011, 1995; Hsu et al., 2002; Parvaresh and Bahramnezhad, 2009; Roussos et al., 2005; Tian et al., 2014; Wang et al., 2012; Ying et al., 2013; Zhang et al., 2012). Pre-earthquake mental distress and disorder were associated with PTSD in some studies (Asarnow et al., 1999; Lau et al., 2010) but not others (Zhang et al., 2012). Few studies have examined the relationship between non-earthquake related traumatic experiences and PTSD among children and youth in earthquake-affected regions, and available evidence exploring an association is inconclusive (Cénat and Derivois, 2014a; Derivois et al., 2017; Gökçen et al., 2013; Lau et al., 2010; Ying et al., 2013; Zhang et al., 2012). Many studies either examined other traumatic experiences in aggregate (Cénat and Derivois, 2014a; Gökçen et al., 2013; Ying et al., 2013; Zhang et al., 2012) or looked at a limited range of other stressful experiences (i.e., physical abuse, family violence, street violence, school bullying, severe illness, death or severe illness of a relative, serious accident, or corporal punishment) (Derivois et al., 2017; Lau et al., 2010). To our knowledge, no study has investigated the relation between exposure to a broad range of traumatic and other stressful life events and PTSD among youth after a major earthquake.

The Haitian context provides a window for understanding how different types of traumatic exposures may be linked to the risk for PTSD after a natural disaster. In addition to the aforementioned earthquake, in the past decade Haitians have endured devastating hurricanes, floods, and a cholera epidemic. Chronic poverty is also pervasive, and at the time of the

earthquake over 75% of the population lived on less than two dollars a day (DesRoches et al., 2011). Historically, life experience in Haiti has been negatively influenced by harsh social conditions and violent political events. Indeed, the earthquake in Haiti has been referred to as “an ‘acute-on-chronic’ event” (Farmer, 2011, p. 3). Elucidating the relationship between PTSD and specific types of traumatic and other stressful life events may shed light on the variation in PTSD prevalence following an earthquake and can inform disaster response efforts. This analysis examines the prevalence of stressful life events and the association of specific types of these events with PTSD in a school-based sample of youth in central Haiti.

## 2. Method

Study data were collected in October and November 2013, approximately 3.75 years after the earthquake, as part of the baseline mental health assessment of a pilot school-based intervention for secondary school students in Haiti’s Central Plateau. Although the 2010 earthquake was centered near Haiti’s capital, Port-au-Prince, the Central Plateau was affected by moderate to strong earthquake activity (see DesRoches et al. 2011). Over 90,000 internally displaced Haitians migrated to the Central Plateau (Raviola et al., 2013), including many of those injured in the earthquake. The aim of this intervention was to improve access to mental health services for youth with depression, PTSD, and suicide risk through school-based screening and training teachers to serve as mental health navigators for students. Details about the intervention, recruitment, eligibility, and study outcomes are described elsewhere (Eustache et al., 2017b, 2017a). Aspects of the study relevant to the current analysis are summarized below. The respective institutional review boards at [edited out for blind review] approved this study. All participants provided written, informed consent.

## 2.1. Participants

Participants were recruited from four high schools in the Central Plateau, approximately 90 km from the epicenter of the 2010 earthquake. Eligibility criteria included youth 18-22 years of age and current enrollment in one of the participating schools. Youth (n=145) were randomly selected from within each school (n = 33-41 per school) based on a registry provided by the school.

## 2.2. Assessments, Data, and Data coding

Prior to the intervention, a baseline cross-sectional assessment was conducted to ascertain the presence of PTSD and history of stressful life events, as well as other psychosocial characteristics relevant to study aims. Among the items in the comprehensive mental health and psychosocial assessment relevant to this analysis were: 1) questions about the student's living situation (e.g., housing, number of meals per day); 2) the Stressful Life Events Checklist (SLE Checklist) (Bean et al., 2004); and 3) an interview based on content from the major depressive episode (MDE) and post-traumatic stress disorder (PTSD) modules of the Structured Clinical Interview for DSM-IV-TR, abridged and adapted for this study, to assess for current MDE and current PTSD as well as lifetime exposure to traumatic events (described below) (Eustache et al., 2017b).

