# Adverse Childhood Experiences: Prevalence and Association With Adolescent Health in Malawi

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## Abstract

**Introduction:** Childhood adversity is robustly associated with poor health across the life course. However, very few studies have examined the prevalence and implications of adverse childhood experiences (ACEs) in low- and middle-income countries. The objective of this study is to measure ACEs among adolescents in Malawi and examine the association with mental and physical health outcomes.

**Methods:** From 2017 to 2018, baseline data were collected among adolescents aged 10–16 years (N=2,089). Respondents were interviewed in their local language at their homes. Respondents completed questions on childhood adversity (ACE-International Questionnaire), self-rated health, mortality expectations, and mental health (Beck Depression Inventory and Post-traumatic Stress Disorder Scale). Stunting, obesity, and grip strength were measured. Analyses were conducted in 2018. Frequencies described the prevalence of ACEs and adjusted multivariate models examined whether cumulative adversity predicts current health.

**Results:** Adolescents reported a high burden of adversity (i.e., five lifetime ACEs on average). Adolescents who scored in the top ACEs quintile were more likely to report depression (OR=3.11, 95% CI=2.10, 4.60), post-traumatic stress disorder (OR=4.19, 95% CI=2.43, 7.23), worse self-rated health (OR=3.72, 95% CI=2.03, 6.81), and a higher expected likelihood of dying in the next 5 years (RR=5.02, 95% CI=2.15, 7.88) compared with those in the bottom quintile. However, ACEs did not demonstrate a graded relationship with obesity, stunting, or grip strength.

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**Conclusions:** These patterns are quite consistent with evidence from high-income countries, and suggest that primary prevention of ACEs should be a priority to ensure lifelong health in low-resources settings.

# INTRODUCTION

Childhood adversity captures a broad array of events that are stressful or traumatic for children. For example, it may include abuse, bullying by peers, witnessing domestic violence, parental death, and experiencing collective violence. Critically, a substantial proportion of the population experiences childhood adversity: In a representative study of 23 U.S. states, almost two thirds experienced at least one of these adversities, and a quarter experienced three or more.[1] Childhood adversity is robustly associated with poor health in later life, including heart disease, cancer, depression, and premature mortality.[2–3,4]

To date, much of what is known about adverse childhood experiences (ACEs) comes from high-income countries (HIC). Very few studies have examined the prevalence and implications of ACEs in low- and middle-income countries (LMIC). Fewer still have done so in an HIV endemic context. A 2017 systematic review concluded that "little is known about how ACEs predict health outcomes in low income, high violence settings, where exposure to adversity is widespread across the life course."[4] In the past few years, however, the geographic scope of inquiry has expanded slowly. Emerging evidence supports the cross-cultural relevance of the ACEs concept and suggests that ACEs may be even more common in LMIC.[5–14] In many contexts, extreme poverty, war, and HIV/AIDS fuel adversity.[8] Children who grow up in families affected by HIV are more likely to experience multiple, overlapping adversities.[15,16] For example, having a parent who has died, or who is HIV-positive, increases the likelihood that a female will then be sexually abused.[17] At the same time, the HIV epidemic disrupts natural sources of protection, such as community social support, which may buffer children against adversity.[18]

Moreover, estimates of childhood adversity mostly come from adult retrospective reports. From studies in HIC, there is evidence that ACEs begin to negatively impact health as early as adolescence, with depression, early pregnancy, and sexually transmitted disease among the documented effects.[19–23] Yet, only a few studies have attempted to measure cumulative ACEs among adolescents in LMIC.[24–27] In a study of South African adolescents, 77% reported at least one adverse experience and 20% reported three or more.[24] Similar findings were reported among adolescents in Kenyan slums.[25] ACEs were also common among young (aged 10–14 years) urban adolescents in multiple LMICs, though this study did not provide the distribution.[27] Moreover, few studies use a standardized instrument to measure ACEs, which hampers comparison. Accurate measurement during this developmental period is critical to understand the link between adversity and subsequent health trajectories in adolescence and beyond.

