

Multiple adverse childhood experiences and maternal mental health outcomes among Kenyan mothers with and without HIV

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A thesis

submitted in partial fulfillment of the
requirements for the degree of

Master of Public Health

University of Washington

2023

Committee:

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Program Authorized to Offer Degree:

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Abstract

Multiple Adverse Childhood Experiences and Maternal Mental Health Outcomes Among Kenyan Mothers with and without HIV

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Background: Adverse childhood experiences (ACEs) reflect childhood exposure to abuse, neglect, and family stressors, and there is consistent evidence that ACEs are associated with subsequent poor mental health outcomes. ACEs experienced by women who are mothers (referred to as maternal ACEs) can have lasting effects for mothers and may have impacts transmitted to their children. Few studies of maternal ACEs have been conducted in low- and middle-income countries (LMIC), and mothers in LMICs may have high likelihood of ACEs due to resource deprivation. We aimed to determine the relationship between maternal ACEs and mental health among postpartum mothers in Kenya.

Methods: This nested cross-sectional study used data from the HOPE study in Nairobi and Western Kenya. Mothers attending 6-week postnatal care visits were enrolled between February 2021 and June 2022. Outcomes of interest were maternal mental health outcomes (depressive symptoms [PHQ-9 scores], psychological distress [K10 scores], and well-being [WHO well-being index scores]), and the primary exposure of interest was self-reported past ACEs. High ACEs

were defined as four or more ACEs. Log binomial regression models were used to calculate prevalence ratios (PRs) and 95% confidence intervals (CIs).

Results: Overall, among 1988 enrolled mothers, median age was 29 (interquartile range [IQR] 24-33) and 342 (17.2%) had high ACEs, 110 (5.5%) had moderate to severe depression (MSD) symptoms, 61 (3.1%) had moderate to severe psychological distress, and 1536 (77.3%) had high well-being. Mothers with high ACEs had a higher prevalence of MSD symptoms (PR: 2.86 [95% CI: 1.98, 4.13], $p < .001$), and moderate/severe psychological distress (PR: 3.68 [95% CI: 2.24, 6.06], $p < .001$) and a lower prevalence of well-being (PR: 0.75 [95% CI: 0.69, 0.82], $p < .001$). These patterns were maintained in analyses stratified by HIV status and perceived social support.

Conclusion: Regardless of HIV status, High maternal ACEs were associated with poorer mental health outcomes among mothers in Kenya. Peripartum ACEs screening may be useful to identify women who may benefit from timely mental health support to address psychological distress and mitigate forward going transmission that may impact mother-child health and relationships.

Introduction

Adverse childhood experiences (ACEs) reflect childhood exposure to multidimensional abuse, neglect, maltreatment, and family stressors. There is consistent evidence of associations between ACEs and poor mental health.¹² The ACEs Framework posits that past traumatic experiences can have a lasting impact on physical and psychological well-being across the lifespan.³ Toxic stress theory posits that prolonged or repeated exposure to severe physical or psychological stressors such as ACEs can disrupt the body's natural stress regulation systems, causing long-term physical and psychological changes.^{4,5} ACEs include traumatic events that occur across emotional, physical, psychological, and interpersonal domains, typically co-occur, and tend to have a dose-response relationship. Several studies have shown that individuals who experienced a greater number of ACEs (4+) have worse mental health outcomes, including depression, anxiety, and poorer overall well-being.⁶

There is emerging evidence that maternal ACEs in childhood can exert generational and cross-generational impact.⁷ Maternal peripartum depression and anxiety have been shown to be associated with ACEs.²⁸ Because perinatal depression and psychological distress influence maternal and infant morbidity and mortality,⁹ it is important to better define associations between ACEs and peripartum mental health among mothers.