Self-report assessments were translated from English to Haitian Creole and then back-translated into English by bilingual study investigators to achieve equivalence. For the modified SCID-based interview, a French language version was obtained (Ouellet, personal communication). Because the Haitian study investigators were fluent in French, the instructions to interviewers were retained in French. The French language version of the instructions to interviewers was reviewed for its equivalence to the original English language version.



Trilingual (English, French, and Haitian Creole) study investigators translated the questions posed to study participants from French to Haitian Creole, back-translated the Haitian Creole version into English, and then adjusted as needed to optimize equivalence and comprehensibility.

The SLE Checklist is a 13-item self-report questionnaire documenting exposure to a broad range of stressful life events (Bean et al., 2004). Student participants were asked to respond 'Yes' or 'No' to 12 questions relating to their having lifetime experience with stressful life events, which included traumatic experiences. A 13<sup>th</sup> item was open-ended and asked respondents to describe experience of any additional stressful event(s). Responses to the 13<sup>th</sup> item were translated by one study team member and verified by another. Excerpts of participant responses to the 13<sup>th</sup> item were purposively selected to provide narrative accounts that illustrate the wide range and variety of stressful life events experienced by participants (Panel 1). To maximize use of the data from the SLE Checklist, student responses to the 13<sup>th</sup> item on the scale were matched against their responses to the first 12 items. If the response on the 13<sup>th</sup> item described an event corresponding to one of the other 12 items (e.g. experienced a serious accident), and the participant did not originally endorse that item, the response for that item was recoded. Responses were coded independently by two study team members and identified discrepancies were resolved by consensus.

The SCID-based interview was modified to accommodate time constraints associated with the school-based assessment and to align with the parent study aims of assessing the burden of PTSD in a school-based study population of youth in central Haiti. Clinician-investigators with local experience in diagnostic assessment of mental disorders conducted or co-facilitated each of these interviews (Eustache et al., 2017b). A description of the modified SCID-based interview and the convergent validity of diagnostic assignments of MDE and PTSD with

corresponding self-report measures of psychopathology have been described elsewhere (Eustache et al., 2017b). The modified SCID-based interview data were used to ascertain a current diagnosis of PTSD, following a procedure described elsewhere (Eustache et al., 2017b).

Interview data were also used as a complementary source to establish history of traumatic exposures. Consistent with the standard use of the PTSD module of the SCID interview, interviewers recorded participant lifetime history of experience of “extremely upsetting” events corresponding to the A(1) criterion for PTSD. In addition to the standard inquiry on trauma and probes regarding exposures relevant to being in an accident and “the victim of a crime,” the modified SCID-based interview was adapted to the local context by adding the following probe: “How did the January 2010 earthquake affect you?” Interviewers made notes along the margins and in summary comments about stressful events reported by the participant during the administration of the MDE and PTSD portions of the interview.

### **2.3. Data Analysis**

Data were entered into an Excel file and verified. SPSS statistical software (version 23.0) was used for the analyses. Deviations from the analytic sample due to missing data occurred only for the demographic items “number of meals per day” and “roofing on home” (see Table 1).

Data from the SLE Checklist were analyzed to estimate the lifetime prevalence of specific kinds of stressful life events among students. Chi-square tests (or Fisher’s Exact Test when expected cell size was less than or equal to 5) and t-tests were used to examine gender differences in frequency of exposure to events (see Figure 1).

Events corresponding to the A(1) criterion for PTSD reported during the modified SCID-based interview were independently coded following the same schema as the SLE Checklist by two study team members and identified discrepancies were resolved by consensus. For example,

exposure to the earthquake or earthquake-related events such as injury or property damage were coded as “experienced a disaster.”

