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Erica L. Pufall[a], Simon Gregson[a], Jeffrey W. Eaton[a], Tidings Masoka[b], Edith Mpandaguta[b], Louise Andersen[c], Morten Skovdal[d], Constance Nyamukapa[a,b] and Catherine Campbell[c]

Objectives: Schools are often cited as a source of support for orphans and children affected by HIV/AIDS in populations experiencing generalized HIV epidemics and severe poverty. Here we investigate the success of schools at including and supporting the well being of vulnerable children in rural Zimbabwe.

Design: Data from a cross-sectional household survey of 4577 children (aged 6–17 years), conducted between 2009 and 2011, were linked to data on the characteristics of 28 primary schools and 18 secondary schools from a parallel monitoring and evaluation facility survey.

Methods: We construct two measures of school quality (one general and one HIV-specific) and use multivariable regression to test whether these were associated with improved educational outcomes and well being for vulnerable children.

Results: School quality was not associated with primary or secondary school attendance, but was associated with children's being in the correct grade for age [adjusted odds ratio 2.0, 95% confidence interval (CI) 1.2–3.5, $P = 0.01$]. General and HIV-specific school quality had significant positive effects on well being in the primary school-age children (coefficient 5.1, 95% CI 2.4–7.7, $P < 0.01$ and coefficient 3.0, 95% CI 0.4–5.6, $P = 0.02$, respectively), but not in the secondary school-age children ($P > 0.2$). There was no evidence that school quality provided an additional benefit to the well being of vulnerable children. Community HIV prevalence was negatively associated with well being in the secondary school-age children (coefficient −0.7, 95% CI −1.3 to −0.1, $P = 0.03$).

Conclusions: General and HIV-specific school quality may enhance the well being of primary school-age children in eastern Zimbabwe. Local community context also plays an important role in child well being.

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Introduction

Children affected by HIV (orphaned children, children with HIV-positive parents, and HIV-positive children) are particularly vulnerable to stigma; abuse; poor nutrition, mental and physical health; and poverty [1,2]. Households affected by AIDS are economically disadvantaged by the cost of medical care and the loss of income from ill or

deceased adult members [2]. All of these factors form barriers to education for children. One of the most visible effects of the HIV epidemic has been a decline in school enrolment, attendance, and academic progress [3,4]. Education is a vital pillar of socio-economic development, helping to support HIV-affected children by buffering the impacts of poverty, trauma, abuse, social isolation and discrimination on children's mental and physical health [5–10], rendering it important to support children's education in any way possible.

Even in conditions of poverty, communities have 'portfolios of assets', including social capital in the form of community networks [11,12], of which schools are one. Developed based on the concepts outlined by Campbell *et al.* [13] and Nhamo *et al.* [14], 'HIV-competent communities' are theorized as an environment in which people work collectively to reduce stigma, promote positive behaviour change and support the care and treatment of people infected or affected by AIDS. HIV-competent communities facilitate access to health-based knowledge and life skills, instil a sense of confidence in an individual's ability to ensure their own health and well being, provide safe spaces in which to discuss and debate how to translate knowledge and skills into action, encourage strong and supportive relationships within the community, and bridge access to additional support networks in the public or non-governmental organisation sector [13,15,16]. It is possible for schools to provide these same resources, but tailored to their environment and geared towards supporting children.

Building on the work of Campbell *et al.* [13,14] in South African communities, we develop two composite indicators of school quality – one measuring general school characteristics (physical infrastructure, staffing and teaching, fee support), and one measuring HIV-specific characteristics (HIV policies, awareness, and curriculum). We investigate how these indices are related to child education and the overall well being in rural eastern Zimbabwe, and whether school characteristics provided particular benefit for children affected by HIV/AIDS.

Methods

Study population and data collection
The Manicaland HIV/STD Prevention Project is a population-based, open cohort study that has monitored HIV trends in adults living in 12 geographically distinct sites [2 small towns; 2 roadside settlements; 4 subsistence farming areas (SFAs); and 4 large-scale agricultural estates] in the Manicaland province of eastern Zimbabwe since 1998 [17]. From 2009 to 2011, a child survey, comprising an interview and test for HIV, was conducted among children aged 2–14 years in a randomly selected one-third of study households and among adolescents aged 15–17 years in two-thirds of study households. A total of

5520 2–17-year-olds participated. Dried blood spot samples were tested for HIV in an offsite laboratory using the COMBAIDS-RS HIV 1+2 Immunodot Assay (Span Diagnostics, India); HIV-positive tests were confirmed using Vironostika HIV Uni-form II Plus O (Biomérieux, France).

