



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

## Violence against children and human capital in South Africa

**Citation for published version:**

Xiaodong, Z, Fang, X, Ugboke, H & Fry, D 2018, 'Violence against children and human capital in South Africa', *Journal of Family Violence*, pp. 1-13. <https://doi.org/10.1007/s10896-018-0008-y>

**Digital Object Identifier (DOI):**

[10.1007/s10896-018-0008-y](https://doi.org/10.1007/s10896-018-0008-y)

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Peer reviewed version

**Published In:**

Journal of Family Violence

**Publisher Rights Statement:**

This is a post-peer-review, pre-copyedit version of an article published in Journal of Family Violence. The final authenticated version is available online at: <https://doi.org/10.1007/s10896-018-0008-y>

**General rights**

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.



**yAbstract**

**Purpose:** This is the first study in Africa to investigate the association of violence against children with human capital development, including short and long term health and educational outcomes in South Africa.

**Method:** Hypotheses were tested by applying logistic regressions, zero inflated poisson regressions and linear regressions with a large and representative sample of adolescents from the Cape Area Panel Study (CAPS). Household fixed effects model and treatment-effects model were performed to check the robustness of the results.

**Results:** Analyses indicate that 58% of adolescents in South Africa have experienced physical or emotional violence in childhood. All forms of violence, especially physical violence, are associated with adverse physical and mental health, poorer academic achievement and lower education level of the victims in both the short and long term. Adolescent males who have experienced violence in childhood are more likely to report poorer educational outcomes and long term physical health, while female victims are at higher risk of mental illness.

**Conclusions:** The findings provide support for the negative effects of violence against children on health and educational outcomes, which lead to increasing inequalities that impact on the future development of South Africa. Urgent violence against children prevention programming is needed alongside health and educational initiatives in the country.

*Keywords:* Violence against children, Human capital, Health, Education, South Africa



49 victims. A quarter to a third of abused children exhibited depression in their late 20s and in the  
50 United States, 80% of young adults who had been abused in childhood experienced one or  
51 more forms of psychiatric disorders by the age of 21. Another global systematic review  
52 focusing on the impacts of violence in childhood on educational outcomes found that all  
53 forms of violence – physical, sexual and emotional violence – impact significantly on  
54 educational attainment and outcomes such as absenteeism for both boys and girls albeit in  
55 different ways (Fry et al. 2018). However, to our knowledge, few studies have  
56 comprehensively discussed the association of VAC with human capital in African context.

57 To fill the research gap, the purpose of the present study is to examine the association  
58 of VAC with human capital, including short and long term health and educational  
59 consequences, from a representative sample of South African adolescents. We further  
60 explored gender differences in this relationship and checked the robustness of our results by  
61 applying household fixed effects and treatment-effects models. Our findings are intended to  
62 help policy makers better understand the negative impact of the VAC on human capital in  
63 South Africa and advance their awareness to support investments for prevention and  
64 intervention programs to reduce the prevalence of VAC and to provide appropriate responses  
65 to those who have experienced violence.

### 66 **Violence against children and human capital**

67 Violence against children can cause negative consequences to the health status of the  
68 victims in several ways. Physical injuries sustained from abuse are the most obvious signs of  
69 physical abuse and in addition to short term consequences such as bruises, scars, burns, and  
70 dislocation, long term consequences such as recurrent illness, permanent scarring, disabilities  
71 and body deformations are also possible (Finkelhor 2008; Greenfield 2010). Furthermore, in  
72 more severe cases, physical violence can result in loss of memory, permanent brain damage,  
73 mental disorders, suicidal tendencies and premature death of the victims (Bicakci 2016; Mills

74 et al. 2013). The negative impacts of emotional violence has also been reported to result in  
75 debilitating long term consequences such as self-inflicted harm, hyper- and high-risk  
76 sexuality, intimate partner violence (IPV), impulsivity, substance use, low self-esteem,  
77 impaired cognitive capacity, emotional upset, fear and post-traumatic stress disorder and  
78 suicide ideation and attempts (Downey et al. 2017; Fang and Corso 2008; Fang et al. 2015;  
79 Herrenkohl et al. 2013).

80         With respect to the mechanism of the relationship between VAC and educational  
81 outcomes, children who suffered from one or more forms of abuse may have difficulty in  
82 concentrating on academic activities, gaining new knowledge, acquiring new developmental  
83 skills and find it difficult socializing within environments such as schools, resulting in  
84 disrupted academic development (Romano et al. 2015; Trout et al. 2008). Moreover, the poor  
85 academic levels of abused children could be attributed to the children constantly delegating  
86 time and energy towards mentally or physically avoiding abuse, thus leaving them with  
87 minuscule amounts of physical or intellectual energy to delegate to academic responsibilities  
88 (Nakamoto et al. 2010; UNESCO 2017). Therefore, in the short term, children who have  
89 suffered from violence are more likely to have poorer academic performance, grade retention,  
90 less school connectedness and attendance, in comparison to children who have not been the  
91 victims of such violence (Mills et al. 2011). In the long term, children who have experienced  
92 violence in childhood have higher probability of not graduating from school and lower  
93 schooling years (Basch 2011; Fry et al. 2018).

94         Although adolescents may experience similar adverse effects to trauma from  
95 childhood violence, previous studies have suggested distinctions of coping responses between  
96 males and females (Gallo et al. 2018; Maschi et al. 2008). Specifically, adolescent males tend  
97 to react to stress by externalizing their behavior to express anger and act out aggressively,  
98 while females often internalize their behavior and therefore have higher levels of feelings of

99 guilt, depression and anxiety (Brensilver et al. 2011; Dunn et al. 2012). As such, on the one  
100 hand, compared to their female counterparts, male adolescents are more likely to engage in  
101 risky behaviors, such as alcohol or substance abuse, and delinquency or criminality, which  
102 are detrimental to their physical health, academic achievement and education levels (Bask  
103 2015; Holt et al. 2008; Maschi et al. 2008). On the other hand, the negative association  
104 between VAC and mental health may be stronger for female victims than their male  
105 counterparts (Brensilver et al. 2011; Dunn et al. 2012; Hanson et al. 2008; Iverson et al.  
106 2013).

### 107 **Hypotheses**

108 To summarize, VAC is an important risk factor of human capital and the effect of  
109 childhood violence might be different between males and females. We intend to test the  
110 associations and its gender differences of VAC with short and long term health and  
111 educational outcomes among South African adolescents. The specific research hypotheses are  
112 as follows:

113 H1: Adolescent victims of childhood violence will have lower levels of physical and  
114 mental health in the short and long term.

115 H2: Adolescent victims of childhood violence will have poorer academic achievement  
116 and lower education levels.

117 H3: The association between VAC and physical health will be stronger for adolescent  
118 males, while female victims will have poorer mental health.