Few studies of maternal ACEs have been conducted in low- and middle-income countries (LMICs). Some studies have noted high prevalence of ACEs in LMICs, with over 75% of individuals experiencing at least one ACE in childhood,¹⁰ compared to about 58% among individuals in the United States.¹¹ Though ACEs can be experienced by anyone regardless of gender, geography, or socioeconomic status, mothers in LMICs may have a high likelihood of ACEs due to resource deprivation.⁷ Research in high income countries (HICs) has shown that the association between ACEs and mental health outcomes may be amplified among people living with HIV.¹²

Different ACEs domains in childhood may be associated with different mental health outcomes in adulthood.¹³⁻¹⁵ ACEs are often classified within domains (e.g. abuse, neglect, and household dysfunction).¹⁶ In HICs, selected studies note that the abuse domain has predicted depression while the neglect domain predicted general psychological distress.^{13,14} There is scant research on the relationship between other ACEs domains namely the household dysfunction domain and mental health outcomes. Additionally, research in HICs has shown that perceived social support may be a protective factor against the long-term mental health outcomes associated with ACEs.¹⁵ It is important to examine these associations in LMICs because mental health interventions strengthening social support may be a viable strategy for supporting mothers in LMICs who experienced high ACEs.

The aims for this study are to 1) determine the relationship between maternal ACEs and maternal mental health and 2) identify potential effect modifiers of the relationship between maternal ACEs and mental health among new mothers in Kenya during the postpartum period.

Methods

Study design and setting: The present study is a cross-sectional study using data from a longitudinal cohort study (HOPE Study) that assesses physical and mental health outcomes for HIV-exposed uninfected (HEU) and HIV-unexposed (HUU) infants and their mothers. Data from the HOPE Study were collected from six public sector maternal and child health clinics in Nairobi and Western Kenya.

Study population and procedure: The HOPE study enrolled 2,000 mother-infant pairs (1,000 mothers with HIV [MWHIV]; 1,000 HIV-negative mothers) between February 2021 and June 2022. Mothers included in the study were at least 18 years of age and provided survey data during their 6-week (range 4-10 weeks) postnatal care visit. Mothers were excluded from participation if their own HIV status was unknown, if their infant was living with HIV, or if they had plans to relocate within the next four years. The current study used data from mothers who provided survey data about past ACEs at their enrollment visit. Standardized questionnaires were administered to obtain data on demographics, medical history, socioeconomic factors, and family structures for mothers and their infants. Prior to enrollment, all participating mothers received an explanation of the study in their preferred language from study nurses. If mothers chose to participate, written consent was collected from each mother.

Outcome of interest: The outcome of interest was maternal mental health. Mental health variables that were assessed were depressive symptoms, psychological distress, and psychological well-being. Depressive symptoms were measured using the 9-item Patient Health Questionnaire (PHQ-9). Participants who scored at least 10 out of 27 total points on the PHQ-9 were categorized as having moderate to severe depressive symptoms based on clinical cutoffs for PHQ-9 scoring.¹⁷ Psychological distress was measured using the 10-item Kessler Psychological Distress Scale (K-10). Participants who scored at least 25 out of 50 total points on the K-10 were categorized as having moderate to severe psychological distress based on clinical cutoffs for the K-10 scale.¹⁸ Psychological well-being was measured using the 5-item World Health Organization Well-being Index (WHO-5). Participants who scored 50 or fewer out of 100 total points on the WHO-5 were categorized as having low well-being based on the World Health Organization's cutoff for "clinically concerning" levels pointing to deterioration in well-being.¹⁹

Exposure of interest: The primary exposure of interest was self-reported past ACEs. ACEs were measured using the 10-item Adverse Childhood Experiences Questionnaire (ACEs-Q; continuous, 0-10 ACEs).³ Participants who reported experiencing 4 or more ACEs were categorized as having high ACEs and participants with 3 or fewer ACEs were categorized as having low ACEs based on ACE-Q cutoff points. The ACE-Q also categorizes each of the 10 ACEs questions into one of three domains of ACEs (Abuse, Neglect, Household Dysfunction) which were also examined.

Other variables of interest: Analyses were stratified by participants' perceived social support and HIV status. Perceived social support was measured using the 12-item Multi-Dimensional Scale of Perceived Social Support (MSPSS). Participants who scored 35 out of 84 total points on the MSPSS were considered as having moderate to high levels of perceived social support and were categorized as having moderate/high social support.²⁰ Finally, HIV status was assessed from maternal medical record information.

Data analysis

Summary statistics for the demographic characteristics of the sample stratified by ACEs status were calculated. Proportions, medians, and interquartile ranges (IQR) were used to summarize demographic information. P values from two-sided t-tests and chi-squared tests were reported to determine if characteristics differed between the two groups at $\alpha = 0.05$.