Ethical approval for the Manicaland HIV/STD Prevention Project was provided by the Research Council of Zimbabwe, the Biomedical Research and Training Institute Zimbabwe's institutional review board, and the Imperial College London Research Ethics Committee. Written informed consent was obtained prior to survey participation from each child's primary caregiver. In addition, children aged 7–12 and adolescents aged 13–17 years provided verbal or written assent, respectively.

In parallel, a monitoring and evaluation (M&E) facility survey collected information about health facilities and schools in each community, including 28 primary schools and 18 secondary schools. Information was collected during a face-to-face interview with the school headmaster using a structured questionnaire with questions on physical infrastructure, number of staff and students, fees, HIV policies, teaching methods, student engagement, and community links (see Appendix 1). The villages in each school's catchment area and the number of children from each village were also collected.

Measuring child well being and school competence
Individual child well being was calculated using a relative objective micro-level index based on existing indices of well being [18–23] and using data available from round five of the Manicaland HIV/STD Prevention Project survey. Domains included in the index for primary school-age children were health behaviours, physical health, risk and safety, psychological health, and household resources. Domains for secondary school-age children were the same as primary school-age children, with the addition of a social well being domain, for which no datum was collected in younger children (Fig. 1). Principal-components analysis was used to integrate the variables in each domain together to obtain a score for each child in each domain [24,25]. The scores for each domain were averaged to create an overall well being score for each child, which was then scaled to be between 0 and 100.

School general and HIV-specific quality scores were calculated from data collected in the M&E facility survey. Criteria were adapted from the proposed characteristics of HIV-competent communities developed by Campbell *et al.* [13] and based on qualitative interviews with school officials, teachers, and community members. Factors in the general quality score included the physical infrastructure, student to teacher ratio, fee structure and support, community links, teaching methods, and
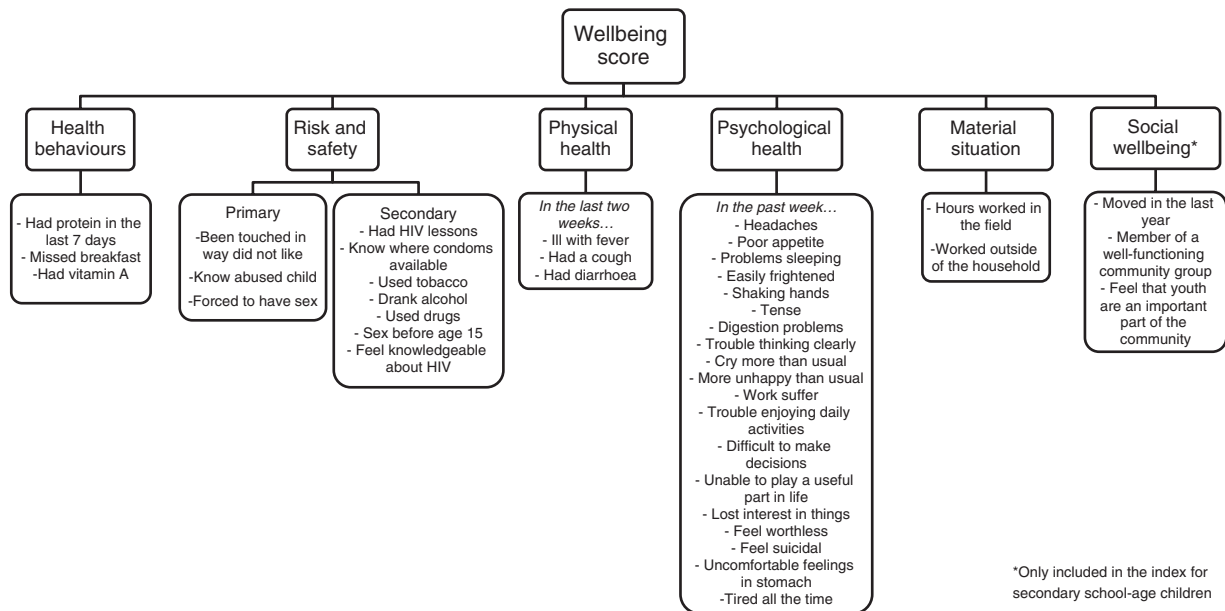
Fig. 1. Components of the primary and secondary wellbeing indices, divided into their different domains.

extracurricular activities. Factors in the HIV-specific score included HIV policies, teaching of HIV-related subjects, HIV/AIDS-related clubs and initiatives, and community links. Each component was given a score between zero and one (either as proportions or binary variables), summed, and the average taken for each school. Each score (general and HIV-specific) was categorized into binary variables for analysis.