# METHODS

## Study Sample

This study was an extension of the Malawi Longitudinal Study of Families and Health (MLSFH).[28] Established in 1998, the MLSFH provides data on the health and demographic/socioeconomic conditions of adults in three regions of Malawi. The MLSFH study population lives in rural areas and primarily engages subsistence agriculture and small-scale market activities. HIV/AIDS is widespread: 5% of male and 9% of female adults living in rural areas are HIV-infected.[29] Both orphanhood (21% of males and 25% of females aged 13–17 years) and early marriage (2% and 9%, respectively) are common.[30] Finally, two thirds of children live below the national poverty line[31] and 22% of adolescents aged 14–17 years are out of school.[32]

This study established an adolescent cohort by building on the existing MLSFH. From household rosters completed in 2008 and 2010, all children estimated to be aged 11–15 years in 2017 were selected for potential inclusion. To create sibling matches in households with only one adolescent, the age range was extended by 1 year in both directions and the adolescent closest in age to the index child was enrolled. Using the residential information of the original MLSFH respondent, selected adolescents were traced, their age was verified as 10–16 years, and they were invited to participate in the adolescent study. When adolescents no longer lived at the original location, attempts were made to trace them if their new location was within the district or in a major city. Of the 3,317 potential respondents, many were age-ineligible, duplicates, or had moved out of the study catchment area. Others had passed away or their location was unknown. Of the 2,102 eligible adolescents located, 13 (<1%) did not give assent or caregiver consent to participate. Thus, 2,089 adolescents were surveyed: 1,787 were located at or near the homes of the original adult MLSFH respondents, 114 were traced to new homes within a nearby village, and 262 respondents were located further away. The study also interviewed the adolescent's primary caregiver if available (N=1,453). Often, there were several adolescents living with the same caregiver (1,016 adolescents in pairs; 136 in larger sibling groups). All participants gave their informed written consent/assent to participate. IRB approval was obtained from Stony Brook University and the National Health Science Research Committee in Malawi. Face-to-face interviews were conducted privately at the adolescent's home. Redcap was used to enter responses in real time on a tablet. Respondents were interviewed in their local language (chiChewa, chiYao, or chiTumbuka) and any potential distress was monitored by the trained interviewers. In cases of substantial distress, the interviewer called in a supervisor who arranged any necessary support. Following the survey, HIV Testing and Services counsellors collected anthropometric measures. All adolescents were given an emergency phone number card that listed local resources as well as a study "hotline." During the study and for 2 months after completion, the implementation partner (IKI Malawi) operated the hotline and provided additional information about resources and support.

## Measures

The WHO notes that ACEs remain understudied in LMIC[33]; to facilitate such research, they designed and piloted the ACE-International Questionnaire (ACE-IQ) in conjunction with

African researchers.[34] The ACE-IQ covers 13 individual, family, peer, and community influences (Table 2). Previous work shows a strong graded relationship between ACEs and poor health[35,36]; thus, ACEs were operationalized by summing the number of lifetime adversities reported using the binary method. These were also categorized into quintiles to facilitate description. The ACE-IQ showed good validity and reliability in this sample.[37]

An ordinal measure of self-rated health was created using the question: *Compared to other people your age, would you say your health is much better, better, same, worse, or much worse?* For regression analyses, this was dichotomized into worse/much worse versus others. Adolescents were also asked a series of questions to elicit their subjective expectations for the future using an approach developed in prior MLSFH rounds.[38] After a brief tutorial, adolescents were given ten beans, and told to place beans on a plate to represent the likelihood that a given event would happen (more beans = more likely). For this analysis, the focus was on adolescents' expectations of dying within the next 5-year period (0%–100%).

Several anthropometric measures of nutritional health were collected. Research shows that children experiencing adversity—including abuse, orphanhood, and maternal depression—are less likely to have access to adequate nutrition and more likely to become stunted.[39–41] Childhood maltreatment and other adversities can also lead to obesity later in life, though it is unclear whether this is observable during adolescence.[42,43] Height-for-age was used to capture stunting, and coded using Z-scores in relation to the WHO child/adolescent international reference group for age and sex; stunting was defined as Z-score < −2.[44] Similarly, BMI was used to measure obesity in relation to the WHO international reference group, and defined as Z-score >2. Finally, grip strength is an indicator of muscle strength that helps identify the level of development and degree of disability[45]; it is thus a recommended tool for measuring health outcomes in youth.[46] Participants made two attempts with each hand using the Jamar dynamometer. For this study, the authors analyzed the maximum grip strength achieved.

