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To cite this article: Neema Mosha, Gerry Mshana, Elona Toska, Lucas Hertzog, Chris Desmond, Lucie Cluver, Saidi Kapiga & Heidi Stöckl (2022): Intergenerational education and violence effects on adolescent education, early employment and adolescent parenting, Psychology, Health & Medicine, DOI: [10.1080/13548506.2022.2108083](https://doi.org/10.1080/13548506.2022.2108083)

To link to this article: <https://doi.org/10.1080/13548506.2022.2108083>



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Published online: 12 Aug 2022.



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Intergenerational education and violence effects on adolescent education, early employment and adolescent parenting

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ABSTRACT

Adolescence is a crucial phase in life, when foundations are established for future health. Therefore, supporting adolescents is necessary to meet the sustainable development goals by 2030. Evidence on the intergenerational transmission of poverty, education and violence suggests that to improve adolescents' well-being, the broader context in which they grow up needs to be understood when developing programmes and approaches to improve their lives. Our study explored intergenerational factors and early childhood influences on adolescent education, employment and parenthood, using the fourth wave of the MAISHA longitudinal study. This study took place in 2016–2021 among 986 adult women in Mwanza, Tanzania, including questions answered by the women on their adolescent's (aged 13–18) education, employment and parenthood, as well as their participation in early childhood programmes, education attainment and other socio-economic variables. Among the 577 mothers in our analysis who had adolescents living in their households, 32% reported that their adolescents did not attend secondary school, 11% were employed, 4% were pregnant or parents. For adolescents in secondary school, 15% ever failed a grade and 10% missed school more than 2 weeks in the last term. Grandparents' not having secondary education was significantly associated with adolescents not attending secondary education and being employed. Living in a female-headed household and mother's experience of intimate partner violence was associated with adolescent early employment. Early childhood influences showed no impact on any outcome in the multivariate analysis. Overall, we report a strong intergenerational impact of education on adolescent outcomes, suggesting the adoption of a strong policy focus on the provision of secondary education for both men and women due to its long-lasting effect. Interventions aimed at improving adolescent outcomes need to be long-term and invest in whole family poverty reduction measures.

ARTICLE HISTORY

Received 22 February 2022
Accepted 25 July 2022

KEYWORDS

Violence; Adolescent;
Accelerator; Tanzania

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Introduction

Adolescents, defined as those aged 10–19 years, are the fastest-growing population group globally (UNICEF, 2019). In sub-Saharan Africa, adolescents make up 16% of the population (UNFPA, 2014). In Tanzania, 12 million of the 54 million citizens are adolescents, a number predicted to reach 30 million by 2050 (UNICEF, 2019). Adolescence is a crucial time in life, when the foundations are laid for their lifelong health and well-being. Therefore, it is clear that in order to meet the Sustainable Development Goals (SDGs) in 2030, we need to improve the opportunities and circumstances of adolescents to support them to thrive. Yet, their developmental needs and vulnerabilities are often overlooked.

Studies on the intergenerational transmission of poverty, education and violence have long shown that the success and well-being of future generations are highly dependent on the economic, social and educational position of their parents and their grandparents (Ehrensaft & Langhinrichsen-Rohling, 2022; Fleury & Gilles, 2018; Li, 2015; Ryabov, 2020; Scorza et al., 2019). A longitudinal study conducted in Ethiopia, Peru, India and Vietnam found that material circumstances, such as caregiver's education and socio-economic status affect wide dimensions of child well-being well into adolescence (Dercon & Krishnan, 2009). Intimate partner violence is known to reproduce itself over generations, with ample evidence on adverse educational and health outcomes for children living in violent households (Chen & Lee, 2021; Lünemann et al., 2019). Poverty, low parental education and experiences of violence at home have all been found to be predictors for adolescents dropping out of secondary education and entering the labour market prematurely, adolescent pregnancy and engagement in risky behaviour (Gunawardena et al., 2019; Roby et al., 2016). The interconnection of poverty, education and experiences of violence make it clear that adolescents need programmes that address multiple outcomes simultaneously to accelerate achievement towards the SDG outcomes by 2030 (Chipanta et al., 2022; Rudgard et al., 2022). Therefore, United Nations Development Programme promotes accelerator programmes, catalytic policy and programme areas that can trigger positive multiplier effects or that combine separate programmes to achieve beneficial outcomes on more than one SDG outcomes as well as to enhance their impact on individual SDG outcomes (UNDP, 2017). Considering the intergenerational transmission and the effect of household structural poverty, early childhood development and parenting programmes need to be implemented (Bietenbeck et al., 2019; McCoy et al., 2020).