Child vulnerability and educational outcomes

Vulnerable children were defined as children who were HIV-positive; were a maternal, paternal, or double orphan; or had an HIV-positive parent. Individual educational outcomes were regular attendance in primary (ages 6–12) and secondary (ages 13–17) school-age children and being in the correct grade for age (ages 8–17). Regular attendance was defined as having attended at least 80% of the last 20 school days. Educational attainment was measured through being in the correct grade for age. Children were deemed to be in the correct grade for their age if they were no more than 1 year behind the normative grade for age [26]. For example, to be at the appropriate grade for age in year 1 of primary school, children would have to be either 6 or 7 years old.

Data analysis

Logistic regression was used to assess whether factors were associated with vulnerable children of primary or secondary school age attending regularly and being in the correct grade for age. Regression models included the school quality scores and community characteristics, adjusting for age, sex, socio-economic status (SES, measured using a previously validated wealth index [27]), and community type (town, roadside settlement, agricultural estate, or SFA). Separate models evaluated

first the effect of the general school score on outcomes of interest, and then the additional effect of the HIV-specific score. Where a village was in the catchment area for more than one school, children were assigned a school score as the average of the two schools serving that village, weighted according to the number of students from that village reported by each school. Community characteristics included unemployment levels, community SES, HIV prevalence (in adults aged 15–54 years), and local community group participation. Community group participation was defined as those respondents who were members of one or more well functioning community groups, such as church groups, savings clubs, youth groups, and so on [28–30]. Household-level random effects were included in the models to account for correlated outcomes for multiple children residing in the same household.

Using multivariable regression, we first tested for the effects of general and HIV-specific school quality on well being for all children, and then tested for an interaction between child vulnerability and general school quality to determine whether school quality differentially affected the well being of vulnerable vs. non-vulnerable children. Community characteristics were also included in the models, along with demographic factors and household of residence as above.

Results

Child and school characteristics

The demographic characteristics of children, including vulnerability, well being scores, and education outcomes are presented in Table 1. Overall, 45.5% of primary

Table 1. Characteristics of children and adolescents included in study.

	Primary school-age children (aged 6–12 years, $n = 1964$)	Secondary school-age children (aged 13–17 years, $n = 2613$)
Percentage vulnerable[a]		
All types	40.1% (37.9–42.3%)	53.1% (51.1–55.1%)
Maternal orphan	11.7% (10.3–13.2%)	20.3% (18.7–21.9%)
Paternal orphan	26.3% (24.4–28.3%)	38.1% (36.2–40.1%)
HIV+	2.1% (1.5–2.7%)	2.0% (1.5–2.6%)
HIV+ parent	13.3% (11.6–14.6%)	12.5% (11.2–13.8%)
Mean age[b]		
Overall	9.17 (8, 11)	15.43 (15, 16)
Non-vulnerable children	8.93 (7, 11)	15.35 (15, 16)
Vulnerable children	9.53 (8, 11)	15.43 (15, 16)
Percentage female[a]		
Overall	49.5% (47.3–51.8%)	51.9% (50.0–53.9%)
Non-vulnerable children	49.2% (46.3–52.1%)	52.5% (49.6–55.4%)
Vulnerable children	50.6% (47.0–53.1%)	51.5% (48.7–54.2%)
Correct grade for age[a]		
Overall	46.6% (44.0–49.1%)	49.3% (47.4–51.2%)
Non-vulnerable children	47.4% (43.9–50.8%)	52.6% (49.7–55.5%)
Vulnerable children	45.9% (42.0–49.8%)	45.7% (43.0–48.5%)
Attending at least 80% of the time[a]		
Overall	95.0% (94.0–96.0%)	94.3% (92.8–95.7%)
Non-vulnerable children	95.4% (94.1–96.6%)	93.8% (91.6–96.0%)
Vulnerable children	94.5% (92.9–96.2%)	94.5% (92.3–96.5%)
Average well being score[b]		
Overall	45.8 (37.5, 52.2)	45.8 (36.3, 54.0)
Non-vulnerable children	47.1 (37.5, 53.9)	45.9 (36.9, 53.6)
Vulnerable children	43.9 (37.5, 50.4)	45.7 (36.5, 54.2)

[a]Mean (95% confidence interval).
[b]Mean (interquartile range).

school-age children and 50.0% of secondary school-age children were classified as vulnerable. Whether or not a child was vulnerable did not differ by sex ($P = 0.78$), but older children were more likely to be vulnerable ($P < 0.001$). In adolescents, vulnerability status did not differ by age ($P = 0.37$) or sex ($P = 0.68$). Vulnerable children were less likely to be in the correct grade for age in secondary school-age children ($P < 0.001$), but not in the primary school-age children ($P = 0.31$). Vulnerability had no association with attendance in primary ($P = 0.45$) or secondary ($P = 0.68$) school-age children.