Depressive symptomology was measured using the Beck Depression Inventory,[47] a self-report scale of 21 items each scored from 0 to 3. For this study, a dichotomous outcome was used: Those individuals who scored >17 were considered to have symptoms indicative of moderate or severe depression. The Post-traumatic Stress Disorder Scale (PTSD-8) is an eight-item scale based on DSM-IV criteria for PTSD and evaluates three symptom clusters: intrusion, avoidance, and hypervigilance behaviors.[48] Item scores range from 0 to 4; individuals who scored at least one item ≥ 2 in each cluster met the criteria for PTSD symptomology.

In Malawi, HIV affects all individuals in a multitude of ways, both including and independent of their own or family members' HIV status. In highly endemic countries, such as Malawi, support and resources are often targeted explicitly to children who are significantly affected by HIV/AIDS. To capture this, adolescents were asked whether parents, siblings, or other household members were HIV-positive or had died from AIDS. Caregivers completed the Fanta Household Hunger Scale to capture food insecurity.[49] Finally, age (continuous), sex, SES (a continuous measure of asset ownership, weighted by inverse of the proportion of the population owning each asset; this was imputed at the

median if missing), and home district (Rumphi, Mchinji, or Balaka) were considered covariates.

### Statistical Analysis

The sample characteristics and prevalence of individual adversities were described using frequencies. Adversities were hypothesized to be more common among HIV-affected adolescents. Ordinary least squares regression was used test this hypothesis. As parental death is a key indicator of whether an adolescent has been affected by HIV, the authors modeled an ACE score that excludes the parental death/divorce domain. Next, analyses examined whether cumulative adversity predicts current health and subjective mortality expectations. Separate unadjusted and adjusted regressions were run for each outcome; these were ordinary least squares regressions for continuous outcomes (in results, β coefficients are presented) and logistic regressions for dichotomous outcomes (in results, ORs are presented). Finally, analyses examined whether adolescents scoring the top quintile of adversity (eight or more ACEs) had worse outcomes than those in the bottom quintile (zero to three ACEs). Missing ACE data were minimal (e.g., 5 of 2,089), and thus were deleted in a case-wise fashion. All models used the cluster command to adjust SEs for correlation at the caregiver level (as adolescents raised by the same caregiver would have more similar experiences). Adjusted models also included age, sex, SES, and home district. Analyses were run using Stata, version 13.

## RESULTS

The average age of the sample was just higher than 13 years, and it was almost evenly split by sex (Table 1). Almost a quarter of the sample lived in a household with moderate to severe hunger. Overall, 11% of the sample reported being affected by HIV; this did not include 12% of adolescents who report having been orphaned but did not cite HIV as the cause.

Less than 1% reported no adversity. On average, adolescents ever experienced five ACEs (SD=2.35; range, 0–12; median, 5). The most common adversities reported were emotional abuse (53%) or neglect (85.9%), physical abuse (53.2%), witnessing domestic violence (59%), and witnessing community violence (88%) (Table 2). Adjusting for demographic covariates, HIV-affected adolescents experienced a higher burden of cumulative adversity compared with unaffected peers (β=0.99, $p<0.001$).

The health profile of the sample is given in Table 3; models associating adversity and health outcomes are presented in Table 4. For each additional adversity experienced, the adjusted odds of depression and of PTSD rose 21% (Table 4). To put this in perspective, results comparing adolescents in the top and bottom quintiles of ACEs score are also presented. Adolescents who scored in the top ACEs quintile had three times the odds of depression and four times the odds of PTSD compared with peers in the bottom quintile. Similarly, adolescents in the top ACE quintile were significantly more likely to report worse self-rated health (OR=3.72, 95% CI=2.03, 6.81) and a higher likelihood of dying in the next 5 years (β=5.02, 95% CI=2.15, 7.88) compared with those in the bottom quintile. However, ACEs did not demonstrate a graded relationship with any objectively measured health outcomes,

including obesity, stunting, and grip strength, in the full sample. Patterns were largely similar when analyzed by sex, with the exception of a small but significant association between ACEs and obesity in females.