119 H4: The association between VAC and educational outcomes will be larger for  
120 adolescent males.

121

122

123

124

125

## Methods

126

### Participants and Procedures

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

We tested our hypotheses by using data from Wave 1(2002) and Wave 5 (2009) of Cape Area Panel Study (CAPS). CAPS is a longitudinal study which focused on the lives of youth and young adults in metropolitan Cape Town and spans 5 waves with studies conducted from 2002 to 2009 (Lam et al. 2012). The CAPS household sample was drawn through a two-stage process. First, a sample of primary sampling units (PSUs) was selected within each population group stratum with probability proportional to size. Second, a sample of 25 screener households was drawn within each PSU and the adolescents aged 14-22 in each selected family were the respondents in Wave 1. For the complete survey sampling design, please see Lam et al. (2012). We used data from Wave 1 to study the short term association between VAC and human capital and merged Wave 5 data to Wave 1 to investigate the long term relationship. Wave 1 collected interviews from 4752 adolescents (response rate: 89.6%) who were asked to recall their childhood abuse. Nearly three thousand (n=2915) respondents were successfully followed in Wave 5 when the age of young adults was 21–29 year-old (Lam et al. 2012). We excluded the observations which have missing values on key variables, resulting in a final sample size of 4724 cases for short term analyses and 2900 cases for long term analyses. The mean age for the sample in Wave 1 was 17.87 years (SD=2.48), The adolescents were predominately female (55%), Black (45%) and Coloured (42%). One-fifth (20%) of household heads were female and 39% of families' home language was English. The mean household size and monthly family income per capita was 5.43 (SD=2.52) and 1164.31 South African Rands (ZAR), respectively. The average education level of the adolescent's mother was 8.89 years of schooling (SD=5.44).

149

150 **Measures**151 **Violence against children**

152 The indicators related to VAC are early life retrospective questions from Wave 1 of  
153 CAPS data in 2002. Respondents were asked to reflect on their family life until 14 years of  
154 age. The questions of VAC were how often a perpetrator (the perpetrator could be a parent,  
155 stepparent, or adult living in their homes) : “swear at you, insult you, or put you down” (*put*  
156 *down*), “made you afraid that you might be physically hurt” (*afraid of hurt*), “push, grab,  
157 slap, or throw something at you” (*push*), “hit you so hard that you had marks or were injured”  
158 (*hit hard*). Respondents were asked to report on a five–point scale to measure the frequency  
159 of childhood abuse (before the age of 14): never, only once, sometimes, often, very often. We  
160 firstly generated 4 dummy variables of VAC to measure childhood abuse experience. They  
161 were *put down*, *afraid of hurt*, *push* and *hit hard*. These dummies were coded 0 if the  
162 respondent answered “never”, otherwise they were coded 1. Following Chapman et al. (2004)  
163 and Dube et al. (2003), *put down* and *afraid of hurt* were regarded as emotional violence,  
164 while *push* and *hit hard* were considered as physical violence. Therefore, we further  
165 generated 3 dummies, namely, *physical violence* (yes=1, no=0), *emotional violence* (yes=1,  
166 no=0) and *overall violence* (yes=1, no=0), to represent the corresponding type of VAC.

167 Table 1 shows the unweighted and weighted descriptive statistics for VAC in Wave 1  
168 of CAPS, with *t*-tests by gender. It can be seen that the unweighted and weighted estimates  
169 are very close and we refer to the weighted statistics whenever means are discussed. The  
170 overall prevalence of VAC is 58%. 34% of the adolescents have been physically abused, and  
171 53% have been emotionally abused, showing a disproportionally high level of childhood  
172 violence in South Africa. Compared with males, a significant higher proportion of females  
173 have been been emotionally abused (*afraid of hurt*) in childhood.



**Human capital: health and educational outcomes**

The measures of the short and long term health outcomes are overall health, physical health and mental health. First, *self-rated health* is an overall health indicator from Wave 1 and Wave 5, which measures: “In general, how is your health? Would you say it is excellent, very good, good, fair or poor?” The self-rated health dummy was coded 1 if the respondent answered “excellent”, “very good” or “good”, otherwise it was coded 0. Because the categorization of the variable relies on researcher decision-making, we also applied different recoding strategies on self-rated health measure (for example, we counted “good” as “0”) and found similar results. Second, *health problems* is a physical health indicator from Wave 1 and Wave 5, which measures: “Do you have any health problems or disabilities?” The health problems were constrained to physical health problems, including physical disabilities, problems with respiratory function and sight, hearing and speech. If the answer was “Yes”, then the dummy variable was coded 1. Third, *Mental illness* in the past 30 days was measured by the Kessler Psychological Distress Scale (K6) in Wave 5, which consists of six questions to assess a respondent’s general mental health, including feelings of being “nervous”, “hopeless”, “restless”, “depressed”, “every thing was an effort” and “worthless” (Kessler et al. 2009). Each response was given a possible score between 0 (none of the time) and 4 (all of the time) and summed up for a total K6 score, ranging from 0 to 24. The higher the K6 score, the poorer the respondents’ mental health. Although Wave 1 had a question in relation to mental problems, it was not included in this study because too few respondents (less than 1%) answered “Yes”, which were not representative enough to analyse the short term effect of VAC on mental health of the victims.

The measures of the short and long term educational outcomes are test scores and education level, respectively. The test score indicators are from Wave 1, whereas the indicator of education level is from Wave 5, when most young adults were graduated from

199 school and had a job. The respondents in Wave 1 had taken a literacy and numeracy  
200 evaluation test (completed in Afrikaans or English) in 4 sections with 45 questions. We  
201 generated 3 variables to measure the short term academic achievement. The first, *total test*  
202 *score*, is an indicator that sums the respondent's literacy score and numeracy score, which  
203 ranges from 0 to 45. Second, *literacy score* is a variable created from the evaluation of  
204 literacy questions in the test and it ranges from 0 to 22. Third, *numeracy score*, is a variable  
205 created from an evaluation of numeracy questions in the test and it ranges from 0 to 23. A  
206 higher test score represents better academic achievement. *Education level* is a continuous  
207 variable from Wave 5, which measures the years of education a respondent completes to  
208 represent long term educational outcomes. The question of this indicator is "What is the  
209 highest education level completed?" and the answers were converted to schooling years  
210 according to the length of schooling for different education levels in South Africa.

211 Table 2 presents the unweighted and weighted descriptive statistics of health and  
212 educational outcomes, with the *t*-tests by gender. The weighted statistics show that 93% of  
213 young adults in Wave 1 and 40% in Wave 5 thought their health status were "good", "very  
214 good" or "excellent", indicating a quick decrease on self-rated health. There were 10% of  
215 respondents in Wave 1 and 6% in Wave 5 who had at least one physical health problem. The  
216 average mental illness (K6) score was 4.36 and females had poorer mental health than males.  
217 Overall, the average education level of the respondents in our sample was 11.05 years of  
218 schooling in Wave 5. In terms of gender differences, compared with males, females had more  
219 physical health problems, more severe mental problems, lower numeracy score, but higher  
220 literacy score and schooling years.

### 221 Demographic Controls

222 Previous studies have showed that various factors are associated with child human  
223 capital development. Following Case et al. (2002) and Currie (2009), individual

224 characteristics and family socioeconomic background in Wave 1 were included in our  
225 analyses as control variables. They are gender (dummy variable coded 1 for male), ethnicity  
226 (two dummy variables, including *Black* and *Coloured* to represent 3 types of race), *age*  
227 (measured in years), *home language* (coded 1 for English), *household size* (number of family  
228 members), *female-headed household* (coded 1 for yes), *mother's education level* (measured  
229 in years) and *per capita income* (measured family monthly income per capita in South  
230 African Rand). The unweighted and weighted descriptive statistics of control variables are  
231 shown in Table 3.