Well being scores, scaled to range between 0 and 100, had an interquartile range (IQR) of 37.5–52.2 in primary school-age children and 36.5–54.0 in secondary school-age children (Table 1, Fig. S1, http://links.lww.com/QAD/A530). When comparing the well being scores by vulnerability status, the average well being score for primary school-age children was significantly lower for vulnerable compared to non-vulnerable children (43.9 vs. 47.1; $P < 0.001$), but there was no difference for secondary school-age children (45.7 vs. 45.9; $P = 0.50$).

Table 2 describes the factors contributing to schools' general and HIV-related quality scores. The mean score for HIV-related quality in primary school was 0.42, and ranged from 0.22 to 0.65; the mean for general quality was 0.48 (range 0.36–0.64). In secondary school, mean HIV quality was 0.42 and ranged from 0.32 to 0.69. Among both primary and secondary schools, certain factors, such as teaching methods and the teaching of HIV-related subjects, were universally well implemented,

whereas links with outside organizations were less frequently reported. Schools that consistently reported outside links for psychological support, scholarships, HIV awareness, and HIV programmes had the highest levels of general and HIV-related quality.

School quality and school attendance and grade progression in vulnerable children

These analyses were restricted to vulnerable children due to universally high attendance and vulnerable children being more likely to be behind in school compared to children unaffected by HIV (Table 1). Higher scores on the general quality school measure were significantly associated with vulnerable children being more likely to be in the correct grade for age, but not with regular attendance in either primary or secondary school-age vulnerable children (Table 3). The HIV-specific score quintile was not significantly associated with any of the measured education outcomes. Older children were less likely to be in the correct grade for age, but age was not associated with attendance in primary or secondary school. In primary school age, children were more likely to attend regularly if they reported eating protein in the past 2 weeks; no factors had a significant association with secondary school attendance. In addition to a school's quality, females were more likely to be in the correct grade for age compared to males, as were children living in all other community types compared to towns.

School quality and child well being

Schools in the top half of the general quality index were significantly associated with higher well being in primary

Table 2. General and HIV-competency characteristics of schools included in study.