## DISCUSSION

Childhood adversity is common in Malawi, a low-income and HIV-endemic country. In this study, almost three quarters (72%) of adolescents (aged 10–16 years) reported four or more adversities. This is far higher than published estimates from any other setting. In a global review, Hughes et al.[4] found that between 1% and 38% of adults reported four or more ACEs, though this review was heavily weighted toward HICs. Estimates from the U.S. tend to fall somewhere in the middle (e.g., 16% in both the Centers for Disease Control and Prevention–Kaiser cohort[50] and a more recent 23-state study[1]). The U.S.-based studies typically exclude three domains captured in the ACE-IQ (bullying, community violence, and collective violence). When these are excluded to make the results more comparable, 55% of Malawian adolescents report four or more adversities. Given the young age of the present sample (13 years on average), the burden of childhood adversity is likely to rise even further before their 18th birthday.

There is an extensive literature demonstrating how ACEs impact mental health, chronic conditions, and infectious diseases across the life course.[3,35,36,51] Importantly, this study also finds that childhood adversity has a strong influence on mental health—even in early adolescence, and even in a setting where adolescents and their parents are affected by chronic poverty and associated relative deprivation. Adversity does not, however, seem to exert the same level of influence on the few physical health measures measured during this developmental period. Despite the very different socioeconomic and epidemiological contexts, these patterns of association in this low-income study population are quite consistent with evidence from high- and middle-income countries. For example, a 2017 meta-analyses found that ACEs were a strong predictor of depression in adults, a moderate predictor of self-rated health, and a weak predictor of obesity.[4] Longitudinal follow-up is critical to track physical health, as there may be latent effects that are unobservable in adolescence. For instance, a meta-analysis found a relationship between childhood maltreatment and obesity, but this only emerged during adulthood.[42]

The study of ACEs takes on additional urgency in countries with a generalized HIV epidemic. In Malawi, where adult HIV prevalence stands at 9%,[29] adversity may both be a cause and a consequence of the epidemic. The current study demonstrates that adolescents affected by HIV (e.g., orphaned or living with an HIV-positive family member) experience significantly greater adversity. It also shows that adversity predicts depression, itself associated with HIV risk behaviors in some (but not all) studies.[52–54] More direct evidence that ACEs drive HIV risk behaviors and incidence comes from recent studies in Malawi, South Africa, and Tanzania.[21,55,56] Thus, addressing the extraordinarily high burden of ACEs should be part of our HIV response. To the authors' knowledge, this represents one of the first studies using the ACE-IQ in a low-income country. The ACE-IQ is a standardized instrument that captures a wide range of adversities across multiple ecological levels, and has demonstrated good psychometric properties among different populations and settings.

[37,57,58] One strength is that this study collected data from adolescents, who may more accurately report ACEs compared with adults given both the relatively shorter recall periods and the lack of confusion about whether adversities were experienced during childhood.[59,60] Although this sample was drawn from rural areas, the estimates of individual adversities are in line with other Malawian studies. For example, a nationally representative study sampled slightly older Malawian youth (aged 13–24 years) and found that 29% experienced emotional violence, 63% experienced physical violence, and 23% experienced sexual violence prior to age 18 years.[61] Likewise, slightly less than a third of the present sample reported being bullied; in a separate study, slightly more than a third of Malawian school children (aged 10–19 years, urban and rural) reported being bullied.[62]

### Limitations

All of these studies relied on self-report; thus, adversity may be under-reported owing to social desirability bias. This paper relies on baseline data from a longitudinal study. The cross-sectional nature precludes any causal inference on whether adversity affects health, though longitudinal studies from elsewhere provide support for such causal pathways (e.g., for depression[63–66]). Finally, 37 adolescents from the sample frame were found to have died; findings may be biased if attrition was related to adversity.[2]