### 232 **Analyses**

233         The following regression estimations were performed to obtain the associations of  
234 VAC with health and educational outcomes. First, for health outcomes, all measures of health  
235 except mental illness (K6) are binary, logistic regressions were used for these binary health  
236 outcomes. Mental illness score ranges from 0 to 24 with over 50% zero counts and the mean  
237 (5.06) and deviation (4.85) of the variable are relatively close. Therefore, zero inflated  
238 poisson (ZIP) model, which is a mixture of Poisson count model and the logistic model for  
239 predicting excess zeros, was used to prevent potential biased estimation of parameters due to  
240 extra zeros in the data (Lee et al. 2006; Yoon et al. 2015). Vuong's tests were performed in  
241 the analyses to demonstrate whether ZIP was superior compared to regular Poisson  
242 regression. Second, for educational outcomes, linear regressions were applied and Ordinary  
243 Least Square (OLS) was used as an estimating method because all measures were continuous.  
244 The four educational outcomes were standardized to zero mean and unit variance (z-score) to  
245 better interpret the regression estimates and deal with possible problem of outliers.  
246 Specifically, "z= $\pm 3$  rule" was used to identify outliers. Specifically, any z-score greater than  
247 3 or less than -3 was considered to be an outlier (Osborne, 2010). Instead of excluding these  
248 outliers (less than 1% for each educational outcome), we winsorized them to 3 or -3 to obtain

249 the full information of the sample as far as possible. To control for false discovery rates due  
250 to multiple testing, we adjusted significance level of p-values as recommended by Benjamini  
251 and Hochberg (1995) in the above regressions to minimize the possibility of Type I error.

## 252 **Robustness checks**

### 253 **Household fixed effects model**

254 The estimated associations between VAC and health and education might be biased if  
255 there exists endogeneity problems. The main sources of endogeneity are reverse causality and  
256 omitted variables. Among them, reverse causality problem is not likely to happen in this  
257 study because the VAC had happened before the questions in regard to health and educational  
258 outcomes were asked. However, unobserved factors such as children's delinquent behaviors  
259 may simultaneously result in childhood violence and poor health and educational outcomes.  
260 Bias may also arise if the parents who abused children also failed to provide good medical  
261 resources and educational opportunities. On account of this, we firstly applied household  
262 fixed effects model and added a vector of household dummies and sibling dummies to control  
263 for the constant and unmeasured family background between and within families that could  
264 possibly be correlated with both VAC and health and educational outcomes (De Neve and  
265 Oswald, 2012). However, household fixed effects model is unable to address any transitory  
266 family shocks, for example, experiences such as parental un- and under-employment and  
267 divorce. Furthermore, the household fixed effects model is also unable to account for sibling  
268 characteristics, such as twin pairs, full-siblings, half-siblings, or unrelated siblings raised  
269 together. These omitted factors may cause selection bias.

### 270 **Treatment-effects model**

271 To correct potential sample selection bias, we further used treatment-effects model  
272 with household fixed effects to investigate the effect of VAC on the human capital of the  
273 victims. The treatment-effects model is a widely used method in such fields as evaluation

274 research. The method is used for data where a subset of non-randomly selected cases received  
275 a treatment. There are two stages in treatment-effects model, namely, treatment equation and  
276 outcome equation. The aim of treatment equation is to predict the probability of exposure to a  
277 specific condition (*i.e.*, VAC) and compute correction factors (*antrho* and *lnsigma*) for the  
278 estimation of outcome equation, which is to examine the factors that affect the dependent  
279 variable (*i.e.*, human capital indicators). In this study, VAC is the treatment variable, which is  
280 assumed to be determined according to the following rule: VAC=1 when the predicted value  
281 of VAC is above zero, otherwise VAC=0. Maximum likelihood estimation (Maddala 1983;  
282 Meada 2008) and two-step estimation (Green 2008) are the two methods to perform the  
283 treatment-effects model. To obtain more robust estimates, maximum likelihood estimation  
284 (MLE) was applied in this study..

285         A key assumption of the treatment-effects model in the present study is the correct  
286 prediction of the probability of childhood abuse in treatment equation. Therefore, it is  
287 important to find appropriate factors to explain and predict VAC probability. Previous  
288 research has shown that adverse family environment conditions and key background  
289 variables are crucial determinants of the likelihood of VAC. For example, family members  
290 who abuse alcohol or substances are at a higher risk of being perpetrators of VAC (Murphy et  
291 al. 1991; Putnam 1997; Maternowska et al. 2017). Therefore, the covariates in treatment  
292 equation include whether the respondent lived with someone in the household who was a  
293 problem drinker or alcoholic (*Problem Drinker*), used illicit drugs (*Drug user*), was mentally  
294 ill or depressed (*Mentally ill*) and spent some time in a jail or prison (*In jail*), when the  
295 adolescents were growing up (up to age 14). Furthermore, the demographic controls were  
296 also used to explain whether a respondent was abused in childhood.

297

## Results

### 298 **Violence against children and human capital: health outcomes**

299 Table 4 presents the estimating results of the logistic regressions and ZIP regressions  
300 with different measures of VAC. To economise on space, we present the full set of  
301 coefficients for the aggregate measures of VAC only. Each model controls variables related  
302 to the dependent variable and odds ratio (or incidence rate ratios), 95% confidence intervals,  
303 pseudo-R-squared and observations of each model are reported in the table. The estimating  
304 results show that, all measures of VAC are significant in column (1) and (2), implying that  
305 any experience of violence in childhood is associated with poorer self-rated health and higher  
306 probability of physical health problems in the short term. Comparatively, physical violence  
307 has larger negative effect on the victims' self-rated health (odds ratio=0.717,  $p<.01$ ) and  
308 positive effect on physical health problems (odds ratio=1.345,  $p<.01$ ). All measures of VAC  
309 are not significant in column (3), indicating that childhood abuse may have no large effect on  
310 the long term self-rated health of the victims. However, physical violence indicators are  
311 significantly associated with higher probability of health problem in column (4) and all  
312 measures are significantly correlated with more severe mental illness in column (5), which  
313 shows that VAC can also cause negative consequences on health, especially mental health in  
314 the long term.

### 315 **Violence against children and human capital: educational outcomes**

316 Table 5 presents the estimating results of OLS regressions with different measures of  
317 VAC. The distributions of residuals of each regression are asymptotic normality, which meets  
318 the distribution assumption, Column (1) shows that all measures of VAC are negatively  
319 significant except *put down*, which implies that any experience of physical or emotional  
320 violence in childhood can significantly decrease the *total test score* of children in the short  
321 term. Comparatively, the estimated coefficients show that physical violence has more severe

322 educational consequences. Column (2) and column (3) present negative associations of VAC  
323 with *literacy score* and *numeracy score*. The results show that being *pushed* and *afraid of*  
324 *being hurt* in childhood will significantly decrease the *literacy score* and all measures of  
325 VAC, especially physical violence, have significant and negative correlation with *numeracy*  
326 *score* of the victims. Column (4) reports that all indicators of VAC, particularly physical  
327 violence, are negatively significant, showing negative relationship between VAC and long  
328 term education level

### 329 **Violence against children and human capital: gender difference**

330 We further investigated the gender difference of the relationship between VAC and  
331 human capital. The results are presented in Appendices A.1 and A.2 (available at  
332 [https://drive.google.com/open?id=1ILA6okJYqp19\\_OMipxqWzTiVSGS0jnYR](https://drive.google.com/open?id=1ILA6okJYqp19_OMipxqWzTiVSGS0jnYR)). From the  
333 perspective of health measures, estimated results demonstrate more significant associations  
334 between VAC and females' short term self-rated health and physical health problems. For  
335 example, the estimated correlations of emotional violence on female's short term self-rated  
336 health are significant in column (6) (odds ratio=0.563,  $p<.001$ ) and column (7) (odds  
337 ratio=1.404,  $p<.05$ ), while the relationships for males are not significant. In the long term, a  
338 larger negative association of VAC with physical health seems to be driven by males in the  
339 sample (*overall violence*, odds ratio=2.392,  $p<0.001$ ), while the association between  
340 childhood violence and mental health is stronger for females (*overall violence*, relative rate  
341 ratio=1.137,  $p<0.01$ ). From the perspective of educational outcomes, results show that the  
342 estimated associations between *overall violence* in childhood and short term *total test score*,  
343 *literacy score* and *numeracy score* are larger for males than females. In the long term, no  
344 matter physically or emotionally, VAC also has stronger significant and negative association  
345 with education level for adolescent male victims. Overall, males who have been maltreated in

346 childhood are more likely to have lower learning ability and higher probability to drop out  
347 from school in their later adolescent years.