To examine the association between the exposure and outcome, log binomial regression models were used to calculate prevalence ratios (PRs) and 95% confidence intervals (CIs) to compare prevalence of depression symptoms, psychological distress, and well-being by ACEs score. Analyses were run using random effects models clustered by enrollment site. Analyses were

repeated after stratifying by HIV status and stratifying by perceived social support (moderate/high versus low social support) to explore potential differences in the association between ACEs score and mental health by stratified support categories.

We then examined the association between specific ACEs domains and mental health outcomes. Log binomial regression models were used to calculate prevalence ratios (PRs) and 95% confidence intervals (CIs) to separately compare prevalence of depression symptoms, psychological distress, and well-being by presence vs absence of each of the ACEs domains (abuse, neglect, and household dysfunction). Analyses were run using random effects models clustered by enrollment site. All analysis was conducted using R version 4.2.3.

Results

Characteristics of the study population: Overall, 1,988 (99.4%) of the 2,000 mothers enrolled in the HOPE study completed the ACEs questionnaire and the mental health measures. In the total cohort, 1206 (60.7%) mothers reported at least one ACE. The median maternal age was 29 years (interquartile range [IQR] 24-33), most women had completed secondary education or less (secondary = 895 [45%]; primary or less = 772 [38.8%]), were in monogamous marriages (1524 [76.7%]), had little to no food insecurity (1670 [84%]), reported moderate to high social support (1820 [91.5%]) and few women experienced intimate partner violence (85 [4.3%]).

Comparison of mothers with high ACEs to those with low ACEs: Of the 1,988 mothers in the study, 342 (17.2%) had high ACEs and 1,646 (82.8%) had low ACEs. Among mothers with high ACEs, the median number of ACEs reported was 5 ([IQR] 4-6). Among mothers with low ACEs, the median number of ACEs reported was 1 ([IQR] 0-2).

Compared to mothers with low ACEs, mothers with high ACEs were slightly older (29 vs. 28 years, $p=0.06$), had less formal education (44.4% vs 37.7% primary education or less, $p = 0.04$), less likely to be monogamously married (68.1% vs 78.4% in a monogamous marriage, $p < 0.001$), had more household food insecurity (30.2% vs 13.1% moderate/severe hunger in household, $p < 0.001$), and reported lower perceived social support (83.3% vs 93.2% moderate/high social support, $p < 0.001$). Employment status, HIV status, and experiences of intimate partner violence were similar among the two groups (Table 1).

Mothers with high ACEs had a 2.86-fold higher prevalence of moderate/severe depressive symptoms (PR: 2.86 [95% CI: 1.98, 4.13], $p < .001$), a higher prevalence of moderate/severe psychological distress (PR: 3.68 [95% CI: 2.24, 6.06], $p < .001$) and a lower prevalence of psychological well-being (PR: 0.75 [95% CI: 0.69, 0.82], $p < .001$) (Table 2).

Comparison of mothers with high and low ACEs, stratified by maternal HIV status: Similar patterns emerged in analyses stratified by maternal HIV status. Among mothers living with HIV, mothers with high ACEs had a higher prevalence of moderate/severe depressive symptoms (PR: 2.49 [95% CI: 1.44, 4.32], $p = .002$), a higher prevalence of moderate/severe psychological distress (PR: 2.39 [95% CI: 1.17, 4.87], $p = .021$) and a lower prevalence of psychological well-being (PR: 0.78 [95% CI: 0.68, 0.88], $p = < .001$). Among mothers without HIV, mothers with high ACEs had a higher prevalence of moderate/severe depressive symptoms (PR: 3.24 [95% CI: 1.97, 5.32], $p < .001$), a higher prevalence of moderate/severe psychological distress (PR: 5.88 [95% CI: 2.85, 12.11], $p < .001$) and a lower prevalence of psychological well-being (PR: 0.73 [95% CI: 0.65, 0.83], $p < .001$) (Table 3; Figure 1).