	Primary schools ($n = 28$)	Secondary schools ($n = 18$)
General competency		
Facilities available[a]		
Electricity	12 (42.9%)	12 (66.7%)
Water	12 (42.9%)	11 (61.1%)
Phone line	2 (7.1%)	2 (11.1%)
Separate male and female toilets	28 (100%)	18 (100%)
Student to teacher ratio[b,c,d]	31.4 (29, 35.5)	20.4 (18.4, 22.5)
Student committee[a]	18 (64.3%)	13 (72.2%)
Parent teacher meetings[a]	28 (100%)	18 (100%)
Field trips[a]	17 (60.7%)	14 (77.8%)
Counselling available[a]	28 (100%)	18 (100%)
Number of cases of bullying by students[b,c,d]	3.4 (0, 10)	1.6 (0, 3)
Number of cases of bullying by teachers[b,c,d]	0.04 (0, 0; max: 1)	0.06 (0, 0; max: 1)
Subjects taught[a]		
Communication skills	28 (100%)	16 (88.9%)
Income generation	22 (78.6%)	17 (94.4%)
Teaching methods[a]		
Problem-based learning	26 (92.9%)	18 (100%)
Peer education	25 (89.3%)	17 (94.4%)
Group learning	28 (100%)	18 (100%)
Participatory teaching	28 (100%)	18 (100%)
Role plays	28 (100%)	18 (100%)
Average school fees (min, max)[b,c,d]	$53.36 ($45, $60)	$341.33 ($105, $270)
Students receiving support for school fees[d]		
School – direct	0.9% (0%, 1.0%)	2.0% (0%, 2.5%)
Other – e.g. BEAM	16.5% (11.1%, 19.3%)	16.3% (4.1%, 28.6%)
Pupils who did not pay fees[c,d]	26.0% (11.4%, 33.0%)	34.0% (17.9%, 49.0%)
Pupils sent home for non-payment of fees[c,d]	65.4% (0%, 100%)	69.1% (14.3%, 100%)
Supporting teachers[a]		
Links with private groups/individuals	12 (42.9%)	7 (38.9%)
Links with churches	2 (7.1%)	2 (11.1%)
Links with the MoHCW	0 (0%)	0 (0%)
Links with business organizations	0 (0%)	0 (0%)
Links with NGOs	0 (0%)	0 (0%)
Scholarships[a]		
Links with private groups/individuals	9 (32.1%)	6 (33.3%)
Links with churches	3 (10.7%)	1 (5.6%)
Links with the MoHCW	0 (0%)	0 (0%)
Links with business organizations	0 (0%)	0 (0%)
Links with NGOs	6 (21.4%)	6 (33.3%)
Psychological support[a]		
Links with private groups/individuals	0 (0%)	2 (11.1%)
Links with churches	2 (7.1%)	2 (11.1%)
Links with the MoHCW	5 (17.9%)	3 (16.7%)
Links with business organizations	4 (14.3%)	0 (0%)
Links with NGOs	10 (35.7%)	5 (27.8%)
Overall competency score[d]	0.47 (0.44, 0.50)	0.52 (0.43, 0.56)
HIV competency		
Teachers with AIDS training[d]	6.3% (0%, 14.3%)	6.5% (0%, 11.1%)
School has an AIDS policy[a]	7 (25.0%)	6 (33.3%)
After-school AIDS club[a]	20 (71.4%)	16 (88.9%)
Student HIV or health initiatives[a]	8 (28.6%)	5 (27.8%)
Subjects taught[a]		
HIV prevention methods	27 (96.4%)	18 (100%)
HIV stigma awareness	28 (100%)	16 (88.9%)
AIDS treatment and care	26 (92.9%)	17 (94.4%)
Condom use	10 (35.7%)	6 (33.3%)
Sexual health	28 (100%)	18 (100%)
HIV programmes[a]		
Links with private groups/individuals	0 (0%)	0 (0%)
Links with churches	0 (0%)	2 (11.1%)
Links with the MoHCW	7 (25.0%)	2 (11.1%)
Links with business organizations	0 (0%)	0 (0%)
Links with NGOs	22 (78.6%)	14 (77.8%)
HIV awareness[a]		
Links with private groups/individuals	0 (0%)	2 (11.1%)
Links with churches	1 (3.6%)	4 (22.2%)
Links with the MoHCW	8 (28.6%)	3 (16.7%)
Links with business organizations	2 (7.1%)	2 (11.1%)
Links with NGOs	16 (57.1%)	10 (55.6%)
Overall HIV competency score[d]	0.42 (0.32, 0.49)	0.42 (0.32, 0.49)

[a]n (percentage). [b]The value for each school was taken and divided by the largest value in each category to get a value between 0 and 1, which was then used in the calculation of the HIV competency score. [c]Lower values were taken to be more competent. [d]Mean (interquartile range). BEAM, Basic Education Assistance Module; MoHCW, Ministry of Health and Child Welfare; NGO, non-governmental organisation.

Table 3. Association between various factors, including school quality, and education outcomes among children made vulnerable by HIV.