Next, we constructed two models to examine the association between type of stressful life event and current PTSD; one based on events reported on the SLE Checklist and the other based on events reported during the modified SCID-based interview (see Table 2). Chi-square tests (or Fisher’s Exact Test when expected cell size was less than or equal to 5) and t-tests or Wilcoxon-Mann-Whitney tests were used to examine bivariate associations. Stressful life events with bivariate associations with PTSD of  $p < .2$  were entered into a multivariable logistic regression model and adjusted for age and gender to calculate an adjusted odds ratio of the relationship between type of event and PTSD.

In a post-hoc analysis, we examined the circumstances surrounding the deaths of loved ones reported during the modified SCID-based interview. Deaths of loved ones were coded as resulting from violent causes if the participant explicitly described the death as a murder, “assassination,” stabbing, etc. Deaths were coded as resulting from the earthquake if the deaths were described as resulting from the earthquake or its aftermath. Deaths described as a result of “accidents” were also coded. Deaths for which the participant did not know or report a cause were coded as “other / not known.”

### 3. Results

Of the 145 students randomly selected, 121 eligible students agreed to participate. One student withdrew and requested that data be discarded; hence, the analysis sample was  $n=120$ . The response rate was 82.8%. Demographic characteristics of participants are summarized in Table 1. Two-thirds of participants were male. Students had two meals per day on average. The

type of roof and toileting facilities at home suggested economic hardship with approximately two-thirds of participants having aluminum or thatched roofing and 25.0% of participants having no latrine at home. As previously reported, the one-month point prevalence of PTSD was 10.8% overall, with 10.0% of males and 12.5% of females having a diagnosis based on findings from the modified SCID-based interview (Eustache et al., 2017b).

### 3.1. Participant experience with stressful life events

The lifetime prevalence estimates of types of stressful life events from the SLE Checklist, stratified by gender, are displayed in Figure 1. All participants endorsed at least one stressful life event (Mean number of events: 5.43; SD: 2.20; range 1-10). Nearly three-quarters of participants reported witnessing others being physically mistreated and 42.5% experienced physical mistreatment themselves. In addition, 58.3% indicated that there was a time when they felt that their life was in danger and 56.7% had experienced the death of a loved one. Male participants experienced a greater variety of stressful life events on average (Mean: 5.83 (SD: 2.10; range: 1-10)) than female participants (Mean: 4.65 (SD: 2.23; range: 1-9);  $t(118) = 2.84, p = .005$ ). Male participants were significantly more likely to endorse experiencing a stressful life event in which “I was in danger” (OR: 2.66; 95% CI: 1.22, 5.79;  $p = .013$ ) and the death of a loved one (OR: 2.38; 95% CI: 1.10, 5.17;  $p = .027$ ). Differences between male and female participants did not reach statistical significance for other SLEs, including having experienced sexual abuse (males: 13.8%; females: 15.0%; OR: 0.90; 95% CI: .31, 2.65;  $p = .853$ ).

Only 51.7% of participants endorsed experiencing a disaster such as earthquake on the SLE Checklist. In comparison, 31.7% of participants endorsed that the earthquake or another disaster affected them or was experienced as traumatic during the modified SCID-based interview.

### 3.2. Association between stressful life events and PTSD

We examined the associations between specific types of stressful life events and PTSD via bivariate and multivariable analysis. In bivariate analyses, a diagnosis of PTSD was associated with several forms of interpersonal violence (Table 2). Using the SLE Checklist, experiencing sexual abuse (OR: 7.48; 95% CI: 2.13, 26.27;  $p < .001$ ) and war or armed conflict (which in the local context could refer to the armed conflict that has accompanied political upheaval, United Nations peacekeeping activities, or paramilitary action) (OR: 3.65; 95% CI: 1.12, 11.79;  $p = .024$ ) showed significant associations with PTSD. Additionally, having had a life-threatening medical problem, being physically mistreated, and experiencing “other” stressful life events in which the participant “was in danger” met the threshold for inclusion in the multivariable model ( $p < .2$ ). A parallel set of bivariate analyses to examine the relation between events reported during the modified SCID-based interview and a current diagnosis of PTSD yielded a significant association between PTSD and both experiencing sexual abuse (OR: 21.67; 95% CI: 4.37, 107.5;  $p < .001$ ) and also “other” stressful life events in which the participant “was in danger” (OR: 9.07; 95% CI: 2.06, 39.8;  $p = .008$ ). In addition, experiencing the death of a loved one met the threshold for inclusion in the multivariable model ( $p < .2$ ). Experiencing a disaster either on the SLE Checklist or during the modified SCID-based interview was not significantly associated with PTSD in bivariate analyses ( $p > .2$ ). However, the covariate was included in the multivariable analysis given our hypothesis that it would be associated with PTSD.