Comparison of mothers with high and low ACEs, stratified by social support: Among mothers with moderate/high perceived social support, high ACEs remained associated with moderate/severe depressive symptoms (PR: 2.60 [95% CI: 1.69, 4.01], $p < .001$), moderate/severe psychological distress (PR: 4.10 [95% CI: 2.29, 7.35], $p < .001$) and psychological well-being (PR: 0.82 [95% CI: 0.75, 0.89], $p = .043$). Among mothers with low perceived social support, high ACEs remained associated with moderate/severe depressive symptoms (PR: 2.28 [95% CI: 1.09, 4.75], $p = .012$) and psychological well-being (PR: 0.43 [95% CI: 0.28, 0.64], $p = .027$), but the association with moderate/severe psychological distress was no longer significant (PR: 1.50 [95% CI: 0.59, 3.82], $p = .635$) (Table 4; Figure 2).

ACEs domain and associations with mental health outcomes: We found significant associations between each ACE domain and mental health outcomes. Mothers who reported any past abuse had a higher prevalence of moderate/severe depressive symptoms (PR: 2.52 [95% CI: 1.59, 3.98], $p < .001$), a higher prevalence of moderate/severe psychological distress (PR: 2.63 [95% CI: 1.60, 4.33], $p = .002$) and a lower prevalence of psychological well-being (PR: 0.79 [95% CI: 0.74, 0.85], $p < .001$) than mothers who did not experience any past abuse. Similarly, we found that mothers who reported any past neglect had a higher prevalence of moderate/severe depressive symptoms (PR: 2.24 [95% CI: 1.41, 3.55], $p = .007$), a higher prevalence of moderate/severe psychological distress (PR: 2.18 [95% CI: 1.32, 3.59], $p = .003$) and a lower prevalence of psychological well-being (PR: 0.86 [95% CI: 0.81, 0.91], $p = .004$) than mothers without any past neglect. Finally, mothers who reported any past household dysfunction had a higher prevalence of moderate/severe depressive symptoms (PR: 2.93 [95% CI: 1.79, 4.82], $p < .001$), a higher prevalence of moderate/severe psychological distress (PR: 6.72 [95% CI: 3.43, 13.17], $p < .001$) and a lower prevalence of psychological well-being (PR: 0.80 [95% CI: 0.75, 0.84], $p < .001$) than mothers without any past household dysfunction (Table 5).

Discussion

In this cross-sectional study of almost 2000 mothers in Kenya, the majority reported experience of at least one ACE, and about one fifth reported 4 or more ACEs. Women with high ACEs in our cohort were, less educated, less likely to be monogamously married, and more likely to be food insecure. Mothers with high ACEs had a higher prevalence of depressive symptoms and psychological distress, and a lower prevalence of psychological well-being.

The prevalence of at least one ACE and high ACEs in our study were similar to that in other settings in LMICs that estimate the prevalence of any ACE at 75%¹⁰ and high ACEs among mothers to be between 7% and 39%.^{21,22} Our findings are consistent with previous research demonstrating that past ACEs are associated with poorer psychological outcomes later in life.^{3,15} It is possible that the influence of maternal ACEs on mental health outcomes was influenced by the impact of ACEs on marital status, education, and food security. Women with high ACEs were less likely to have high perceived social support than women with low ACEs. Despite this, in our sample over 80% of women with high ACEs reported moderate/high social support. This may reflect extended community, family, or peer networks of women in the community in general in this cohort. Our study adds to recent evidence demonstrating that maternal ACEs are associated with poor psychological outcomes in LMICs.^{7,21,23,24} ACEs reflect exposures that occurred in early childhood and adolescence, however it has been shown that these contribute towards long-term adverse outcomes.^{1,2} The impact of these early exposures underscore the need to mitigate ACEs early on and provide treatment focused interventions during early adolescence and adulthood given that these may continue to feed into complex psychiatric morbidity over time if left untreated. There is a potentially unique opportunity among mother/infant pairs in the peripartum period to prevent a recurring generation of ACEs. There is recent evidence to suggest that group

interventions for parents with ACEs may be an effective strategy for improving maternal mental health and strengthening parenting efficacy.²⁵ Screening women for ACEs, targeted counseling to explore the impact and residue of ACEs and ways to avoid ACEs for the new infant may be a strategy that yields long-term impact. Training health care workers to provide education and skill-building related to ACEs for new mothers could be a viable way to intervene on the intergenerational impact of maternal ACEs for the next generation.