## CONCLUSIONS

This study demonstrates a higher-than-expected burden of adversity in rural Malawi, and suggests a negative influence on depression and self-reported health. This is consistent with emerging evidence from urban adolescents in LMIC.[27] Unfortunately, primary prevention of ACEs has been a low priority in resource-constrained contexts.[67] The increased focus on measuring adversity in LMIC combined with the global commitments to reduce such may provide momentum.[3] The Sustainable Development Goals contain commitments to reduce "abuse, exploitation, trafficking and all forms of violence against children" and to "eliminate all forms of violence against women and females."[68]

To reach these Sustainable Development Goals in light of a very high prevalence of ACEs, the current analyses suggest that low-income countries will need to develop and invest in a comprehensive plan to reduce ACEs and ameliorate their effect on later-life health. The fact that most adolescents were exposed to multiple types of adversity at multiple ecological levels suggests that no one intervention will be adequate. Thus, the WHO and global partners created the INSPIRE package of evidence-based interventions for ending violence against children.[69] INSPIRE calls for scaling up victim support services at the individual level, providing parenting and economic interventions at the household level, challenging harmful social norms at the community level, and creating legal protections (e.g., outlawing physical punishment) at the national level.

Researchers have a vital role to play. There are many questions that need to be answered to shape local responses, starting with, "Why are the levels of adversity so high?" Identifying shared risk factors for multiple types of adversity provides key targets for interventions. Moreover, many of the above recommendations are based primarily on intervention evidence from HICs, and have rarely been adapted to LMIC.[69–71] Rigorous evaluation is needed to

identify interventions that are effective and could be brought to scale in LMIC, and implementation science can identify how best to deliver interventions in diverse, low-resource settings. Finally, repeated surveillance of ACEs will be a necessary component to track whether interventions are having the intended impact at a large scale. This study shows that such measurement is possible in a low-income country, and establishes an important benchmark.

## ACKNOWLEDGMENTS

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**Table 1.**

Description of Sample

| Characteristic | _n_ (%) |
|---|---|
| Age, years, mean (SD) | 13.25 (1.69) |
| Sex | |
|     Female | 1,027 (49.16) |
|     Male | 1,062 (50.84) |
| SES quintile | |
|     Lowest | 494 (23.65) |
|     Second | 327 (15.65) |
|     Third | 453 (21.69) |
|     Fourth | 407 (19.48) |
|     Highest | 408 (19.53) |
| Household hunger | |
|     Little to no hunger | 1,588 (77.69) |
|     Moderate hunger | 418 (20.45) |
|     Severe hunger | 38 (1.86) |
| Home district | |
|     Balaka | 742 (35.52) |
|     Rumphi | 677 (32.41) |
|     Mchinji | 670 (32.07) |
| HIV-affected | |
|     Yes | 474 (22.69) |
|     No | 1,615 (77.31) |

**Table 2.**

Lifetime Prevalence of Individual and Cumulative ACE, by Sex

| Type of ACE | Prevalence of ACE, N (%) | | |
|---|---|---|---|
| | All | Females | Males |
| Individual abuse and neglect | | | |
| Emotional neglect | 1,792 (85.95) | 859 (83.72) | 933 (88.10) |
| Emotional abuse | 1,105 (53.00) | 508 (49.51) | 597 (56.37) |
| Physical neglect | 677 (32.47) | 328 (31.97) | 349 (32.96) |
| Physical abuse | 1,110 (53.24) | 508 (49.51) | 602 (56.85) |
| Sexual abuse | 136 (6.52) | 82 (7.99) | 54 (5.10) |
| Family dysfunction | | | |
| Substance abuser in household | 467 (22.40) | 219 (21.35) | 248 (23.42) |
| Someone with mental health issues in household | 137 (6.58) | 76 (7.41) | 61 (5.77) |
| Incarcerated household member | 269 (12.91) | 134 (13.07) | 135 (12.75) |
| Domestic violence | 1,231 (59.04) | 621 (60.53) | 610 (57.60) |
| Parents dead or divorced | 1,057 (50.70) | 525 (51.17) | 532 (50.24) |
| Peer | | | |
| Bullied | 654 (31.38) | 261 (25.46) | 393 (37.11) |
| Community | | | |
| Community violence | 1,842 (88.35) | 891 (86.84) | 951 (89.80) |
| Collective violerce | 186 (8.92) | 92 (8.97) | 94 (8.88) |
| ACE Quintile | | | |
| 1 (0–3 ACEs) | 574 (27.53) | 309 (30.12) | 265 (25.02) |
| 2 (4 ACEs) | 309 (14.82) | 158 (15.40) | 151 (14.26) |
| 3 (5–6 ACEs) | 623 (29.88) | 299 (29.14) | 324 (30.59) |
| 4 (7 ACEs) | 239 (11.46) | 101 (9.84) | 138 (13.03) |
| 5 (8+ ACEs) | 340 (16.31) | 159 (15.5) | 181 (17.09) |