In a multivariable analysis of the relation between stressful life events and PTSD (Table 2), experiencing sexual abuse was the only stressful life event demonstrating a statistically significant association with PTSD using data from the SLE Checklist (AOR: 6.04; 95% CI: 1.32,

27.74;  $p = .021$ ). In a similar multivariable analysis of the relation between kinds of traumatic events derived from the modified SCID-based interview and PTSD, experiencing sexual abuse (AOR: 38.0; 95% CI: 5.37, 268.9;  $p < .001$ ), “other” stressful life events in which the participant “was in danger” (AOR: 11.78; 95% CI: 1.70, 81.7;  $p = .013$ ), and the death of a loved one (AOR: 5.79; 95% CI: 1.13, 29.8;  $p = .030$ ) were each significantly associated with PTSD (Table 2). Age, gender, and exposures to other kinds of stressful life events, including experiencing a disaster or earthquake, were not independently associated with PTSD in either multivariable model. In a post-hoc review of responses to the modified SCID-based interview, among the 41 participants who reported death of a loved one, 16 reported death due to a violent cause (39.0%). Four of the 41 participants reported the death of a loved one due to the earthquake (9.8%). None of the participants reporting the death of a loved one due to the earthquake were classified as having current PTSD.

#### 4. Discussion

In this community-based sample of youth attending secondary school, we observed a high prevalence of stressful life events. This finding is consistent with previous reports that stressors are commonly experienced among Haitians (Cénat and Derivois, 2014a, 2014b; Martsof, 2004). Male participants in this study were more likely to experience violence and endorse a greater number of types of traumatic experiences. This suggests a higher risk of exposure to violence among male youth in Haiti. Reported experience of sexual abuse or assault did not differ between male and female participants. Our data are consistent with previous reports of sexual assault or abuse among Haitian men, women, and children (Cénat et al., 2018; Kolbe and Hutson, 2006; Martsof, 2004).

In contrast to previous reports of PTSD and PTSD symptomatology following the earthquake in Haiti and in communities affected by earthquakes elsewhere and contrary to our *a priori* hypothesis, lifetime exposure to disaster such as the earthquake was not associated with PTSD diagnosis in bivariate or multivariable analyses in this study sample. There are several possible explanations for the unexpected lack of association between earthquake and PTSD. At the time of the study our participants resided outside the geographic area most affected by the earthquake. That being said, this region experienced moderate to strong earthquake activity and many of its current residents were internally displaced as a result of the earthquake. In addition, because study data were not collected until nearly four years following the earthquake, it is possible that respondents' recollection of the impact of the event would have been different had data been collected more proximally. It is also possible that some respondents who developed PTSD following the earthquake recovered (Goenjian et al., 2011; Zhang et al., 2012), and we failed to capture this episode of PTSD within our assessment of current PTSD. Nonetheless, PTSD may persist following an earthquake (Cadichon et al., 2017; Goenjian et al., 2005). A recent study of Haitian youth in Port-au-Prince suggested that the persistence of PTSD six years after the earthquake was associated with the persistence of social and economic stressors related to the earthquake, such as youth who continued to live in camps or attend schools in temporary, prefab structures (Cadichon et al., 2017). Finally, it is possible that our study assessment of PTSD using a modified SCID-based interview provided a more rigorous standard than previous studies in Haiti which used self-administered or study staff-administered questionnaires to measure PTSD symptomatology.