### 348 **Robustness checks**

349 As discussed in the previous sections, the estimates of VAC could be biased in the  
350 logistic, ZIP or OLS regressions if endogeneity problems exist. To address these potential  
351 problems, we applied household fixed effects model and treatment-effects model to check the  
352 robustness of the previous estimates. The Appendices A.3 to A.6 (available at  
353 [https://drive.google.com/open?id=1ILA6okJYqp19\\_OMipxqWzTiVSGS0jnYR](https://drive.google.com/open?id=1ILA6okJYqp19_OMipxqWzTiVSGS0jnYR)) present the  
354 estimated effects of VAC on health and educational outcomes, respectively. First, The results  
355 of household fixed effects model show that, after controlling for the time invariant household  
356 and sibling characteristics, the estimated odds ratios, incidence rate ratios and coefficients of  
357 all measures of VAC on health and educational outcomes in the regressions are in close  
358 proximity to previous estimates, indicating that our results are robust. Second, the results of  
359 treatment-effects model (with household fixed effects) show that the adverse family  
360 environment (including *problem drinker*, *drug user*, *mentally ill*, *in jail*) is significantly  
361 associated with higher probability of experiencing maltreatment in childhood. The estimates  
362 of *athrho* and *Insigma* are significant in the most of the regressions, regardless of  
363 measurement of health and educational outcomes, which implies that the estimates of VAC in  
364 previous regressions are possibly biased. However, the direction and significance level of the  
365 estimated coefficients of *physical violence*, *emotional violence* and *overall violence* are  
366 almost the same as corresponding previous estimates on the associations between VAC and  
367 health and educational outcomes. In some cases, the significance level of VAC measure are  
368 even higher in treatment-effects models, which indicate that, to a certain extent, our estimates  
369 of the association between VAC and human capital in South Africa in the previous



370 regressions are conservative and the prevention of VAC and interventions to reduce the  
371 negative effects of childhood violence are in more urgent need.

### 372 **Discussion**

373 This is the first study to comprehensively discuss the association between violence  
374 against children and human capital in African context. The aim of the present study was to  
375 explore the short and long term health and educational consequences of childhood violence in  
376 South Africa. Specifically, this research used data from the Cape Area Panel Study (CAPS)  
377 and sought to examine whether adolescents who were abused in childhood are more likely to  
378 have lower levels of physical health, mental health, academic achievement and education  
379 levels, if so, what were the differences of the associations between males and females.

380 Our analyses indicated that physical violence, emotional violence and overall violence  
381 in childhood are reported by 34%, 53% and 58% of respondents, respectively. Congruent  
382 with the first and second hypotheses and previous studies, our results showed that all forms of  
383 violence are associated with adverse physical and psychological health, poorer academic  
384 achievement and lower education levels of victims in both short and long term (Fang et al.  
385 2015; Herrenkohl et al. 2013; Mills et al. 2011; Norman et al. 2012; Romano et al. 2015;). In  
386 addition, our findings suggested that, compared with emotional violence, physical violence is  
387 even more detrimental to the health and educational outcomes of the adolescent victims  
388 echoing findings from other global regions (Fang et al. 2017; Fry et al. 2018). Negative long  
389 term mental health outcomes are more significantly associated with VAC than physical health,  
390 which implies that childhood abuse has larger long lasting effects on psychological health of  
391 the victims (Gilbert et al. 2009).

392 In line with our third and fourth hypotheses, this study found that VAC has stronger  
393 association with long term physical health for males and mental health for females.  
394 Adolescent males who have experienced abuse in childhood are more likely to have poorer

395 numeracy and literacy skills as well as lower long term education levels. These results are  
396 consistent with the literature regarding gender differences on the sensitivity and ways of  
397 coping with stress caused by adverse childhood experience (Brensilver et al. 2011; Gallo et al.  
398 2018; Maschi et al. 2008). However, different from some past research, our results suggested  
399 a stronger relationship between childhood violence and short term females' physical health.  
400 A possible reason is that girls are more likely to be exposed to violence than boys (Dunne et  
401 al. 2012), as the descriptive statistics of violence exposure showed that the prevalence of  
402 childhood violence, especially emotional violence was higher for females than their male  
403 counterparts. It is also possible that adolescent females have poorer short term health in our  
404 sample (as demonstrated in the summary statistics of health measures), which make them  
405 more vulnerable to be affected by the experience of childhood violence.

406         The findings from this study have several implications for research and practice. In  
407 terms of research implications, as suggested in the results of our study, VAC has significantly  
408 negative association with human capital in South Africa. Future research can further  
409 investigate the effects of childhood abuse on the young adults' employment status and  
410 economic well-being, as well as test the contribution of the mediating effects of health and  
411 education. We also encourage future studies to test the pathways of gender differences of the  
412 relationship between childhood violence and human capital by examining the externalizing  
413 and internalizing behaviour for males and females in African context. In terms of  
414 implications for practice, as VAC is currently not regarded as a significant human rights or  
415 public health issue in South Africa (Hsiao et al. 2018), setting up laws and rules for banning  
416 violent punishment of children by parents, teachers or other caregivers is in urgent need.  
417 More efforts are also required to prevent VAC by building the parenting capacity of parents  
418 and caregivers through parenting and caregiver support programs and cash transfer programs  
419 as strategies that has been proven to be effective at preventing VAC (WHO 2016). Examples

420 of successful parenting programs already exist in South Africa and these can be expanded to  
421 reach larger populations (Cluver et al. 2017). Moreover, much like efforts to curb VAC at  
422 home, endeavours within the school environment focused on whole school approaches that  
423 span training and support from initial teacher education to governance within schools settings  
424 for addressing both violence prevention (both within and outwith school settings) and making  
425 appropriate referrals for violence that occurs in other settings that may come to the attention  
426 of teachers and school personnel is essential. Additionally, a dedicated national policy is  
427 urgently required, aimed at providing sufficient, subsidised healthcare services to children at  
428 risk and special education and rehabilitation services for victims of violence.