The present study aims to explore the long-term effects of secondary education, poverty and intimate partner violence, as well as programmes implemented early in children's life on SDG-related outcomes of adolescents for their potential to act as accelerator programmes, utilizing cohort data from Mwanza, Tanzania.

Materials and methods

This study is a cross-sectional analysis of wave 4 of the MAISHA longitudinal study, which enrolled approximately 1000 women aged 18 years and older of the control arms of the two MAISHA trials in Mwanza, Tanzania. The MAISHA Trials recruited women

through existing micro-finance groups (Trial 1) and created groups of women not in micro-finance (Trial 2) aimed at empowering women and preventing intimate partner violence through 10 group gender training sessions (Kapiga et al., 2019). Women in the control groups of the two trials, who did not receive the intervention, but were interviewed during baseline (wave 1) and 2 years later for the follow-up interview (wave 2) were asked if they wanted to take part in the longitudinal study. The longitudinal study interviewed them 1 year after the trial follow-up was completed (wave 3) and one more time a year later (wave 4), resulting in four (4 waves) distinct 90 minutes face-to-face interviews over 5 years.

Women provided explicit informed consent to participate in the longitudinal study. Only women who were interviewed in wave four between 2020 and 2021, who had adolescents aged 13–17 years living in their households were included in this analysis. The questionnaires were translated into Swahili and independently back-translated into English. Questionnaires included information on woman's economic well-being, childhood, relationships, health, experiences of intimate partner violence and the community they live in. Data was inputted directly onto a tablet with validation checks to minimise missing or erroneous data and uploaded and checked daily to a secure server. For each interview, women received reimbursement for their time and effort, following local ethical guidance.

The study received ethical approval from the National Institute of Medical Research, Tanzania, the London School of Hygiene and Tropical Medicine, London, UK and the Ludwig-Maximilians-University Munich, Germany. Throughout the study, participants and researcher's safety, confidentiality and well-being were paramount, following the WHO recommendations on interviewing women on intimate partner violence (World Health Organization, 2001). This included women being interviewed in private by regularly trained female interviewers with a specific focus on how to conduct interviews in an empathic manner considering the safety and well-being of the women and the researcher and offering participants referral services after the interviews if needed.

Measures

SDG-related adolescent outcomes

Participating mothers responded to five questions on SDG-related outcomes for any adolescent aged 13–17 years living in their household. It is therefore not possible to have information on individual adolescents, only on all adolescents in the household. All outcomes were coded as binary. *SDG 3*: good health and wellbeing was measured through the question: 'Is any of your teenage children pregnant/has given birth to a child or has fathered a child (if a boy)?'. *SDG 4*: Quality education was measured through the questions: 'Is any of your teenage children attending secondary school?', 'Has any of your teenage children missed more than 2 weeks of school in the last term?' and 'Has any of your teenage children ever repeated a grade or failed their last grade?'. *SDG 8*: decent employment and economic growth: "Is any of your teenage children currently employed or working?". A positive answer was interpreted as a negative sign, as it implicates that

the teenager has not obtained secondary education and is working in a low-level job such as farming or housekeeping that will not ensure economic prosperity and decent employment in the future (Ntumva & Rwambali, 2013).

Hypothesized accelerators

The accelerators related to education captured mother's, father's and maternal grandmother's and grandfather's secondary education. While mother's and father's education were coded as secondary versus not, grandparent's education was coded none, primary and secondary due to the low levels of secondary education in this generation. Accelerators related to poverty included mother's household's socio-economic status (measured in five quintiles), mother living in a female-headed household (Yes/No), mother growing up in a female-headed household (Yes/No), mother's mobile phone ownership (Yes/No) and mother's microfinance participation (Yes/No). Violence-related accelerators focused on mother's reports on witnessing physical violence between their parents/caregivers when growing up (Yes/No), mother's experience of intimate partner violence based on the WHO tool on measuring domestic violence (Garcia-Moreno et al., 2006) and mother's age at first sex (below/above age 16). Early life accelerators coded binary asked whether the adolescents were attending a creche or pre-school when young and whether the mother ever participated in any parenting programming or received home visits from someone who discussed parenting. Additional hypothesized accelerators also coded binary included adolescent's mobile phone access and adolescents ever receiving career development advice.