	Primary attendance (n = 388)		Secondary attendance (n = 219)		Correct grade for age (n = 575)	
	Model 1 AOR (95% CI)[b]	Model 2 AOR (95% CI)[b]	Model 1 AOR (95% CI)[b]	Model 2 AOR (95% CI)[b]	Model 1 AOR (95% CI)[b]	Model 2 AOR (95% CI)[b]
School quality index						
Lower quality	1	1	1	1	1	1
Higher quality	0.63 (0.11–3.44)	0.69 (0.12–3.96)	1.03 (0.20–5.26)	2.39 (0.18–31.58)	2.05 (1.18–3.54)	2.11 (1.22–3.67)
HIV-specific school quality index						
Lower quality	—	1	—	1	—	1
Higher quality	—	1.48 (0.26–8.32)	—	0.04 (0.00–1.98)	—	0.65 (0.36–1.17)
HIV in school area	0.95 (0.76–1.19)	0.93 (0.74–1.18)	1.15 (0.89–1.49)	1.34 (0.98–1.784)	0.95 (0.87–1.03)	0.96 (0.85–1.05)
Unemployment in area	0.98 (0.89–1.07)	0.97 (0.89–1.07)	0.94 (0.82–1.07)	1.03 (0.87–1.23)	0.99 (0.96–1.02)	1.00 (0.95–1.03)
CG participation in area	0.99 (0.85–1.14)	0.99 (0.86–1.14)	1.06 (0.90–1.24)	1.02 (0.82–1.26)	0.99 (0.94–1.05)	1.00 (0.97–1.05)
Worked outside home	6.90 (0.33–145.2)	7.19 (0.34–153.94)	1.57 (0.25–9.85)	1.15 (0.18–7.53)	0.74 (0.37–1.52)	0.71 (0.35–1.48)
Had breakfast	0.77 (0.09–6.38)	0.76 (0.09–6.33)	N/A[a]	N/A[a]	0.98 (0.41–2.32)	0.95 (0.44–2.26)
Protein in past week	14.50 (2.40–87.81)	14.92 (2.44–91.22)	2.90 (0.59–14.26)	3.04 (0.60–15.33)	0.89 (0.47–1.70)	0.91 (0.44–1.73)
Ill in past 2 weeks	0.65 (0.07–6.11)	0.67 (0.07–6.28)	0.54 (0.04–6.56)	0.50 (0.04–5.92)	0.70 (0.30–1.65)	0.70 (0.30–1.64)
Hours worked in field	1.40 (0.77–2.51)	1.41 (0.78–2.56)	0.95 (0.80–1.12)	0.97 (0.82–1.15)	1.04 (0.95–1.14)	1.05 (0.93–1.15)
External support	N/A[a]	N/A[a]	0.56 (0.10–3.02)	0.68 (0.13–3.61)	0.97 (0.55–1.70)	0.99 (0.53–1.75)
Age	0.70 (0.47–1.03)	0.70 (0.47–1.02)	0.76 (0.45–1.29)	0.77 (0.44–1.35)	0.86 (0.78–0.96)	0.86 (0.84–0.95)
Sex (female vs. male)	0.90 (0.28–2.89)	0.91 (0.28–2.90)	0.79 (0.20–3.16)	0.80 (0.19–3.45)	2.61 (1.62–4.23)	2.61 (1.56–4.21)
Household SES						
Poorest quintile	1	1	1	1	1	1
Second quintile	1.29 (0.18–9.45)	1.25 (0.17–9.18)	0.76 (0.11–5.45)	0.56 (0.07–4.62)	1.32 (0.62–2.84)	1.34 (0.65–2.87)
Middle quintile	2.66 (0.33–21.22)	2.62 (0.33–20.61)	0.64 (0.07–5.48)	0.46 (0.05–4.63)	2.77 (1.33–5.78)	2.85 (1.42–5.95)
Fourth quintile	0.83 (0.13–5.48)	0.83 (0.13–5.50)	0.40 (0.04–3.65)	0.23 (0.02–2.52)	1.47 (0.66–3.28)	1.43 (0.65–3.21)
Highest quintile	6.88 (0.54–87.56)	6.82 (0.54–86.76)	1.45 (0.11–19.80)	0.89 (0.06–14.37)	1.72 (0.81–3.64)	1.68 (0.89–3.55)
Site type						
Town	1	1	1	1	1	1
Agricultural estate	0.74 (0.04–12.65)	0.99 (0.04–22.11)	3.65 (0.33–40.20)	2.06 (0.16–26.35)	3.42 (1.30–8.99)	2.79 (0.92–7.58)
SFA	2.11 (0.09–48.48)	2.30 (0.10–51.46)	2.29 (0.21–24.84)	2.94 (0.17–50.83)	5.06 (1.81–14.16)	4.85 (1.26–13.54)
Roadside settlement	0.95 (0.05–18.04)	1.14 (0.06–23.51)	11.69 (0.49–279.0)	9.11 (0.11–736.5)	3.44 (1.20–9.85)	2.76 (0.74–8.16)

AOR, adjusted odds ratio; CI, confidence interval; N/A, not applicable; SES, socio-economic status; SFA, subsistence farming area.
[a]Not included because too few observations were present.
[b]Adjusted for all other variables in the table.

school-age children, both before and after adding the HIV-specific quality index to the model (Table 4). HIV-specific school quality was also significantly associated with higher well being in primary school. In secondary school-age children, neither general school quality nor HIV-specific school quality was significantly associated with higher well being in the models (Table 4). Although the level of general school quality was associated with higher well being of children overall, this association was not significantly different between vulnerable and non-vulnerable children as the interaction term was not significant in the models for primary ($P = 0.19$) or secondary ($P = 0.44$) schools.

In primary school-age children, living in a roadside settlement compared to a town was associated with higher well being, and older age was associated with lower well being. In secondary school-age children, older age was associated with higher well being, and higher HIV prevalence in the school catchment area was associated with lower well being.