### 429 **Limitations**

430 Despite the contributions and implications for the family violence literature, the  
431 limitations of this study also warrant mentioning. First, it is possible that there exists  
432 measurement errors for determining VAC. One possible measurement error is that the  
433 prevalence of different types of childhood violence are underreported in the retrospective  
434 survey questions. The respondents may be unwilling to disclose such private information or  
435 they may suppress violence experienced in childhood, or even not recognize what they  
436 experienced as a child was actually abuse. The measurement error of VAC may result in  
437 underestimation of the association of childhood violence with health outcomes in South  
438 Africa. Second, due to the lack of data on other types of VAC, sexual violence and neglect,  
439 which also constitute forms of VAC, were not included and discussed in this study. Future  
440 studies would benefit by also including these types of VAC and considering the disparities on  
441 the effects of different violence measures on health and educational outcomes and any gender  
442 differences. Moreover, although we used 9 measures to represent the short and long term  
443 health and educational outcomes, the relationship between VAC and short term mental health  
444 was not investigated in this study due to the unavailability of the outcome variable, which is

445 also needed to be accounted in future studies. Third, in spite of the large sample size in this  
446 study, the response rate in Wave 5 of CAPS data is 61.3% of the sample in Wave 1.  
447 According to the officially released technical documentation of the CAPS, high non-response  
448 rate among the sample, especially the white population is a common issue facing surveys in  
449 South Africa (Lam et al. 2012). The most common reason of non-response in this study is  
450 respondents moving out of Cape Town area. Consequently, researchers should be cautious in  
451 making generalizations from our findings of long term analyses. More relevant studies are  
452 needed to further strengthen the understanding of the effect of VAC on human capital and  
453 raise the awareness of protection of children and preventing VAC before it ever starts.

### 454 **Conclusions**

455 This study contributes to family violence literature by highlighting the associations of  
456 VAC and human capital in South Africa. We found significant and negative relationships  
457 between childhood violence, especially physical violence and physical health, mental health,  
458 academic achievement and education level of the adolescent victims. Furthermore, findings  
459 of the present study showed that adolescent males who have experienced violence in  
460 childhood are more likely to have poorer educational outcomes and long term physical health,  
461 while female victims are at higher risk of mental illness. As noted by Doodge (2007) and  
462 Pettinger (2017), the development of an individual through childhood, particularly with  
463 respect to health and education, plays a significant role in their ability to contribute positively  
464 to their environment, determines their human capital value and ultimately determines the  
465 growth and development of the environment as well. With VAC reported to be prevalent and  
466 impacting the physical and psychological well-being of children with short term  
467 consequences in childhood and long term consequences in adulthood, addressing this  
468 problem with strategies to prevent VAC is an essential endeavour in improving the health and  
469 well-being of children and improving the value of their human capital as well.

470

## 471 References

- 472 Basch, C. E. (2011). Aggression and violence and the achievement gap among urban  
473 minority youth. *Journal of School Health, 81*(10), 619-625.
- 474 Bask, M. (2015). Externalising and internalising problem behaviour among Swedish  
475 adolescent boys and girls. *International Journal of Social Welfare, 24*(2), 182-192.
- 476 Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: a practical and  
477 powerful approach to multiple testing. *Journal of the royal statistical society. Series B*  
478 *(Methodological)*, 289-300.
- 479 Brensilver, M., Negriff, S., Mennen, F. E., & Trickett, P. K. (2011). Longitudinal relations  
480 between depressive symptoms and externalizing behavior in adolescence: Moderating  
481 effects of maltreatment experience and gender. *Journal of Clinical Child &*  
482 *Adolescent Psychology, 40*(4), 607-617.
- 483 Bicakci, M. Y., Er, S., & Aral, N. (2016). An overview of child neglect and abuse: types,  
484 causes, impact and prevention. *Studies on Ethno-medicine, 10*(2), 221-228.
- 485 Case, A., Lubotsky, D., & Paxson, C. (2002). Economic status and health in childhood: The  
486 origins of the gradient. *American Economic Review, 92*(5), 1308-1334.
- 487 Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F.  
488 (2004). Adverse childhood experiences and the risk of depressive disorders in  
489 adulthood. *Journal of Affective Disorders, 82*(2), 217-225.
- 490 Corso, P. S., Edwards, V. J., Fang, X., & Mercy, J. A. (2008). Health-related quality of life  
491 among adults who experienced maltreatment during childhood. *American Journal of*  
492 *Public Health, 98*(6), 1094-1100.
- 493 Crocker, R. (2006). *Human capital development and education*. Canadian Policy Research  
494 Networks.
- 495 Currie, J. (2009). Healthy, wealthy, and wise: Socioeconomic status, poor health in

- 496 childhood, and human capital development. *Journal of Economic Literature*, 47(1),  
497 87-122.
- 498 Cluver, L. D., Meinck, F., Steinert, J. I., Shenderovich, Y., Doubt, J., Romero, R. H., ... &  
499 Nzima, D. (2018). Parenting for Lifelong Health: a pragmatic cluster randomised  
500 controlled trial of a non-commercialised parenting programme for adolescents and  
501 their families in South Africa. *BMJ Global Health*, 3(1), e000539.
- 502 De Neve, J. E., & Oswald, A. J. (2012). Estimating the influence of life satisfaction and  
503 positive affect on later income using sibling fixed effects. *Proceedings of the National  
504 Academy of Sciences*, 109(49), 19953-19958.
- 505 Dodge, K. A., Dishion, T. J., & Lansford, J. E. (Eds.). (2007). *Deviant peer influences in  
506 programs for youth: Problems and solutions*. Guilford Press.
- 507 Downey, J. C., Gudmunson, C. G., Pang, Y. C., & Lee, K. (2017). Adverse childhood  
508 experiences affect health risk behaviors and chronic health of Iowans. *Journal of  
509 Family Violence*, 32(6), 557-564.
- 510 Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003).  
511 Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use:  
512 the adverse childhood experiences study. *Pediatrics*, 111(3), 564-572.
- 513 Dunn, E. C., Gilman, S. E., Willett, J. B., Slopen, N. B., & Molnar, B. E. (2012). The impact  
514 of exposure to interpersonal violence on gender differences in adolescent-onset major  
515 depression: results from the National Comorbidity survey replication  
516 (NCS-R). *Depression and Anxiety*, 29(5), 392-399.
- 517 Fang, X., Brown, D. S., Florence, C. S., & Mercy, J. A. (2012). The economic burden of  
518 child maltreatment in the United States and implications for prevention. *Child Abuse  
519 & Neglect*, 36(2), 156-165.
- 520 Fang, X., & Corso, P. S. (2008). Gender differences in the connections between violence

- 521 experienced as a child and perpetration of intimate partner violence in young  
522 adulthood. *Journal of Family Violence*, 23(5), 303-313.
- 523 Fang, X., Fry, D. A., Ji, K., Finkelhor, D., Chen, J., Lannen, P., & Dunne, M. P. (2015). The  
524 burden of child maltreatment in China: a systematic review. *Bulletin of the World  
525 Health Organization*, 93(3), 176-185C.
- 526 Fang, X., Fry, D. A., Brown, D. S., Mercy, J. A., Dunne, M. P., Butchart, A. R., ... & McCoy,  
527 A. (2015). The burden of child maltreatment in the East Asia and Pacific  
528 region. *Child Abuse & Neglect*, 42, 146-162.
- 529 Fang, X., Fry, D. A., Ganz, G., Casey, T., & Ward, C. L. (2016). The Economic Burden of  
530 Violence against Children in South Africa. Report to Save the Children South Africa.
- 531 Fang, X., Zheng, X., Fry, D. A., Ganz, G., Casey, T., Hsiao, C., & Ward, C. L. (2017). The  
532 economic burden of violence against children in South Africa. *International Journal  
533 of Environmental Research and Public Health*, 14(11), 1431.
- 534 Finkelhor, D. (2008). *Childhood victimization: Violence, crime, and abuse in the lives of  
535 young people*. Oxford University Press.
- 536 Fitzsimons, P. (2015). Human capital theory and education. In *Encyclopedia of educational  
537 philosophy and theory* (pp. 1-4). Springer Singapore.
- 538 Fry, D., Fang, X., Elliott, S., Casey, T., Zheng, X., Li, J., ... & McCluskey, G. (2018). The  
539 relationships between violence in childhood and educational outcomes: a global  
540 systematic review and meta-analysis. *Child Abuse & Neglect*, 75, 6-28.
- 541 Gallo, E. A. G., Munhoz, T. N., de Mola, C. L., & Murray, J. (2018). Gender differences in  
542 the effects of childhood maltreatment on adult depression and anxiety: a systematic  
543 review and meta-analysis. *Child Abuse & Neglect*, 79, 107-114.
- 544 Gilbert, R., Widom, C. S., Browne, K., Fergusson, D., Webb, E., & Janson, S. (2009).  
545 Burden and consequences of child maltreatment in high-income countries. *The*