Data analysis

The analysis was restricted to the 577 women who had at least one adolescent aged 13–17 years living in their households. Tetrachoric correlations and bivariate analysis using chi-square tests were used to compare proportions between the adolescent's SDG-related outcomes and the hypothesized accelerators. Accelerators showing significant results were used to fit the logistic regression models on the individual adolescent SDG outcomes to determine the strength of associations (odds ratios). In the multivariate analysis, only variables showing significant results in the correlation matrix, or the univariate analyses were adjusted for, in addition to those accelerators of main interest – other covariates including education, poverty and intimate partner violence regardless of their significance status. Age was only adjusted for if significant in the univariate analyses. In independent exploration analysis between accelerators, outcomes was conducted to assess how each of them are associated with each other. *P* values of 0.05 were used as a cutoff point for significance testing.

Results

Demographic characteristics and adolescent outcomes

The mean age of the 577 mothers was 42.3 years, with 414 (72%) being married or living with a man as if married. Of them, 68% reported that any of their adolescent are currently attending secondary schools and 11% that any of their adolescents were employed early. Out of those attending secondary school, 10% have missed 2 or more weeks of school in

the last term and 15% have ever had to repeat a grade. Adolescent pregnancy and fatherhood were reported by 4% of mothers, while child marriage or their child living as if married was reported by 1%, taken together 4.6%.

Accelerator exposure

Secondary education: Secondary school completion was higher among fathers with 36% compared to mothers with 23%. This pattern is starker when looking at grandparent's educational attainment, where 20% of grandfathers obtained secondary education compared to 6% of grandmothers. The proportion of grandfathers and grandmothers with no school attendance was 31% vs 36%. *Poverty:* Nearly half of the mothers were participating in microfinance groups (47%), a result of the study design. While 32% (182) of mothers lived in female-headed households, 13% (74) also grew up in one. Mother's mobile phone ownership was high, with 92% reporting it. *Intimate partner violence:* This was highly prevalent in population, with 63% of mother's reporting witnessing physical abuse among their parents during childhood, and 36% of mother's ever experiencing physical violence by their partner. First sex was reported by 34% of mothers to have occurred before the age of 16. *Early life accelerators:* Among the 577 mothers, 316 (55%) have participated in parenting programs or received home visits from someone, 88% (505) send at least one of their adolescent to a creche or pre-school. *Adolescent-targeted accelerators:* Only 10% of mothers reported or knew that their adolescent received career development advice through groups or school. Twenty-five per cent of adolescent in this study had access to mobile phones. For more details, refer to [Table 1](#).

Accelerators association with adolescents currently not attending secondary school

[Table 2](#) outlines the unadjusted and adjusted odds ratios examining the association between adolescent's secondary school non-attendance with different accelerators. Adolescent's non-attendance of secondary school was associated with their grandfather's low level of education, their mother's experience of physical intimate partner violence and their mother's young age at first sex. Grandfather having secondary education reduced the odds of adolescents not to attend secondary school by 48% (aOR = 0.43, 95% CI = 0.22–0.84) when compared to grandfather's with no education. Adolescents secondary school non-attendance was also lower if their mother owned a mobile phone (aOR = 0.47, 95% CI = 0.24–0.93) while adolescent access to mobile phones increased their likelihood to secondary school non-attendance by 67% (aOR = 1.67, 95% CI = 1.06–2.63) compared to not having a mobile phone.

Accelerators association with adolescents missing 2 or more weeks of school and repeating a grade

Among mothers with adolescents attending secondary school, missing at least 2 weeks of school in the last term was univariately associated with mother's secondary education (OR = 0.31, 95% CI = 0.13–0.75), mother's experience of physical intimate partner violence (OR = 2.19, 95% CI = 1.12–4.31) and adolescent receiving career development advice (OR = 2.531, 95% CI = 1.025 – 6.248). Adjusting for all key and significant accelerators,

Table 1. Characteristics of adolescents, their parents/caregivers and their maternal grandparents and their exposure to adolescents' accelerators (N = 577).