It is highly unlikely that any of the participants were outside of Haiti during the earthquake, and it is curious why some students did not endorse exposure to the earthquake on

the SLE Checklist. Because experience of trauma is subjective and influenced by social and cultural factors that may mediate or moderate the experience (Kirmayer et al., 2010), it is possible that for these reasons some of the participants did not regard the earthquake as stressful and did not endorse it on the SLE Checklist or during the modified SCID-based interview.

In our study, stressors other than earthquake exposure emerged as salient to a current PTSD diagnosis. Among events examined, sexual abuse or assault demonstrated a statistically significant relationship with PTSD diagnosis. Participant report of both having been in danger and having experienced the death of a loved one were also significantly associated with PTSD diagnosis, but only when examining exposures reported during the modified SCID-based interview. These findings are consistent with data reported by two qualitative studies conducted in Haiti that have related interpersonal violence, including sexual violence, to PTSD symptomatology (Bolton et al., 2012; Rahill et al., 2015). Notably, almost half of reported deaths were attributed to violent causes, and none of the deaths caused by the earthquake were endorsed by participants classified as having PTSD. Altogether, these findings are consistent with the interpretation that violent trauma may have a greater impact on PTSD than does exposure to disaster in this context. Social vulnerability is ubiquitous in Haitian communities and contributes to vulnerability to violence. The earthquake raised awareness of mental health in Haiti, but future mental health interventions in Haiti and other settings characterized by social adversities should consider the potential pathogenic impacts of chronic exposures to stressful life conditions in addition to acute stressors like natural disasters.

Our findings are consistent with observations that rates of PTSD in youth following interpersonal trauma are higher than those following other types of traumatic events (Alisic et al., 2014) and that a wide range of chronic stressors impact the health and well-being of children and



youth (Itani et al., 2014; Kessler et al., 2010). These findings are also consistent with two studies from Haiti, one of adults and one of children living on the streets, conducted after the earthquake which demonstrated an association between PTSD symptomatology and lifetime exposure to at least one violent event (Cerdá et al., 2013; Derivois et al., 2017). To our knowledge, there are no other studies among youth residing in an earthquake-affected region that examine the specific associations between PTSD and exposure to a wide range of stressful life events. Although direct comparisons have not been attempted, perhaps chronic stressors, which may sometimes be compounded by natural disaster, may help to explain the wide range of estimates of PTSD prevalence in studies of earthquake-affected children and youth reported in the literature.

#### **4.1. Limitations**

This study has several limitations. Exposure to events may have been underreported in this study (related to fear, shame, inability to recall the traumatic event, gender differences, or other issues that may influence disclosure). Sexual abuse or assault, in particular, may have been underreported because of concerns about stigma or fear of reprisal or other consequences. Agencies supporting public safety and child protective services suffer from a lack of resources. The lack of appropriate management of childhood neglect, maltreatment, and sexual abuse or assault may reinforce social taboos in disclosing sexual abuse and assault and affect estimates of prevalence and tests of an association between sexual violence and PTSD diagnosis.

In addition to the potential for underreporting traumatic experiences, our study has other limitations. This school-going population drawn from the Central plateau may not be representative of youth in Haiti and thus study findings may not be generalizable outside this region. Youth residing in this locale during the earthquake—approximately 90 km from the epicenter—may have had a different experience of the earthquake than youth elsewhere. A study

of PTSD symptomatology following an earthquake in Armenia showed it was higher among youth closer to an earthquake's epicenter (Goenjian et al., 1995). Nonetheless, associations between PTSD and earthquake exposure have been reported among youth living as far as 75 and 327 km from a major earthquake (Goenjian et al., 1995; Pynoos et al., 1993; Wang et al., 2012). Because we did not systematically collect data on participants' location at the time of the earthquake or exposure to specific earthquake-related events, we cannot compare students based on their distance from the earthquake's epicenter at the time of the earthquake (i.e., compare high versus low earthquake exposure or exposure to specific earthquake-related events such as damage to one's home). We have no prevalence data on stressful life events or PTSD in this population prior to 2010 to examine whether there was a change in prevalence temporally associated with exposure to the earthquake.