- 546 *Lancet*, 373(9657), 68-81.
- 547 Greene, W. H. (2008). *Econometric Analysis*. 6th ed. Upper Saddle River, NJ: Prentice-Hall.
- 548 Greenfield, E. A. (2010). Child abuse as a life-course social determinant of adult  
549 health. *Maturitas*, 66(1), 51-55.
- 550 Hanson, R. F., Borntrager, C., Self-Brown, S., Kilpatrick, D. G., Saunders, B. E., Resnick, H.  
551 S., & Amstadter, A. (2008). Relations among gender, violence exposure, and mental  
552 health: the national survey of adolescents. *American Journal of*  
553 *Orthopsychiatry*, 78(3), 313.
- 554 Herrenkohl, T. I., Hong, S., Klika, J. B., Herrenkohl, R. C., & Russo, M. J. (2013).  
555 Developmental impacts of child abuse and neglect related to adult mental health,  
556 substance use, and physical health. *Journal of Family Violence*, 28(2), 191-199.
- 557 Holt, S., Buckley, H., & Whelan, S. (2008). The impact of exposure to domestic violence on  
558 children and young people: A review of the literature. *Child Abuse & Neglect*, 32(8),  
559 797-810.
- 560 Hong, J. S., Davis, J. P., Sterzing, P. R., Yoon, J., Choi, S., & Smith, D. C. (2014). A  
561 conceptual framework for understanding the association between school bullying  
562 victimization and substance misuse. *American Journal of Orthopsychiatry*, 84(6),  
563 696.
- 564 Hong, J. S., Kral, M. J., & Sterzing, P. R. (2015). Pathways from bullying perpetration,  
565 victimization, and bully victimization to suicidality among school-aged youth: a  
566 review of the potential mediators and a call for further investigation. *Trauma,*  
567 *Violence, & Abuse*, 16(4), 379-390.
- 568 Hong, J. S., Voisin, D. R., Cho, S., Smith, D. C., & Resko, S. M. (2017). Peer Victimization  
569 and Substance Use Among African American Adolescents and Emerging Adults on  
570 Chicago's Southside. *American Journal of Orthopsychiatry*. Advance online



- 571 publication. <http://dx.doi.org/10.1037/ort0000247>
- 572 Hsiao, C., Fry, D., Ward, C. L., Ganz, G., Casey, T., Zheng, X., & Fang, X. (2018). Violence  
573 against children in South Africa: the cost of inaction to society and the economy. *BMJ*  
574 *Global Health*, 3(1), e000573.
- 575 Huang, L., & Mossige, S. (2012). Academic achievement in Norwegian secondary schools:  
576 the impact of violence during childhood. *Social Psychology of Education*, 15(2), 147-  
577 164.
- 578 Iverson, K. M., Dick, A., McLaughlin, K. A., Smith, B. N., Bell, M. E., Gerber, M. R., ... &  
579 Mitchell, K. S. (2013). Exposure to interpersonal violence and its associations with  
580 psychiatric morbidity in a US national sample: A gender comparison. *Psychology of*  
581 *Violence*, 3(3), 273.
- 582 Kaminski, J. W., & Fang, X. (2009). Victimization by peers and adolescent suicide in three  
583 US samples. *The Journal of Pediatrics*, 155(5), 683-688.
- 584 Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., ... &  
585 Zaslavsky, A. M. (2003). Screening for serious mental illness in the general  
586 population. *Archives of General Psychiatry*, 60(2), 184-189.
- 587 Lam, D., Ardington, C., Branson, N., Case, A., Leibbrandt, M., Maughan-Brown, B., ... &  
588 Sparks, M. (2012). The Cape Area Panel Study: overview and technical  
589 documentation for waves 1-2-3-4-5 (2002-2009). *The University of Cape Town*.  
590 Available at: <http://microdata.worldbank.org/index.php/catalog/895>
- 591 Lauder, H. (2015). Human capital theory, the power of transnational companies and a  
592 political response in relation to education and economic development. *Compare: A*  
593 *Journal of Comparative and International Education*, 45(3), 490-493.
- 594 Lee, A. H., Wang, K., Scott, J. A., Yau, K. K., & McLachlan, G. J. (2006). Multi-level zero-  
595 inflated Poisson regression modelling of correlated count data with excess

- 596           zeros. *Statistical Methods in Medical Research*, 15(1), 47-61.
- 597 Lin, D., Li, X., Fan, X., & Fang, X. (2011). Child sexual abuse and its relationship with  
598           health risk behaviors among rural children and adolescents in Hunan, China. *Child*  
599           *Abuse & Neglect*, 35(9), 680-687.
- 600 Liu, G. G., Dow, W. H., Fu, A. Z., Akin, J., & Lance, P. (2008). Income productivity in  
601           China: On the role of health. *Journal of Health Economics*, 27(1), 27-44.
- 602 Lutz, W., Butz, W. P., & Samir, K. E. (Eds.). (2017). *World Population & Human Capital in*  
603           *the Twenty-First Century: An Overview*. Oxford University Press.
- 604 Maeda, K. (2008). Re-examining the contamination effect of Japan's mixed electoral system  
605           using the treatment-effects model. *Electoral Studies*, 27(4), 723-731.
- 606 Maddala, G. S. (1983). *Limited-dependent and qualitative variables in econometrics* (No. 3).  
607           Cambridge University Press.
- 608 Maschi, T., Morgen, K., Bradley, C., & Hatcher, S. S. (2008). Exploring gender differences  
609           on internalizing and externalizing behavior among maltreated youth: Implications for  
610           social work action. *Child and Adolescent Social Work Journal*, 25(6), 531-547.
- 611 Mills, R., Alati, R., O'Callaghan, M., Najman, J. M., Williams, G. M., Bor, W., & Strathearn,  
612           L. (2011). Child abuse and neglect and cognitive function at 14 years of age: Findings  
613           from a birth cohort. *Pediatrics*, 127(1), 4-10.
- 614 Mills, R., Scott, J., Alati, R., O'Callaghan, M., Najman, J. M., & Strathearn, L. (2013). Child  
615           maltreatment and adolescent mental health problems in a large birth cohort. *Child*  
616           *Abuse & Neglect*, 37(5), 292-302.
- 617 Murphy, J. M., Jellinek, M., Quinn, D., Smith, G., Poitras, F. G., & Goshko, M. (1991).  
618           Substance abuse and serious child mistreatment: Prevalence, risk, and outcome in a  
619           court sample. *Child Abuse & Neglect*, 15(3), 197-211.
- 620 Nakamoto, J., & Schwartz, D. (2010). Is peer victimization associated with academic