In this study, mothers with high ACEs had an over 3-fold higher prevalence of moderate to severe depressive symptoms and psychological distress than those women who experienced fewer ACEs. These findings are consistent with previous work demonstrating a link between ACEs and depression and psychological distress.^{2,6} The postpartum period is a time of considerable risk for poor maternal mental health and as maternal depression is the most commonly occurring condition, it can have a substantial negative impact on physical health, mental health and well-being for mothers and their children²⁶ such as increased risk for pregnancy loss, preterm birth, and delayed infant development.^{27,28} Because there is a clear link between ACEs and depression among pregnant and postpartum women, intervening on ACEs before pregnancy could be an important step in addressing maternal mental health.²⁹ Much like maternal depression, maternal psychological distress is associated with poorer infant outcomes including delays in cognitive, socio-emotional, and psychomotor development.²⁹ Though the overall prevalence of psychological distress was relatively low (3.1%) in the present study, previous research has demonstrated a much higher prevalence of psychological distress among postpartum mothers in Kenya ranging from 35% to 65%.^{30,31} Mothers with high ACEs had a substantially lower perceived sense of well-being than mothers with low ACEs, a finding that would make sense given the dose and frequency of traumatic exposures entailed. Research on psychological well-being in pregnancy is less common but positive psychological well-being in pregnancy is associated with beneficial infant outcomes including greater cognitive development and language acquisition.³² Similarly, the World Health Organization considers improving maternal well-being to be a main principle when it comes to improving quality of care in maternal and child health care settings.³³ Screening mothers for ACEs, as well as mental health outcomes, early in pregnancy could lead to early intervention for potential negative outcomes during pregnancy.

In analyses stratified by HIV status, associations of poor psychological outcomes with ACEs were higher among mothers without HIV than among mothers with HIV. This differed from previous work demonstrating that psychological outcomes were worse among people living with HIV with high ACEs.¹² This may be because prior work was in HICs or because HIV status does not have as much of an impact on the relationship between maternal ACEs and psychological outcomes in a setting with high HIV prevalence. HIV care in Kenya has integrated several aspects of mental health programming including assessment of mothers using PHQ-9, PMTCT services including psychosocial messaging and relatively better support for women experiencing distress. Of late more tailored personalized interventions have been added which are missing for general populations of women.³⁴

In analyses stratified by social support, most associations persisted in all subgroups. However, among mothers with low perceived social support, associations between ACEs and psychological distress were not retained. These findings are likely due to the limited statistical power to detect a difference in the low perceived social support group. There is considerable evidence that social support may buffer against poor mental health outcomes.³⁵ However, social support is difficult to measure, and there was limited heterogeneity in social support in our cohort. In addition, the benefits and outcomes related to social support differ depending on cultural context³⁶ and the measure used to assess social support have had less relevance for this cohort in Kenya.

Finally, we found that associations persisted for each ACE domain. Our findings contrast with prior studies that demonstrated that specific ACEs domains were more strongly associated with particular psychological outcomes.^{7,11,14,15} For example, previous work found that a history of family mental illness (household dysfunction domain) and experiencing sexual abuse (abuse domain) were the only ACEs associated with a diagnosis of depression later in life.¹¹ Another study found that abuse and neglect predicted subsequent depression, anxiety, and trauma, while household dysfunction only predicted subsequent anxiety.¹⁴ However, these studies were both conducted using nationally representative, mixed-gender samples from the United States. It is likely that the context for a sample of exclusively postpartum women in a limited-resource setting in Kenya is different enough that we would not see similar patterns.

A strength of the current study is it is one of the few studies to examine the interplay of maternal ACEs, psychological outcomes, and HIV in a LMIC. Additionally, our study had a large sample size with a wide variety of ACEs and psychological outcome scores. Measures of outcomes and exposures may have had limitations due to cultural differences in our LMIC cohort and between regions assessed in the study. Though there were significant differences in marital status, educational attainment, and food insecurity between women with high ACEs and those with low ACEs, marital status,³⁷ educational attainment³⁸ and food insecurity³⁹ are all likely on the causal pathway between maternal ACEs and mental health, so we did not adjust for these variables. Further mediation analyses may be useful to elucidate pathways between ACEs and mental health outcomes.