Next, although most of the participants were under 18 at the time of the earthquake, our results may not be generalizable to children or younger adolescents. In addition, many Haitians are unable to attend school consistently because of the cost; therefore, our results may not be generalizable to youth who do not attend school. The study response rate was adequate, but it is possible students with PTSD disproportionately did not respond to the invitation to participate in the study because of avoidance or other symptoms of PTSD or impacts on school attendance. However, if individuals with greater trauma and experiencing avoidant symptoms of PTSD are more likely to decline participation, then this would bias results towards the null. Limited sample size may have reduced the power of the study. Although the measures employed in this study have been used extensively and in many different contexts, to our knowledge this is the first time the SLE Checklist and an interview based on the SCID have been used to ascertain prevalence of stressful and traumatic life events in this setting.

#### 4.2. Clinical implications and future directions

Notwithstanding these limitations, our data support that youth in Haiti are vulnerable to chronic stressors in their community. Clinicians evaluating and treating youth in Haiti should screen for exposure to stressful life events as they may relate to a number of psychological, behavioral, and somatic concerns and mental disorders, including depressive, anxiety, and substance use disorders. Moreover, our findings suggest that interventions targeting mental health problems in disaster settings might best serve their constituents by anticipating the possible impacts of a variety of prevalent exposures to acute and chronic stressors. Understanding the characteristics of sexual and other violent traumas (e.g., intrafamilial, community-based, political, etc.) and resilience could guide prevention efforts (Cénat et al., 2018). Initiatives to reduce exposure to violence, such as sexual assault, if successful, may have the added benefit of improving the health and wellbeing of children and youth.

Longitudinal studies are needed to determine causal pathways and the long-term consequences of exposure to chronic stress on youth development and the health of communities. Because lower social support, educational attainment, and income are risk factors for mental disorders, including PTSD (Derivois et al., 2014; Ludermir and Lewis, 2001), future research should investigate the relationship of these factors on exposure to trauma and development of PTSD. Finally, examination of social factors, economic factors, and exposure to other forms of trauma in future studies of PTSD among earthquake-exposed youth may illuminate contextual factors that moderate risk for PTSD across different social settings.

Our data show that both male and female youth are at risk for exposures to violence and their sequelae, including sexual violence. Overall, the findings from the study underscore the potential value of addressing youth mental health in secondary schools as well as community-

based mental health care and related services in resource-limited settings, and can inform humanitarian response efforts as well as longer-term policy and program development.

### Acknowledgments

Portions of this paper were presented at the Frontiers in Neuroscience for Global Health/Tenth Anniversary of “Brain Disorders in the Developing World: Research across the Lifespan”, National Institutes of Health, Bethesda, Maryland, February 11, 2014 and the 61st Annual Meeting of the American Academy of Child and Adolescent Psychiatry, San Diego, California, October 21-26, 2014. Research reported in this paper was supported by the National Institute of Mental Health of the National Institutes of Health under award number R21MH093298 (PIs: Becker and Eustache). Dr. Grelotti received support from the National Institute of Mental Health of the National Institutes of Health under award T32MH017119. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors report no potential conflicts of interest. The authors would like to thank the students for their participation in the study, the educators who participated in the intervention, and Marie-Christine Ouellet, Ph.D. and her team at the Ecole de Psychologie, Université Laval, Québec, Canada who provided the French translation of the SCID. The authors would like to acknowledge the contributions of the other members of Harvard Medical School Department of Global Health and Social Medicine, Partners In Health, and Zanmi Lasante who contributed to this project, including George Erick Alexis, Shin Daimyo, Elysee Noesil, Ernst Origene, Handy Petit-Homme, Claire Pernar, and Megan Benson Stack.