ACE, adverse childhood experience.

**Table 3.**

Frequency of Health Outcomes

| Outcome | *n* (%) | Mean ACEs (SD) |
|---|---|---|
| Physical health | | |
| Self-rated health | | |
| Much better | 468 (22.46) | 4.82 (2.25) |
| Better | 826 (39.64) | 4.95 (2.28) |
| Same | 660 (31.67) | 5.31 (2.39) |
| Worse | 120 (5.76) | 6.15 (2.47) |
| Much worse | 10 (0.48) | 7.30 (1.77) |
| 5-year mortality expectation[a] | | |
| 0–20% | 727 (34.97) | 4.89 (2.23) |
| 30–50% | 1,090 (52.43) | 5.28 (2.38) |
| 60–100% | 262 (12.60) | 5.09 (2.47) |
| Stunting | | |
| Yes | 605 (30.04) | 5.30 (2.89) |
| No | 1,409 (69.96) | 5.04 (2.36) |
| Obesity | | |
| Yes | 473 (23.65) | 5.19 (2.40) |
| No | 1,527 (76.35) | 5.09 (2.32) |
| Grip strength[b] | | |
| 7–18.5 kg | 169 (21.64) | 5.37 (1.89) |
| 19–23.5 kg | 148 (18.95) | 5 (2.04) |
| 24–33.5 kg | 154 (19.72) | 5.12 (2.34) |
| 34–46.5 kg | 174 (22.28) | 4.72 (2.25) |
| 47–55.5 kg | 136 (17.41) | 5.07 (2.22) |
| Mental health | | |
| PTSD | | |
| Yes | 230 (11.06) | 6.17 (2.92) |
| No | 1,849 (88.94) | 4.99 (2.32) |
| Depression | | |
| Yes | 354 (16.99) | 6.06 (2.41) |
| No | 1,730 (83.01) | 4.92 (2.85) |

[a] 5-year mortality expectations were measured using ten beans, which results in 10% increments.

[b] Grip strength was rounded to the nearest 0.5 kg.

ACE, adverse childhood experience; PTSD, post-traumatic stress disorder.