Overall, we found that high maternal ACEs are associated with poorer mental health outcomes for new mothers in Kenya regardless of HIV status. These findings have implications for clinical and public health practice for women with greater vulnerability like HIV, but also have implications for population level screening, intervention and mental health promotion including awareness building around public health mitigation of ACEs. New mothers in Kenya may benefit from ACEs screenings and additional mental health support during the postpartum period to facilitate positive psychological well-being.

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Table 1. Sociodemographic characteristics by ACEs score

	Overall Sample N = 1988 (N/% or Median/IQR)	High ACEs N = 342 (N/% or Median/IQR)	Low ACEs N = 1646 (N/% or Median/IQR)	p-value
Maternal Characteristics				
Mother age (years)	29 (24-33)	29 (25-34)	28 (24-33)	0.06
Education				0.04
Primary or less	772 (38.8%)	152 (44.4%)	620 (37.7%)	--
Secondary	895 (45.0%)	139 (40.7%)	756 (45.9%)	--
College/University	321 (16.1%)	51 (14.9%)	270 (16.4%)	--
Marital status				< 0.001
Married (monogamous)	1524 (76.7%)	233 (68.1%)	1291(78.4%)	--
Married (polygamous)	158 (7.9%)	37 (10.8%)	121 (7.4%)	--
Unmarried, but partnered	91 (4.6%)	15 (4.4%)	76 (4.6%)	--
Separated/widowed	134 (6.7%)	43 (12.6%)	91 (5.5%)	--
Never married	79 (4.0%)	14 (4.1%)	65 (3.9%)	--
Household food insecurity				< 0.001
Little to no hunger in household	1670 (84.0%)	239 (70.0%)	1431 (86.9%)	--
Moderate hunger in household	307 (15.4%)	98 (28.7%)	209 (12.7%)	--
Severe hunger in household	11 (0.5%)	5 (1.5%)	6 (0.4%)	--
Employment status				0.88
Professional	133 (6.7%)	24 (7.0%)	109 (6.6%)	--
Casual	235 (11.8%)	43 (12.6%)	192 (11.7%)	--
Unemployed	1414 (71.1%)	246 (71.9%)	1168 (71.0%)	--
Other	206 (10.4%)	29 (8.5%)	177 (10.8%)	--
HIV status				
Living with HIV	992 (49.9%)	178 (52.0%)	814 (49.5%)	0.42
ACEs Characteristics				
Average number of ACEs	1 (0-3)	5 (4-6)	1 (0-2)	< 0.001
Proportion endorsed for each ACE domain				
<i>Abuse</i>	521 (26.2%)	292 (85.4%)	229 (13.9%)	< 0.001
<i>Neglect</i>	713 (35.9%)	297 (86.8%)	416 (25.3%)	< 0.001
<i>Household dysfunction</i>	849 (42.7%)	322 (94.1%)	527 (32.0%)	< 0.001
Social Support				
Moderate to high social support	1820 (91.5%)	285 (83.3%)	1535 (93.2%)	< 0.001
Social support provider				
<i>Family</i>	1662 (83.6%)	240 (70.2%)	1422 (86.4%)	< 0.001
<i>Friends</i>	1270 (63.9%)	203 (59.4%)	1067 (64.8%)	0.06
<i>Significant other</i>	1771 (89.1%)	276 (80.7%)	1495 (90.8%)	< 0.001
Intimate partner violence	85 (4.3%)	19 (5.6%)	66 (4.0%)	0.26

Table 2: Prevalence ratios for mental health outcomes by ACEs score

	High ACEs N = 342	Low ACEs N = 1646		
Maternal Mental Health	Prevalence	Prevalence	Prevalence Ratio (95% CI)	P value
Wellbeing (Score of 50% or higher)	59.3%	81.0%	0.75 (0.69, 0.82)	< .001
Depression Symptoms (moderate/severe)	12.0%	4.2%	2.86 (1.98, 4.13)	< .001
Psychological Distress Symptoms (moderate/severe)	7.6%	2.1%	3.68 (2.24, 6.06)	< .001

Table 3: Prevalence ratios of mental health outcomes by ACEs score, stratified by HIV status