ACCEPTED MANUSCRIPT

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Panel 1. Selected excerpts from participant comments on the Stressful Life Events Checklist illustrate a wide range and variety of participant experiences of stressful life events

<b><i>Disaster</i></b>
“The January 12th earthquake that recently happened, that scared me a lot. And I was seeing several kinds of illnesses that were causing a lot of problems such as Cholera, and lots of other illnesses that are plaguing my family and friends.”
“I experienced a lot... In the time of the flood, I saw water cover nearby homes and people that were scrambling to climb on top of the roofs of their houses.”
<b><i>Violence and armed conflict</i></b>
“They killed a young man in the complex. He liked helping people a lot. But because of those good deeds he did, they assassinated him. For me, this was very terrible, terrible. This made me feel bad, not well at all.”
“This young man said he would beat me; that made me almost stop going out. Also, I think about the miseries I am undergoing as a young person.”
“One thing that happened in my life that scared me a lot is that my mother and father fight; they were fighting, insulting each other in the house. That scared me a lot because I was hoping my father would not kill my mother during the fights.”
“I was having sex with a young woman and she did not want me to put a condom. I told her no, I don't want to do it. She fought with me and this is one thing that marks my life.”
<b><i>Medical problems</i></b>
“I was sick from sickle cell disease. I was scared. I was sure I would die because I was not well at all. When I go to bed I am usually very scared.”

Table 1. Sociodemographic characteristics of study participants (n=120)

	<i>n</i> (or Mean)	% (or SD)
Gender (% Female)	40	33.3%
Age in years (Mean (SD))	19.5	1.4
Number of meals per day (Mean (SD)) (n=106*)	2.2	0.6
Latrine at home	90	75.0%
Roofing on home (n=119*)		
Aluminum	77	65.7%
Thatched	2	1.7%
Concrete	30	25.2%
Other	10	8.4%

\*Sample size less than 120 due to missing data.

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Table 2. Bivariate and multivariable associations between stressful life events derived from the Stressful Life Events Checklist or modified SCID-based interview with PTSD ( $n = 120$ )

Stressful life event	SLE Checklist				SCID-based interview			
	Bivariate		Multivariable		Bivariate		Multivariable	
	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI
Experienced sexual abuse	7.48***	2.13, 26.27	6.04*	1.32, 27.74	21.67*** <sup>b</sup>	4.37, 107.5	38.0***	5.37, 268.9
Experienced an “other” stressful life event in which “I was in danger”	4.47	0.95, 21.17	4.20	0.69, 25.67	9.07*** <sup>b</sup>	2.06, 39.8	11.78*	1.70, 81.7
Experienced war or armed conflict	3.65*	1.12, 11.79	3.22	0.81, 12.86	— <sup>a,b</sup>	—	—	—
Was physically mistreated	2.38	0.73, 7.77	2.51	0.63, 1.01	2.15 <sup>b</sup>	0.22, 2.8	—	—
Had a life-threatening medical problem	2.38	0.73, 7.77	1.53	0.35, 6.66	2.89 <sup>b</sup>	0.28, 3.00	—	—
Experienced a disaster	0.55	0.17, 1.78	0.27	0.06, 1.18	0.95 <sup>b</sup>	0.27, 3.32	0.41	0.07, 2.38
Saw someone else physically	2.56	0.54, 12.20	—	—	1.59 <sup>b</sup>	0.31, 8.10	—	—

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mistreated

Experienced an “other” stressful life event in which “someone else was in danger”	2.143 <sup>b</sup>	0.45, 1.24	–	–	0.90 <sup>b</sup>	0.18, 4.41	–	–
Experienced the death of a loved one	1.83	0.53, 6.31	–	–	3.59 <sup>b</sup>	1.09, 11.8	5.79*	1.13, 29.8
Experienced important changes in family life	1.73	0.55, 5.52	–	–	– <sup>c</sup>	–	–	–
Experienced a serious accident	0.66 <sup>b</sup>	0.08, 5.53	–	–	2.25 <sup>b</sup>	0.42, 12.0	–	–
Was separated from family against will	– <sup>a,b</sup>	–	–	–	– <sup>b,d</sup>	–	–	–