Covariates	N = 577	Adolescent not attending secondary school (N = 577)	Adolescent missed days in schools (N = 392)	Adolescent failed a grade (N = 392)	Adolescent early employment (N = 577)	Adolescent parenthood (N = 577)
<i>Total</i>						
Mother's age: Mean (SD)	42.28 (7.9)	185 (32%) 42.30 (8.26)	38 (10%) 41.76 (6.69)	59 (15%) 42.80 (7.91)	66 (11%) 43.39 (8.15)	25 (4%) 45.68 (8.22)
Mother's current marital status						
Married/living with man as if married	414 (72%)	120 (65%)	25 (66%)	45 (76%)	41 (62%)	14 (56%)
Been in relationship past 12 months	81 (14%)	32 (17%)	7 (18%)	8 (14%)	11 (17%)	3 (12%)
Not in a relationship	82 (14%)	33 (18%)	6 (16%)	6 (10%)	14 (21%)	8 (32%)
<i>Accelerators related to education</i>						
Mother's has secondary education	133 (23%)	38 (21%)	5 (13%)	6 (10%)	11 (17%)	2 (8%)
Father's has secondary education	177 (36%)	49 (32%)	14 (44%)	16 (30%)	17 (33%)	3 (18%)
Grandmother's education level						
No primary	203 (36%)	61 (34%)	14 (37%)	27 (46%)	23 (35%)	14 (56%)
Primary	330 (58%)	111 (61%)	19 (50%)	31 (53%)	39 (60%)	10 (40%)
Secondary or Higher	35 (6%)	9 (5%)	5 (13%)	1 (2%)	3 (5%)	1 (4%)
Grandfather's education level						
No primary	177 (31%)	65 (36%)	9 (24%)	20 (34%)	28 (43%)	9 (36%)
Primary	279 (49%)	90 (50%)	19 (50%)	30 (51%)	28 (43%)	14 (56%)
Secondary or Higher	112 (20%)	26 (14%)	10 (26%)	9 (15%)	9 (14%)	2 (8%)
<i>Accelerators related to poverty</i>						
Mother's microfinance participation	270 (47%)	87 (47%)	21 (55%)	31 (53%)	23 (35%)	6 (24%)
Mother is the head of the household	182 (32%)	68 (37%)	16 (42%)	15 (25%)	29 (44%)	13 (52%)
Mother's socio-economic status levels						
1st quintile	107 (20%)	38 (23%)	4 (11%)	17 (31%)	15 (25%)	7 (37%)
2nd quintile	108 (20%)	34 (21%)	8 (22%)	10 (18%)	15 (25%)	2 (11%)
3rd quintile	98 (19%)	34 (21%)	4 (11%)	12 (22%)	8 (13%)	4 (21%)
4th quintile	106 (20%)	29 (18%)	10 (28%)	11 (20%)	10 (16%)	3 (16%)
5th quintile	108 (20%)	29 (18%)	10 (28%)	5 (9%)	13 (21%)	3 (16%)
Mother grew up in a female-headed household	74 (13%)	19 (10%)	7 (18%)	10 (17%)	8 (12%)	4 (16%)
Mother owns a mobile phone	532 (92%)	165 (89%)	38 (100%)	56 (95%)	59 (89%)	22 (88%)
<i>Accelerators related to violence</i>						
Mother ever experienced physical intimate partner violence	217 (38%)	78 (42%)	20 (53%)	28 (47%)	32 (48%)	8 (32%)
Mother witnessed domestic violence as a child (Missing = 9)	358 (63%)	111 (61%)	23 (62%)	38 (64%)	37 (57%)	14 (58%)
Mother's age at first sex (Missing = 9)	375 (66%)	108 (59%)	26 (70%)	44 (75%)	41 (63%)	14 (58%)
<i>Early life accelerators</i>						

(Continued)

Table 1. (Continued).