- 621 achievement? A meta-analytic review. *Social Development*, 19(2), 221-242.
- 622 Norman, R. E., Byambaa, M., De, R., Butchart, A., Scott, J., & Vos, T. (2012). The long-term  
623 health consequences of child physical abuse, emotional abuse, and neglect: a  
624 systematic review and meta-analysis. *PLoS Medicine*, 9(11), e1001349
- 625 OECD. (2007). Human Capital: How what you know shapes your life. *Summary in Russian*.  
626 *P*, 2.
- 627 Osborne, J. W. (2010). Data cleaning basics: Best practices in dealing with extreme  
628 scores. *Newborn and Infant Nursing Reviews*, 10(1), 37-43.
- 629 Pettinger, T. (2017). Human Capital definition and importance. Available at:  
630 [http://www.economicshelp.org/blog/26076/economics/human-capital-definition-and-](http://www.economicshelp.org/blog/26076/economics/human-capital-definition-and-importance/)  
631 [importance/](http://www.economicshelp.org/blog/26076/economics/human-capital-definition-and-importance/). [Accessed on 2 July 2017]
- 632 Putnam, F. W. (1997). *Dissociation in children and adolescents: A developmental*  
633 *perspective*. Guilford Press.
- 634 Romano, E., Babchishin, L., Marquis, R., & Fréchette, S. (2015). Childhood maltreatment  
635 and educational outcomes. *Trauma, Violence, & Abuse*, 16(4), 418-437.
- 636 Trout, A. L., Hagaman, J., Casey, K., Reid, R., & Epstein, M. H. (2008). The academic status  
637 of children and youth in out-of-home care: A review of the literature. *Children and*  
638 *Youth Services Review*, 30(9), 979-994.
- 639 UNESCO. (2017). School violence and bullying: Global status report. Available at:  
640 <http://unesdoc.unesco.org/images/0024/002469/246970e.pdf> [Accessed on 2 July  
641 2017]
- 642 UNICEF (2015). Estimating the Economic Burden of Violence against Children in East Asia  
643 and the Pacific. Available at:  
644 [http://srsg.violenceagainstchildren.org/sites/default/files/blocks/cost\\_of\\_violence/UNI](http://srsg.violenceagainstchildren.org/sites/default/files/blocks/cost_of_violence/UNICEF%20Child%20Maltreatment%20Research%20Overview%20FINAL.pdf)  
645 [CEF%20Child%20Maltreatment%20Research%20Overview%20FINAL.pdf](http://srsg.violenceagainstchildren.org/sites/default/files/blocks/cost_of_violence/UNICEF%20Child%20Maltreatment%20Research%20Overview%20FINAL.pdf)

646 [Accessed on 2 July 2017]

647 World Health Organization. (2016). *INSPIRE: Seven strategies for ending violence against*  
648 *children*. World Health Organization.

649 Yoon, J. Y., Brown, R. L., Bowers, B. J., Sharkey, S. S., & Horn, S. D. (2015). Longitudinal  
650 psychological outcomes of the small-scale nursing home model: a latent growth curve  
651 zero-inflated Poisson model. *International Psychogeriatrics*, 27(6), 1009-1016.

652

653

654

655 Table 1

656 *Descriptive statistics of violence against children, Wave 1*

| Variable           | Mean<br>(sample) | Mean<br>(weighted) | Gender |        | <i>t</i> -test | Sample<br>size |
|--------------------|------------------|--------------------|--------|--------|----------------|----------------|
|                    |                  |                    | Male   | Female |                |                |
| Put down           | 0.48             | 0.50               | 0.47   | 0.49   | -1.56          | 4724           |
| Afraid of hurt     | 0.27             | 0.26               | 0.26   | 0.29   | -2.05**        | 4724           |
| Push               | 0.31             | 0.32               | 0.30   | 0.31   | 0.45           | 4724           |
| Hit hard           | 0.12             | 0.13               | 0.12   | 0.12   | -0.75          | 4724           |
| Physical violence  | 0.33             | 0.34               | 0.33   | 0.33   | 0.33           | 4724           |
| Emotional violence | 0.52             | 0.53               | 0.51   | 0.53   | -1.28          | 4724           |
| Overall violence   | 0.57             | 0.58               | 0.56   | 0.58   | -0.99          | 4724           |

657

658 *Notes.* Statistics in *t*-test column are *t* values. Population means are weighted with survey  
659 design effects of individuals clustered in sampling units of enumeration areas (EAs) and  
660 stratification of major population groups in Cape Town.

661 \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

662

663

664

665

666 Table 2

667 *Descriptive statistics of health and educational outcomes*

| Variable            | Wave  | Mean<br>(sample) | Mean<br>(weighted) | Gender |        |                | Sample<br>size |
|---------------------|-------|------------------|--------------------|--------|--------|----------------|----------------|
|                     |       |                  |                    | Male   | Female | <i>t</i> -test |                |
| <b>Health</b>       |       |                  |                    |        |        |                |                |
| self-rated health   | Wave1 | 0.93             | 0.93               | 0.95   | 0.91   | 4.05***        | 4724           |
| Health problem      | Wave1 | 0.10             | 0.10               | 0.09   | 0.11   | -1.62          | 4697           |
| self-rated health   | Wave5 | 0.39             | 0.40               | 0.40   | 0.37   | 1.64           | 2900           |
| Health problem      | Wave5 | 0.07             | 0.06               | 0.05   | 0.08   | -3.66***       | 2886           |
| Mental illness (K6) | Wave5 | 5.06             | 4.36               | 4.58   | 5.46   | -4.86***       | 2900           |
| <b>Education</b>    |       |                  |                    |        |        |                |                |
| Total test score    | Wave1 | 26.83            | 28.78              | 26.99  | 26.70  | 1.09           | 4683           |
| Literacy score      | Wave1 | 17.10            | 17.82              | 16.94  | 17.21  | -2.36**        | 4683           |
| Numeracy score      | Wave1 | 9.73             | 10.95              | 10.04  | 9.48   | 3.25***        | 4683           |
| Education level     | Wave5 | 10.91            | 11.05              | 10.71  | 11.08  | -4.49***       | 2900           |

668

669 *Notes.* Statistics in *t*-test column are *t* values. Population means are weighted with survey  
670 design effects of individuals clustered in sampling units of enumeration areas (EAs) and  
671 stratification of major population groups in Cape Town.

672 \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

673

674 Table 3

675 *Individual and household characteristics, Wave1*

| Variable                               | Mean (sample) | Mean (weighted) | Standard deviation | Sample size |
|--|---------------|-----------------|--------------------|-------------|
| <b>Individual characteristics</b>      |               |                 |                    |             |
| Male                                   | 0.45          | 0.48            | 0.50               | 4724        |
| Black                                  | 0.45          | 0.28            | 0.50               | 4724        |
| Coloured                               | 0.42          | 0.53            | 0.49               | 4724        |
| White                                  | 0.13          | 0.19            | 0.33               | 4724        |
| Age                                    | 17.87         | 17.91           | 2.48               | 4724        |
| <b>Family socioeconomic background</b> |               |                 |                    |             |
| Home language English                  | 0.20          | 0.29            | 0.40               | 4724        |
| Household size                         | 5.43          | 5.31            | 2.52               | 4724        |
| Female-headed household                | 0.39          | 0.37            | 0.12               | 4724        |
| Mother's education level (years)       | 8.89          | 9.68            | 5.44               | 4322        |
| Mother's education missing             | 0.08          | 0.08            | 0.28               | 4724        |
| Per capita income (Rands)              | 1164.31       | 1570.37         | 2041.87            | 4724        |

676

677 *Notes.* Statistics in *t*-test column are *t* values. Population means are weighted with survey  
678 design effects of individuals clustered in sampling units of enumeration areas (EAs) and  
679 stratification of major population groups in Cape Town.