	Mothers with HIV			p value	Mothers without HIV			p value
	High ACEs N = 178	Low ACEs N = 814	Prevalence Ratio (95% CI)		High ACEs N = 164	Low ACEs N = 832	Prevalence Ratio (95% CI)	
Maternal Mental Health	Prevalence	Prevalence	Prevalence Ratio (95% CI)		Prevalence	Prevalence	Prevalence Ratio (95% CI)	
Wellbeing (Score of 50% or higher)	60.1%	77.5%	0.78 (0.68, 0.88)	< .001	61.6%	84.5%	0.73 (0.65, 0.83)	< .001
Depression Symptoms (moderate or higher)	10.1%	4.1%	2.49 (1.44, 4.32)	.002	14.0%	4.3%	3.24 (1.97, 5.32)	< .001
Psychological Distress Symptoms (moderate or higher)	6.2%	2.6%	2.39 (1.17, 4.87)	.021	9.1%	1.6%	5.88 (2.85, 12.11)	< .001

Table 4: Prevalence ratios of mental health outcomes by ACEs score, stratified by social support

	High Social Support				Low Social Support			
	High ACEs N = 285	Low ACEs N = 1535			High ACEs N = 56	Low ACEs N = 108		
Maternal Mental Health	Prevalence	Prevalence	Prevalence Ratio (95% CI)	p value	Prevalence	Prevalence	Prevalence Ratio (95% CI)	p value
Wellbeing (Score of 50% or higher)	66.7%	81.2%	0.82 (0.75, 0.89)	.043	42.6%	80.7%	0.53 (0.28, 0.64)	.027
Depression Symptoms (moderate or higher)	9.8%	3.8%	2.60 (1.69, 4.01)	< .001	4.6%	0.7%	2.28 (1.09, 4.75)	.012
Psychological Distress Symptoms (moderate or higher)	6.7%	1.6%	4.10 (2.29, 7.35)	< .001	2.5%	0.6%	1.50 (0.59, 3.82)	.635

Table 5: Prevalence ratios for mental health outcomes by ACEs domain

Abuse				
	Any Abuse N = 521	No Abuse N = 1,467		
	Prevalence	Prevalence	Prevalence Ratio (95% CI)	P value
Well-being	64.7%	82.4%	0.79 (0.74, 0.85)	< .001
Depressive Symptoms	6.3%	2.5%	2.52 (1.59, 3.98)	< .001
Psychological Distress	5.6%	2.1%	2.63 (1.60, 4.33)	.002
Neglect				
	Any Neglect N = 713	No Neglect N = 1,275		
	Prevalence	Prevalence	Prevalence Ratio (95% CI)	P value
Well-being	70.4%	81.8%	0.86 (0.81, 0.91)	.004
Depressive Symptoms	5.6%	2.4%	2.24 (1.41, 3.55)	.007
Psychological Distress	4.6%	2.2%	2.18 (1.32, 3.59)	.003
Household Dysfunction				
	Any Household Dysfunction N = 849	No Household Dysfunction N = 1,139		
	Prevalence	Prevalence	Prevalence Ratio (95% CI)	P value
Psychological Well-being	67.5%	85.2%	0.80 (0.75, 0.84)	< .001
Depressive Symptoms	5.7%	1.9%	2.93 (1.79, 4.82)	< .001
Psychological Distress	5.9%	0.9%	6.72 (3.43, 13.17)	< .001