Covariates	N = 577	Adolescent not attending secondary school (N = 577)	Adolescent missed days in schools (N = 392)	Adolescent failed a grade (N = 392)	Adolescent early employment (N = 577)	Adolescent parenthood (N = 577)
Mother participates in a parenting programme or received home visits from someone	316 (55%)	104 (56%)	7 (18%)	32 (54%)	34 (52%)	8 (32%)
Adolescents attended a creche or preschool?	505 (88%)	162 (88%)	11 (29%)	54 (92%)	57 (86%)	24 (96%)
Adolescent targeted accelerators	56 (10%)	20 (11%)	7 (18%)	6 (10%)	17 (26%)	3 (12%)
Adolescent received career development advice	145 (25%)	57 (31%)	11 (29%)	10 (17%)	43 (65%)	19 (76%)

Table 2. Association between accelerators and adolescent secondary school non-attendance (n = 577), missing days in school (n = 392) and having failed a grade (n = 392).

	Un-adjusted OR (95% CI)	Adjusted ^a OR (95% CI)	Un-adjusted OR (95% CI)	Adjusted ^b OR (95% CI)	Un-adjusted OR (95% CI)	Adjusted ^c OR (95% CI)
	Not attending secondary school			Failed a grade		
	Missed days in schools			Failed a grade		
<i>Mother's age</i>	1.00 (0.98,1.02)		0.99 (0.95,1.04)		1.01 (0.97,1.05)	
<i>Mother's secondary education (Ref: No)</i>	0.81 (0.53,1.24)		0.44 (0.17,1.17)	0.24 (0.07,0.83)*	0.31 (0.13–0.75)	0.51 (0.19,1.31)
<i>Father's secondary education (Ref: No)</i>	0.80 (0.53,1.20)		1.34 (0.64,2.80)	1.81 (0.79,4.13)	0.69 (0.36,1.29)	1.09 (0.54,2.17)
<i>Grandmother's education (Ref: None)</i>	1	1	1		1	1
<i>Primary</i>	1.18 (0.81,1.72)	1.77 (1.09,2.88)*	0.87 (0.42,1.79)	0.80 (0.32,2.01)	0.70 (0.40,1.24)	1.02 (0.51,2.05)
<i>Secondary or Higher</i>						
<i>Grandfather's education (Ref: None)</i>	0.81 (0.36,1.82)	1.48 (0.58,3.75)	2.18 (0.71,6.68)	3.42 (0.77,15.3)	0.17 (0.02,1.31)	0.45 (0.05,4.05)
<i>Primary</i>	1	1	1		1	1
<i>Secondary or Higher</i>	0.82 (0.55,1.22)	0.59 (0.36,0.97)*	1.28 (0.56,2.93)	2.10 (0.71,6.24)	0.87 (0.47,1.62)	0.97 (0.46,2.05)
<i>Mother's micro-finance participation (Ref: No)</i>	0.52 (0.31,0.89)	0.43 (0.22,0.84)*	1.51 (0.58,3.89)	2.35 (0.66,8.37)	0.54 (0.23,1.25)	0.64 (0.22,1.88)
<i>Female-head of the household (Ref: Male)</i>	1.01 (0.71,1.44)		1.46 (0.75,2.87)		1.32 (0.76,2.30)	
<i>Socio-economic status levels (Ref: 1st)</i>	1.42 (0.98,2.05)		1.90 (0.96,3.77)	2.60 (1.08,6.31)*	0.81 (0.43,1.51)	1.42 (0.98,2.05)
<i>2nd quintile</i>	1	1	1		1	1
<i>3rd quintile</i>	0.83 (0.47,1.47)		1.37 (0.39,4.72)		0.59 (0.25,1.40)	0.74 (0.30,1.87)
<i>4th quintile</i>	0.96 (0.54,1.71)		1.60 (0.49–5.15)		0.68 (0.30,1.52)	0.82 (0.34,1.94)
<i>5th quintile</i>	0.68 (0.38,1.22)		1.42 (0.44,4.57)		0.49 (0.21,1.13)	0.55 (0.22,1.38)
<i>Mother grew up in a female-headed household (Ref: No)</i>	0.67 (0.37,1.19)		1.75 (0.55,5.49)		0.17 (0.06,0.55)	0.17 (0.06,0.64)
<i>Mother owns mobile phone (Ref: No)</i>	0.71 (0.41,1.23)		1.90 (0.96,3.77)		1.28 (0.61,2.71)	
<i>Mother ever experienced physical IPV (Ref: No)</i>	0.56 (0.30,1.04)	0.47 (0.24,0.93)*	-	3.28 (1.45,7.43)*	1.32 (0.38,4.56)	1.63 (0.87,3.04)
<i>Mother witnessed violence in childhood (Ref: No)</i>	1.33 (0.93,1.90)	1.49 (0.99,2.26)	2.20 (1.12,4.31)		1.81 (1.03,3.16)	
<i>Age at first sex (Ref: <16 years)</i>	0.86 (0.60,1.24)	0.66 (0.43,1.01)	0.91 (0.45,1.83)		1.01 (0.57,1.81)	
<i>Mother received parenting programme or advice (Ref: No)</i>	0.64 (0.44,0.92)		1.05 (0.50,2.20)		1.36 (0.72,2.55)	
<i>Mother sent adolescent to pre-school or creche (Ref: No)</i>	1.09 (0.77,1.55)		1.34 (0.68,2.65)		1.01 (0.58,1.76)	
<i>Adolescent received career advice (Ref: No)</i>	1.01 (0.59,1.71)		1.74 (0.51,5.89)		1.64 (0.62,4.34)	
<i>Adolescent has access to mobile phone (Ref: No)</i>	1.20 (0.67,2.13)		2.53 (1.03,6.25)	2.15 (0.74,6.26)	1.14 (0.45,2.88)	
	1.54 (1.04,2.28)	1.67 (1.06,2.63)*	1.47 (0.70,3.09)		0.67 (0.32,1.38)	