**Sociodemographic characteristics**

Age	1.36	0.90, 2.05	1.21	0.69, 2.13	1.36	0.90, 2.05	1.75	0.96, 3.21
Female gender	1.29 <sup>b</sup>	0.39, 4.22	2.16	0.42, 11.0	1.29	0.39, 4.22	2.43	0.41, 14.51

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$

OR = Odds Ratio; CI = Confidence Interval; AOR = Adjusted Odds Ratio



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<sup>a</sup> OR cannot be calculated: no participant with PTSD was separated from family against will

<sup>b</sup> Fisher's Exact Test

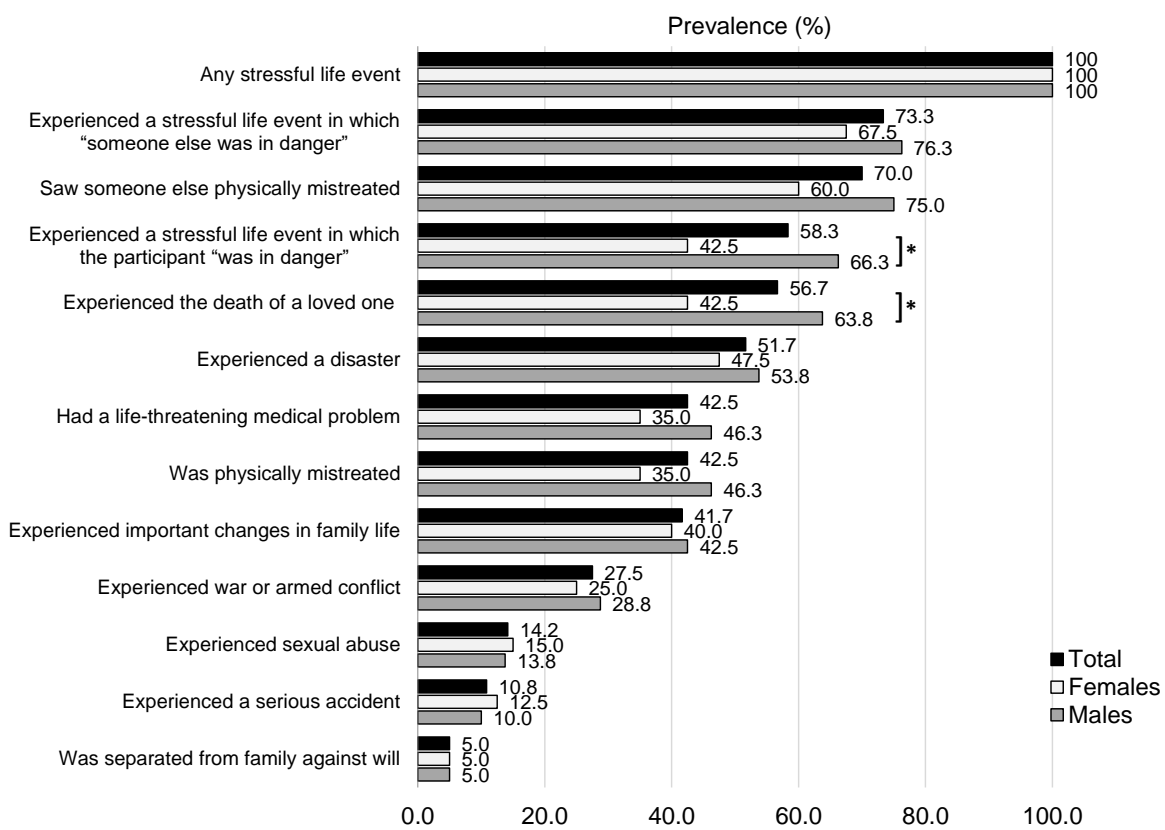
<sup>c</sup> No participant experienced important changes in family life on the modified SCID-based interview

<sup>d</sup> OR cannot be calculated: no participant without PTSD was separated from family against will

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Figure 1. Lifetime prevalence estimates of stressful life events, stratified by gender, reported on the Stressful Life Events Checklist (n=120)



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\*A statistically significant difference ( $p < 0.05$ ) between the proportion of males and females that experienced a stressful life event.