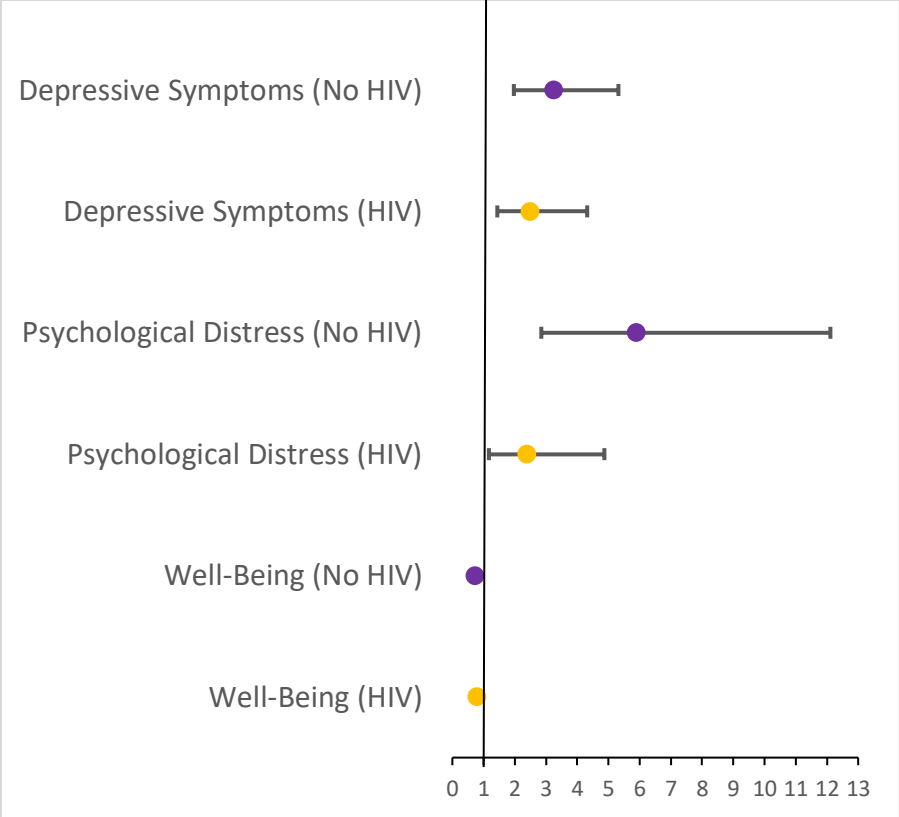


Fig 1. Forest plot of prevalence ratios of mental health outcomes by ACEs score by HIV status

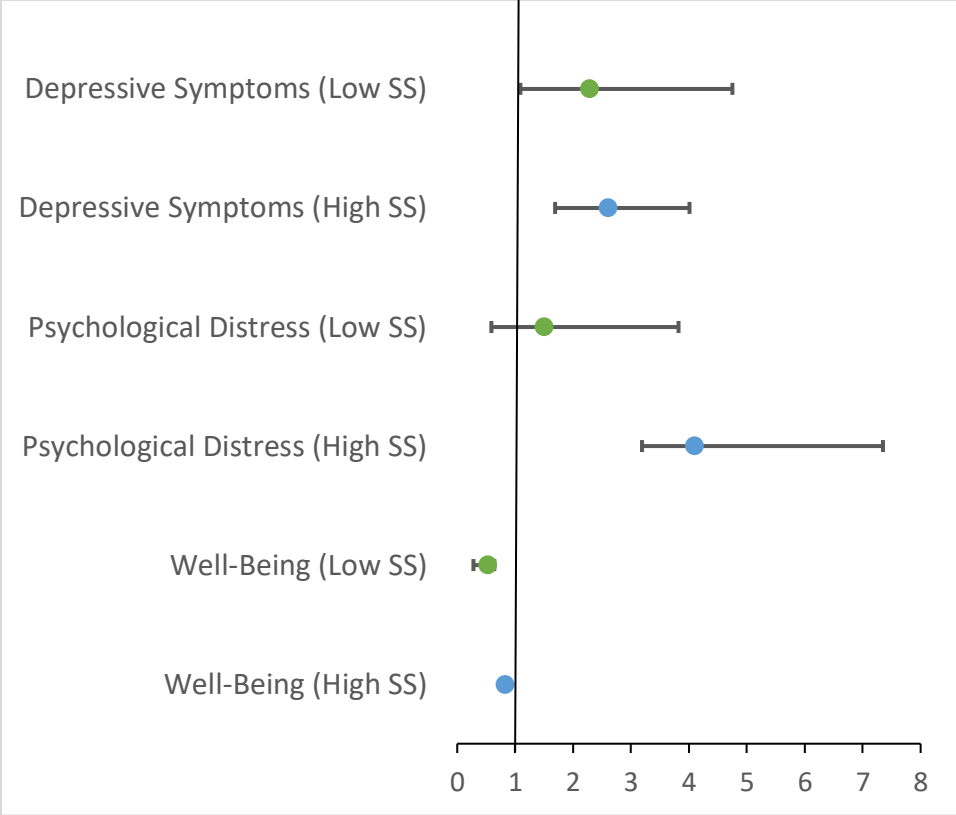


Fig 2. Forest plot of prevalence ratios of mental health outcomes by ACEs score by social support