*pvalue <0.05, **pvalue<0.001

mother's secondary education decreased the chance of reporting that their adolescent missed school by more than 75% (aOR = 0.24, 95% CI = 0.07–0.83) compared to mothers with no secondary education, while mother's experiencing physical intimate partner violence increased their likelihood by more than 300% (aOR = 3.28, 95% CI = 1.45–7.43).

Repeating a grade was only associated with being in the higher quintile of mother's socio-economic status both univariately (OR = 0.17, 95% CI = 0.06–0.55) and after adjusting for key accelerators, when it decreased the odds of repeating a grade by 83% (aOR = 0.17, 95% CI = 0.05–0.64) compared to those of adolescents living with mothers in the lower socio-economic quintile. Mothers ever experiencing physical intimate partner violence was only significant in the univariate analysis with adolescents repeating a grade in school (OR = 1.81, 95% CI = 1.03–3.16).

Accelerators association with school-age adolescents being employed

School-age adolescents living with mothers who participated in microfinance groups were less likely (OR = 0.57, 95% CI = 0.34–0.98) to be employed as well as adolescents living in male-headed households (OR = 1.83, 95% CI = 1.09–3.09), both key markers of poverty. Also, mothers who reported their adolescents to have received career development advice had four times higher odds (OR = 4.20, 95% CI = 2.21–7.97) of adolescents to be employed too early. Adolescents with mobile phone access were seven times more likely to be employed too early (OR = 7.50, 95% CI = 4.32–13.00). All these accelerators remained significant in the adjusted model, with the addition of physical intimate partner violence (see, [Table 3](#)).

Association between teen being pregnant or fathered a child

Parenthood in adolescents still living in their mother's household was a rare event. Adolescent parenthood was significantly more likely in female- (unadjusted OR = 2.46, 95% CI = 1.10–5.49) than male-headed households, less likely among adolescent of mothers participating in micro-finance groups (unadjusted OR = 0.34, 95% CI = 0.14–0.88) and 63% less likely among mothers who received parenting advice (Unadjusted OR = 0.37, 95% CI = 0.16–0.88). In the adjusted models, school-age adolescents with access to mobile phone remained significant with 11-time higher odds of being pregnant or fathers a child (aOR = 11.03, 95% CI = 3.38–36.05). Yes we explored the association between outcomes as secondary analysiss.