Discussion

Our findings suggest an association between a school's quality and progression in schooling; that is, children being in the correct grade for age. As Campbell et al. have discussed, the ability of communities (and schools) to

support people affected by HIV is not just a measure of HIV-specific activities and policies, but is a composite of factors directly related to HIV, the ethos of the community, and other characteristics that are perceived to be supportive of vulnerable people (e.g. in the case of schools: infrastructure, teaching methods, and school fees) [13,14]. It is the combination of these factors that enables schools to support not just vulnerable children, but children overall. Indeed, from our analyses, it appears that it is not necessarily the HIV-specific factors that enable schools to support vulnerable children, but, instead, the more general factors that provide a safety net.

Previous work investigating best practices for schools in sub-Saharan Africa (SSA) suggests the potential for schools to go beyond education, to also contribute to tackling practical, material, and emotional challenges faced by vulnerable children [5,31–33]. Bell and Murenha [5] suggest that improving the conditions of schools and the process of teaching are keys to mitigating the effects of the HIV epidemic in SSA. Kelly [31] also highlights this approach, focussing on participatory learning and school linkages with the community as ways of moving forward to support children and improve both their health and education outcomes. These views are supported by our findings that general school quality (a measure that includes schools facilities, teaching methods, and community links) is associated with better progress through school and child well being, as opposed

Table 4. Associations between school quality, community factors, and child well being.

	Primary school (*n* = 929)		Secondary school (*n* = 558)	
	Model 1 Change in well being score†	Model 2 Change in well being score†	Model 1 Change in well being score†	Model 2 Change in well being score†
Vulnerable child	−1.55 (−3.49 to +0.38)	−1.49 (−3.43 to +0.44)	−2.00 (−4.28 to +0.29)	−1.96 (−4.25 to +0.33)
School quality index				
Lower quality	1	1	1	1
Higher quality	4.00 (+1.53 to +6.46)	5.06 (+2.45 to +7.68)	1.80 (−1.29 to +4.89)	1.99 (−1.20 to +5.19)
HIV-related school quality index				
Lower quality	—	1	—	1
Higher quality	—	3.02 (+0.43 to +5.62)	—	−0.90 (−4.66 to +2.87)
HIV in school area	0.09 (−0.29 to +0.47)	−0.01 (−0.40 to +0.38)	−0.75 (−1.34 to −0.17)	−0.69 (−1.33 to −0.06)
Unemployment in school area	−0.10 (−0.24 to +0.03)	−0.10 (−0.24 to +0.03)	−0.11 (−0.28 to +0.07)	−0.10 (−0.27 to +0.08)
CG participation in school area	−0.04 (−0.27 to +0.19)	0.06 (−0.28 to +0.17)	0.12 (−0.22 to +0.49)	0.14 (−0.21 to +0.50)
SES in school area	−16.17 (−54.55 to +22.00)	−11.01 (−49.34 to +27.31)	−44.06 (−94.81 to +6.69)	−47.09 (−99.40 to +5.21)
External support	1.53 (−0.93 to +4.00)	1.18 (−1.30 to +3.66)	−0.22 (−3.28 to +2.85)	−0.14 (−3.22 to +2.94)
Age	−0.58 (−0.98 to −0.19)	−0.59 (−0.99 to −0.20)	2.13 (+1.34 to +2.93)	2.14 (+1.34 to +2.94)
Gender (female vs. male)	0.15 (−1.48 to +1.79)	0.21 (−1.43 to +1.84)	0.67 (−1.55 to +2.90)	0.68 (−1.55 to +2.90)
Household SES				
Poorest quintile	1	1	1	1
Second quintile	1.48 (−1.72 to +4.68)	1.41 (−1.77 to +4.59)	−0.58 (−4.35 to +3.19)	−0.56 (−4.32 to +3.21)
Middle quintile	0.68 (−2.40 to +3.76)	0.63 (−2.43 to +3.69)	1.49 (−2.13 to +5.11)	1.58 (−2.05 to +5.22)
Fourth quintile	0.60 (−2.89 to +4.10)	0.25 (−3.24 to +3.74)	−1.41 (−5.51 to +2.69)	−1.44 (−5.54 to +2.67)
Highest quintile	0.83 (−2.32 to +3.99)	0.73 (−2.41 to +3.86)	−0.50 (−4.07 to +3.07)	−0.45 (−4.03 to +3.12)
Site type				
Town	1	1	1	1
Agricultural estate	4.11 (−0.64 to +8.86)	7.12 (+1.73 to +12.50)	−1.67 (−6.13 to +2.79)	−2.04 (−6.76 to +2.68)
SFA	2.64 (−1.84 to +7.12)	3.91 (−0.68 to +8.50)	−2.50 (−7.42 to +2.42)	−2.65 (−7.60 to +2.32)
Roadside settlement	9.36 (+4.85 to +13.87)	10.93 (+6.24 to +15.61)	0.38 (−5.47 to +6.24)	−0.13 (−6.36 to +6.11)