**Table 4.**

Multivariate Association Between Cumulative Lifetime ACEs and Health Outcomes

| Outcome | Unadjusted associations | | Adjusted associations | |
|---|---|---|---|---|
| | **Per single ACE** | **Top versus bottom ACE quintile** | **Per single ACE** | **Top versus bottom ACE quintile** |
| Total sample | | | | |
| Physical health | | | | |
| Worse self-rated health, OR (95%CI) | **1.23 (1.14, 1.33)** *** | **3.53 (2.03, 6.14)** *** | **1.22 (1.13, 1.32)** *** | **3.72 (2.03, 6.81)** *** |
| 5-year mortality expectation, β (95%CI) | **0.48 (0.09, 0.87)** * | **3.15 (0.27, 6.04)** * | **0.86 (0.47, 1.25)** *** | **5.02 (2.16, 7.89)** ** |
| Stunting, OR (95%CI) | **1.05 (1.01, 1.09)** * | 1.32 (0.96, 1.80) | 1.00 (0.96, 1.05) | 0.99 (0.70, 1.40) |
| Obesity, OR (95%CI) | 1.02 (0.98, 1.07) | 1.22 (0.89, 1.69) | 1.04 (0.99, 1.09) | 1.35 (0.94, 1.93) |
| Grip strength (kg), β (95%CI) | 0.02 (−0.84, 0.13) | 0.62 (−0.16, 1.39) | 0.05 (−0.04, 0.14) | 0.65 (−0.04, 1.33) |
| Mental health | | | | |
| PTSD, OR (95%CI) | **1.23 (1.16, 1.30)** *** | **4.28 (2.74, 6.70)** *** | **1.20 (1.13, 1.28)** *** | **4.19 (2.43, 7.23)** *** |
| Depression, OR (95%CI) | **1.23 (1.16, 1.29)** *** | **3.81 (2.60, 5.58)** *** | **1.21 (1.15, 1.28)** *** | **3.11 (2.10, 4.60)** *** |
| Females | | | | |
| Physical health | | | | |
| Worse self-rated health, OR (95%CI) | **1.26 (1.14, 1.39)** *** | **5.24 (2.24, 12.25)** *** | **1.21 (1.09, 1.35)** *** | **4.44 (1.65, 11.94)** ** |
| 5-year mortality expectation, β (95%CI) | 0.49 (−0.06, 1.04) | 2.19 (−1.84, 6.21) | **0.96 (0.41, 1.51)** *** | 4.05 (−0.2, 8.13) |
| Stunting, OR (95%CI) | 1.05 (0.99, 1.12) | 1.30 (0.82, 2.04) | 0.99 (0.92, 1.06) | 0.84 (0.49, 1.45) |
| Obesity, OR (95%CI) | **1.06 (1.00, 1.13)** * | **1.58 (1.04, 2.41)** * | **1.08 (1.01, 1.15)** * | **1.94 (1.19, 3.16)** ** |
| Grip strength (kg), β (95% CI) | 0.08 (−0.06, 0.22) | 0.92 (−0.12, 1.97) | 0.10 (−0.02, 0.23) | **1.04 (0.10, 1.97)** * |
| Mental health | | | | |
| PTSD, OR (95%CI) | **1.26 (1.17, 1.36)** *** | **5.00 (2.71, 9.22)** *** | **1.22 (1.12, 1.33)** *** | **4.27 (1.96, 9.31)** *** |
| Depression, OR (95%CI) | **1.24 (1.15, 1.33)** *** | **3.52 (2.02, 6.11)** *** | **1.21 (1.12, 1.32)** *** | **3.08 (1.66, 5.71)** *** |
| Males | | | | |
| Physical health | | | | |
| Worse self-rated health, OR (95%CI) | **1.21 (1.09, 1.34)** *** | **2.50 (1.23, 5.08)** * | **1.22 (1.09, 1.36)** *** | **3.11 (1.45, 6.64)** ** |
| 5-year mortality expectation, β (95%CI) | 0.51 (−0.2, 1.05) | **4.17 (0.21, 8.12)** * | **0.77 (0.34, 1.29)** ** | **5.74 (1.90, 9.59)** ** |
| Stunting, OR (95%CI) | 1.04 (0.98, 1.10) | 1.30 (0.84, 2.02) | 1.01 (0.95, 1.08) | 1.10 (0.69, 1.74) |
| Obesity, OR (95%CI) | 0.99 (0.92, 1.06) | 0.95 (0.59, 1.55) | 1.00 (0.93, 1.07) | 0.93 (0.56, 1.57) |
| Grip strength (kg), β (95%CI) | −0.04 (−0.20, 0.13) | 0.22 (−0.93, 1.38) | 0.02 (−0.11, 0.15) | 0.32 (−0.66, 1.31) |
| Mental health | | | | |
| PTSD, OR (95%CI) | **1.20 (1.11, 1.30)** *** | **3.70 (1.89, 7.22)** *** | **1.19 (1.09, 1.30)** *** | **4.06 (1.85, 8.09)** *** |
| Depression, OR (95%CI) | **1.21 (1.13, 1.30)** *** | **3.95 (2.37, 6.57)** *** | **1.20 (1.12, 1.29)** *** | **3.32 (1.99, 5.53)** *** |

*Notes:* Boldface indicates statistical significance

*
$p<0.05$,

**
$p<0.01$,

*** 
*p*<0.001.

Beta coefficients (β) are presented for ordinary least-squares regressions, and ORs are presented for logistic regressions.

ACE, adverse childhood experience; PTSD, post-traumatic stress disorder.