Associations between accelerators

We found significant associations between mother's education level with both maternal grandfathers and mother's educational levels, mother's reports of experiencing intimate partner violence and witnessing it as a child ($P < 0.005$), but not between growing up and currently living in a female-headed household. Adolescents who were not attending secondary school had OR = 1.78, 95% CI (1.05–3.00) higher odds of being employed too early.

Table 3. Association between accelerators and adolescent early employment and adolescent pregnancy or parenthood (n = 577).

	Un-adjusted OR (95% CI)	Adjusted ^a OR (95% CI)	Un-adjusted OR (95% CI)	Adjusted ^b OR (95% CI)
	Adolescents' early employment		Adolescents' parenthood	
<i>Mother's age</i>	1.02 (0.99,1.05)		1.05 (1.00,1.10)	1.04 (0.96,1.13)
<i>Mother's secondary education (Ref: No)</i>	0.64 (0.32,1.26)	1.11 (0.47,2.57)	0.28 (0.07,1.20)	0.59 (0.11,3.19)
<i>Father's secondary education (Ref: No)</i>	0.86 (0.47,1.58)	1.01 (0.49,2.04)	0.37 (0.12,1.32)	0.41 (0.10,1.64)
<i>Grandmother's education (Ref: None)</i>	1		1	1
<i>Primary</i>	1.05 (0.61,1.81)	1.52 (0.69,3.29)	0.42 (0.18,0.97)	0.50 (0.14,1.74)
<i>Secondary or Higher</i>	0.73 (0.21,2.59)	1.25 (0.29,5.44)	0.39 (0.05,3.12)	1.18 (0.10,13.61)
<i>Grandfather's education (Ref: None)</i>	1		1	1
<i>Primary</i>	0.59 (0.34,1.04)	0.38 (0.17,0.85)	0.99 (0.42,2.33)	1.93 (0.51,7.34)
<i>Secondary or Higher</i>	0.46 (0.21,1.03)	0.47 (0.17,1.29)	0.34 (0.07,1.60)	1.30 (0.18,9.55)
<i>Mother's micro-finance participation (Ref: No)</i>	0.57 (0.34,0.98)	0.68 (0.35,1.35)	0.34 (0.14,0.88)	0.32 (0.08,1.26)
<i>Female-head of the household (Ref: Male)</i>	1.83 (1.09,3.09)	1.05 (0.50,2.19)	2.45 (1.09,5.49)	1.30 (0.39,4.36)
<i>Socio-economic status levels (Ref: 1st)</i>	1		1	
<i>2nd quintile</i>	0.99 (0.46,2.13)		0.34 (0.07,1.73)	
<i>3rd quintile</i>	0.51 (0.22,1.22)		0.81 (0.24,2.74)	
<i>4th quintile</i>	0.39 (0.15,0.98)		0.47 (0.11,1.94)	
<i>5th quintile</i>	0.93 (0.43,2.01)		0.52 (0.13,2.14)	
<i>Mother grew up in a female-headed household (Ref: No)</i>	0.93 (0.42,2.04)		1.29 (0.43,3.86)	
<i>Mother owns mobile phone (Ref: No)</i>	0.68 (0.29,1.59)		0.60 (0.17,2.10)	
<i>Mother ever experienced physical IPV (Ref: No)</i>	1.66 (0.99,2.78)	2.17 (1.12,4.22) *	0.77 (0.33,1.82)	0.78 (0.27,2.28)
<i>Mother witnessed violence in childhood (Ref: No)</i>	0.75 (0.44,1.27)		0.81 (0.35,1.87)	
<i>Mother's age at first sex (Ref: <16 years)</i>	0.86 (0.51,1.48)		0.71 (0.31,1.63)	
<i>Mother received parenting programme or advice (Ref: No)</i>	0.86 (0.52,1.44)		0.37 (0.16,0.88)	0.69 (0.23,2.12)
<i>Mother sent adolescent to pre-school or creche (Ref: No)</i>	0.89 (0.42,1.89)		3.54 (0.47,26.6)	
<i>Adolescent received career advice (Ref: No)</i>	4.20 (2.21,7.97)	3.48 (1.55,7.82) *	1.28 (0.37,4.43)	
<i>Adolescent has access to mobile phone (Ref: No)</i>	7.49 (4.32,13.0)	6.05 (3.14,11.7) **	10.7 (4.19,27.4)	11.03 (3.38,36.05) **