CG, community group; SES, socioeconomic status; SFA, subsistence farming area.
†Adjusted for all other variables in the table.

to the HIV-specific factors. Indeed, Kelly [31] argues that HIV/AIDS education programmes in SSA often lack contextual understanding and in some cases may in fact exacerbate the very problem they are trying to address. As we did not assess the quality or content of the HIV-related activities and programmes in the schools in our study, it is impossible to say if this is the case in our study population, though it is a potential reason for why we only found associations with the HIV-based quality index in one of our analyses.

Demonstrating the ability of strong institutions to affect child outcomes is important in light of previous work done in this population, which has shown that orphans and vulnerable children (OVCs) are more susceptible to poor education outcomes than children unaffected by poverty and HIV [34]. In SSA, without support, vulnerable children may drop out of school, fail to enrol, attend less frequently, have lower educational attainment, be at a lower grade for their age, and perform worse in school than their counterparts unaffected by the HIV epidemic [4,34–39]. If quality schools are better able to support the educational attainment of vulnerable children then it becomes critical to engage with schools and help them to recognize and mobilize their inherent resources for the benefit of their students. Investing in schools as community resources and a form of social support is a potential complementary approach to cash transfers, which provide direct financial resources to OVCs. Previous research in Manicaland has found that both conditional and unconditional cash transfers to OVCs successfully increased regular attendance [40]. The

use of inter-sectoral programming could be used effectively to improve the education outcomes and well being of OVC, with education departments focusing on supporting schools by helping them to mobilize their inherent resources and engage with the community and the social welfare or children's departments organizing cash transfers.

The role of schools as social protection for children extends beyond improving their education outcomes, into helping to improve a child's overall well being. Even though there was no differential association between vulnerable and non-vulnerable children, higher levels of school quality were associated with significantly higher levels of well being among primary school-age children, suggesting that the effect of good-quality schools may extend beyond vulnerable children to children overall. This is a crucial point because, although high-quality schools may not preferentially help OVCs, our work reinforces the view that schools can go beyond merely dealing with education to improving the practical and emotional challenges faced by children. This is particularly important in areas of high poverty, where schools may be the only formal agency available to support children.

We also found that influences on child well being extend beyond the role that schools can play on their own, as the community context of the schools was significantly associated with the well being. Even when accounting for a school's quality, a higher community prevalence of HIV was negatively associated with well being in secondary

school-age children. This shows that schools do not operate in isolation, but are part of a wider context that cannot be ignored when considering their relationship with child well being and education outcomes. One of the key properties of the concept of HIV competence is the existence of links between communities, or schools, and outside agencies [14]. Without engaging with the larger world and seeking outside links and sources of support, it is unlikely that schools will have the resources or skills to tackle a devastating social problem, such as the effects of the HIV epidemic [14,41]. The community context must also be taken into account when working with schools on the role they can play in the lives of vulnerable children, because the implementation of any intervention is constrained by poverty, social uncertainty and poor service delivery [42]. This is particularly important for social development interventions with a heavy psycho-social component, such as interventions centred on learning. These interventions are more likely to succeed when they resonate with communities' own understandings of their needs and interests, and build on pre-existing community strengths [16,43].

Whereas the cross-sectional nature of the data limits our ability to draw firm causal conclusions about the role of school quality in determining improved educational outcomes of vulnerable children, we have adjusted for various contextual factors, including SES, to reduce the influence of outside resiliencies on our data. Additionally, few of the components of the school-quality indices could be influenced by children's well being; therefore, reverse causality seems implausible and we cannot discount the possible influence of school quality on child well being. We did not find clear or strong effects of HIV-specific school policies on educational outcomes or well being in our data. The unique combination of individual, household, and community data sources available to the Manicaland Project allowed us to link school characteristics (including HIV-specific activities) to children's outcomes, but we may still have been limited by the sample size, potential imprecise classification of the school attended by some children, and lack of detail about schools' policies and implementation. The effectiveness and consequences of these policies should be an area for further quantitative and qualitative research, including more ephemeral measures, such as a sense of school community, that we were unable to measure.

Acting as part of the larger community, schools can play an integral role in improving the future outlook of children, particularly at younger ages. If schools can mitigate the impact of poverty and disease on marginalized children and provide them with opportunities and relevant education, then they take an important step in narrowing the divide between children of more privileged backgrounds and those affected by HIV, poverty and disability.

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