680 \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

681

682 Table 4

683 *Regressions of violence against children and health outcomes*

| Variables             | Short term                 |                            |                          | Long term                 |                            |
|-----------------------|----------------------------|----------------------------|--------------------------|---------------------------|----------------------------|
|                       | (1)<br>self-rated health   | (2)<br>Health problem      | (3)<br>self-rated health | (4)<br>Health problem     | (5)<br>Mental illness (K6) |
| Put down              | 0.630***<br>[0.501, 0.791] | 1.184*<br>[0.974, 1.439]   | 1.02<br>[0.876, 1.189]   | 1.102<br>[0.817, 1.487]   | 1.062***<br>[1.027,1.097]  |
| pseudo-R <sup>2</sup> | 0.021                      | 0.016                      | 0.012                    | 0.016                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |
| Afraid of hurt        | 0.738**<br>[0.582, 0.935]  | 1.208*<br>[0.977, 1.493]   | 1.056<br>[0.893, 1.250]  | 1.238<br>[0.902, 1.699]   | 1.102***<br>[1.064,1.141]  |
| pseudo-R <sup>2</sup> | 0.017                      | 0.016                      | 0.012                    | 0.017                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |
| Push                  | 0.727***<br>[0.576, 0.917] | 1.408***<br>[1.152, 1.722] | 0.936<br>[0.794, 1.104]  | 1.354*<br>[0.992, 1.850]  | 1.084***<br>[1.046,1.124]  |
| pseudo-R <sup>2</sup> | 0.017                      | 0.019                      | 0.012                    | 0.018                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |
| Hit hard              | 0.584***<br>[0.434, 0.785] | 1.583***<br>[1.215, 2.061] | 1.13<br>[0.902, 1.416]   | 1.593**<br>[1.070, 2.373] | 1.133***<br>[1.080,1.190]  |
| pseudo-R <sup>2</sup> | 0.019                      | 0.019                      | 0.012                    | 0.019                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |
| Physical violence     | 0.717***<br>[0.570, 0.902] | 1.345***<br>[1.102, 1.642] | 0.984<br>[0.837, 1.157]  | 1.304*<br>[0.958, 1.776]  | 1.077***<br>[1.039,1.115]  |
| pseudo-R <sup>2</sup> | 0.018                      | 0.018                      | 0.012                    | 0.018                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |
| Emotional violence    | 0.629***<br>[0.499, 0.793] | 1.229**<br>[1.009, 1.495]  | 1.053<br>[0.903, 1.227]  | 1.272<br>[0.940, 1.722]   | 1.088***<br>[1.052,1.125]  |
| pseudo-R <sup>2</sup> | 0.021                      | 0.017                      | 0.012                    | 0.018                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |
| Overall violence      | 0.630***<br>[0.496, 0.800] | 1.327***<br>[1.085, 1.625] | 0.986<br>[0.844, 1.153]  | 1.238<br>[0.908, 1.686]   | 1.093***<br>[1.056,1.130]  |
| pseudo-R <sup>2</sup> | 0.021                      | 0.018                      | 0.012                    | 0.017                     | —                          |
| Observations          | 4724                       | 4697                       | 2900                     | 2886                      | 2900                       |

684

685 *Notes.* Odds Ratios (OR) in column (1) to column (4) are from logistic regressions and Incidence Rate

686 Ratios (IRR) in column (5) are from zero inflated poisson (ZIP) regressions; 95% confidence intervals

687 calculated by Huber-White robust standard errors in brackets. Each coefficient comes from a separate

688 regression. Regressions with all controls include the following: *Male, Black, Coloured, Age, Home*689 *language English, Household size, Female-headed household, Mother's education level, Mother's*690 *education missing, Per capita income (Rands).*

691 \* p&lt;0.1, \*\* p&lt;0.05, \*\*\* p&lt;0.01



692 Table 5

693 OLS regressions of violence against children and educational outcomes

| Variables          | Short term                    |                              |                               | Long term                     |
|--------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|
|                    | (1)<br>Total test score       | (2)<br>Literacy score        | (3)<br>Numeracy score         | (4)<br>Education level        |
| Put down           | -0.029<br>[-0.074, 0.017]     | 0.002<br>[-0.047, 0.052]     | -0.046**<br>[-0.091, -0.001]  | -0.093***<br>[-0.161, -0.024] |
| R <sup>2</sup>     | 0.387                         | 0.266                        | 0.395                         | 0.142                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |
| Afraid of hurt     | -0.073***<br>[-0.125, -0.021] | -0.054*<br>[-0.111, 0.004]   | -0.077***<br>[-0.128, -0.026] | -0.111***<br>[-0.185, -0.037] |
| R <sup>2</sup>     | 0.388                         | 0.266                        | 0.396                         | 0.142                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |
| Push               | -0.083***<br>[-0.132, -0.033] | -0.064**<br>[-0.118, -0.010] | -0.085***<br>[-0.134, -0.036] | -0.171***<br>[-0.244, -0.098] |
| R <sup>2</sup>     | 0.388                         | 0.267                        | 0.396                         | 0.146                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |
| Hit hard           | -0.110***<br>[-0.181, -0.038] | -0.06<br>[-0.138, 0.019]     | -0.129***<br>[-0.200, -0.059] | -0.113**<br>[-0.212, -0.013]  |
| R <sup>2</sup>     | 0.388                         | 0.266                        | 0.397                         | 0.141                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |
| Physical violence  | -0.078***<br>[-0.126, -0.030] | -0.055**<br>[-0.107, -0.002] | -0.084***<br>[-0.132, -0.036] | -0.154***<br>[-0.226, -0.082] |
| R <sup>2</sup>     | 0.388                         | 0.266                        | 0.396                         | 0.145                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |
| Emotional violence | -0.039*<br>[-0.084, 0.007]    | -0.006<br>[-0.055, 0.044]    | -0.055**<br>[-0.101, -0.010]  | -0.097***<br>[-0.166, -0.028] |
| R <sup>2</sup>     | 0.387                         | 0.266                        | 0.396                         | 0.142                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |
| Overall violence   | -0.052**<br>[-0.098, -0.006]  | -0.017<br>[-0.067, 0.033]    | -0.069***<br>[-0.114, -0.023] | -0.123***<br>[-0.194, -0.052] |
| R <sup>2</sup>     | 0.388                         | 0.266                        | 0.396                         | 0.143                         |
| Observations       | 4683                          | 4683                         | 4683                          | 2900                          |

694

695 Notes. Each coefficient comes from a separate OLS regression. 95% confidence intervals calculated by

696 Huber-White robust standard errors in brackets. Each coefficient comes from a separate regression.

697 Regressions with all controls include the following: *Male, Black, Coloured, Age, Home language English,*698 *Household size, Female-headed household, Mother's education level, Mother's education missing, Per*699 *capita income (Rands).*

700 \* p&lt;0.1, \*\* p&lt;0.05, \*\*\* p&lt;0.01

701