*pvalue <0.05, **pvalue<0.001

Discussion

Our analysis of accelerators and SDG-related outcomes of adolescents as reported by their mothers in Mwanza, Tanzania, found a strong effect of the intergenerational transmission of education on adolescent outcomes, suggesting the need for a strong policy focus on the provision of secondary education for both men and women due to its long-lasting effect. Grandfather's education in particular positively impacted adolescent's attendance of secondary education, either directly or through their mother's secondary education. Furthermore, as strengthening women's economic situation was linked with improved adolescent outcomes, poverty reduction programmes should increase their focus on female-headed households. Adolescents reported on in this study were more likely to miss 2 weeks or more per term in school if they lived in a female-headed household. Investment in reducing the occurrence of intimate partner violence remains crucial as well, as women who experienced physical violence by their partner were also more likely to have adolescents who were employed instead of completing their secondary education. Overall, these findings show that beside investing in the design and launch

of necessary new programming and initiatives aimed at adolescents, it remains essential to ensure that mainstream and broad governmental programmes and provisions, such as secondary education and poverty reduction are expanded and adequately funded. In addition to our findings, there is ample evidence on the benefits of secondary education on the social and health benefits of secondary education on young people, particularly HIV and unwanted pregnancy, but also its pivotal role in long-term poverty reduction (Manda et al., 2003). Intimate partner violence is also preventable (Ellsberg et al., 2015). This study provided clear evidence that the effect of programmes reducing intimate partner violence, such as the MAISHA trials (Kapiga et al., 2019), might also show lasting impact on the adolescent of affected mothers.

Surprisingly in this study, mobile phone access was only positively associated with adolescent SDG outcomes if the mother owned a phone, not if the adolescent had access to it. Mobile phone access is generally hailed as positive for gender equality, contraceptive use and lower maternal and child mortality, with immense implications therefore of the SDGs (Rotondi et al., 2020). Yet, more might need to be understood on their potential adverse side effects if used by adolescents (Hirsh-Yechezkel et al., 2019) before simply assuming the benefits exist across generations. Our study did not find significant associations between early childhood accelerators and adolescent SDG outcomes in the adjusted models.

While there might be a real lack of associations between early childhood accelerators and adolescent outcomes, the absence of significant association is likely to be linked to the fact that those accelerators were less well defined and wrongly interpreted in this study. Parenting advice and programmes in Tanzania might range from neighbours and family members visiting the new-born mother to official sessions in church and official parenting programmes being provided, the latter being far less frequent. Similarly, career advice to adolescents might be interpreted as official sessions in school providing long-term career counselling yet could also only consist of an acquaintance providing entrepreneurial advice. The lack of definition on those accelerators was due to them not being common in Tanzania and because this study is a secondary data analysis of adolescent outcomes and accelerators.

The study has several important limitations. First, the original study was designed to explore the predictors and consequences of intimate partner violence among women and not to determine the association between adolescents' accelerators programmes with their SDG outcomes. Therefore, it was only able to receive information from the participating mother who reported on adolescents' outcomes and exposure, while direct questioning would have resulted in more reliable responses. Second, because of the questionnaire length, it was only possible to include questions on a limited number of questions on the adolescents living in the women's household, and we could not assess their gender and specific age. Third, we only gathered cumulative reports on all adolescents in the household and we do not know how many adolescents lived in the household, although the average household size in this population is higher compared to the national average 5.8 vs 4.9, so we would expect more adolescents. Nevertheless, despite these limitations, it is one of the few studies that can explore in-depth the intergenerational transmission of key accelerating factors such as education, poverty and intimate partner violence and is, therefore, one of the only one of this kind from sub-Saharan Africa.

Overall, this study provides first evidence that education, especially secondary education, poverty and violence against women and girls reduction programmes needs to remain a key policy priority for both boys and girls due to its multiplier and

intergenerational effects. Interventions aimed at improving adolescent outcomes need to be long-term and also target the environment in which adolescents live.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the H2020 European Research Council [ERC Starting Grant IPV_Tanzania 716458] and UK Research and Innovation Global Challenges Research Fund [ES/S008101/1].

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