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Predictors of Literacy and School Attainment among Orphan Heads of Households Involved in a Community-Based Empowerment Program in Semi-Rural Kenya

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Abstract

Completion of primary and secondary education, and literacy, are significant determinants of health and livelihood status in later life. Orphans and vulnerable children (OVC) in sub-Saharan Africa have higher risk of lower education and literacy attainment than non-OVC. The present study evaluates factors associated with the ability to read two simple sentences and increase years of schooling among OVC heads-of-household participating in a multisectoral empowerment program in semi-rural Kenya. Methods of analysis include simple and multivariable quantile regression of school years completed, and simple and multivariable logistic regression of ability to completely read two sentences, primary and secondary completion. Findings show recency of sexual intercourse, orphan type, improved primary drinking water, resilience, self-efficacy, gender, age, household income and program participation are significantly associated with outcomes of interest. Support for multisectoral empowerment programs may successfully target multiple outcomes of interest, including increases in educational attainment.

Keywords: literacy, educational attainment, orphans, empowerment, Africa

1. Background

Achieving universal primary education by 2015 is the second Millennium Development Goal(MDG #2) – a goal whose success will most likely be undermined in Sub-Saharan Africa by persistent poverty and AIDS-related orphanhood among other issues (UN Millennium Development Project, 2005). Schooling and literacy are essential to the development and functioning of individuals and society, impacting the accumulation and spread of knowledge essential to productive economies (Ashton, D.N. & Green, F. 1996), the capacity for meaningful personal and collective choices (Unterhalter, E. 2005), and a wide range of health outcomes through an array of pathways (Cutler, D. M., &Lleras-Muney, A. 2006; Cutler, D. M., &Lleras-Muney, A. 2010).As Easterly (2009) argues, the failure across Sub-Saharan African countries to meet the MDG #2 belies the fact that African nations have made real progress in primary education completionrates since 1991.

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The newest challenge to universal primary education across the sub-continent comes from HIV/AIDS. Between 1980 and 1997, gross primary enrollment fell precipitously in Kenya, reflecting some of the consequences of parental loss, predominantly caused by the AIDS pandemic (Ferreira, P.C., Pessoa, S., & Dos Santos, M.R. 2011). The confluence of increased poverty, worse nutritional outcomes, decreased mental health and social status, and increased number of household dependents among households caring for orphans and vulnerable children (OVC) is responsible for persistently worse primary completion rates among OVC compared to non-OVC (Amoako Johnson, F., Padmadas, S. S., & Smith, P. W. 2010; Lee et al., 2014; Beegle, K., De Weerdt, J., &Dercon, S., 2010). The loss of human capital among OVC could substantially impact economic development of the next generation (Evans & Miguel, 2007), continuing a negative spiral of worse economic and educational indicators.

In an effort to increase primary enrollment across Kenya, the administration of President MwaiKibaki instituted a Free Primary Education policy in 2003, ostensibly eliminating all fees for enrolled students (Oketch& Somerset, 2010). In 2008, a Free Secondary Education policy was enacted, again ostensibly eliminating fees for enrolled students (Oketch& Somerset, 2010). Both of these efforts significantly increased enrollment and completion rates, but primary completion rates remain less than 100% (Sawamura, N., &Sifuna, D. N. 2008; Oketch& Somerset, 2010).

Hidden costs that limit or prevent low-income pupils from enrollment or completion may include fees, levies, school uniforms, and school equipment (Oketch and Ngware, 2011; Sawamura&Sifuna, 2008).

Cash transfer programs have been used to improve school attendance among OVCs in Sub-Saharan Africa, as they have been used in Latin American and Asian contexts (Adato& Bassett, 2008; Robertson et al., 2013). Conditioning cash transfers on educational expensesyield improved education-related outcomes compared to cash transfers that are not conditioned (Baird, S., McIntosh, C., &Özler, B., 2011; Robertson et al., 2013). While Latin American and Asian countries typically have sufficient governmental oversight to ensure conditions for government-sponsored cash transfer programs, such oversight is not within the capacity of most sub-Saharan African country governments (Adato& Bassett, 2008). Recently community-conditioned cash transfer programs have arisen in the Sub-Saharan African context, providing an enticing mechanism to increase the efficacy of cash transfers (Skovdal, et al., 2013).In addition to lack of sufficient government oversight in the Sub-Saharan context to condition cash transfers, regional variations in degree of food insecurity, employment prospects, medical access, and educational costs preclude nationally-standardized conditions in countries like Kenya (Adato& Bassett, 2008). Within Kenya, substantial and significant differences exist in education-related outcomes across the country's regions (Diouf, O., Sergeant, L., & Goldstein, C., 2014). A community-conditioned cash transfer program in Kenya may benefit from local responses to community-level developmental requirements, improving educational benefits beyond that achieved by the current unconditional cash transfer program supported by the government (The Kenya CT-OVC Evaluation Team, 2012).The Kenyan government sends monthly transfers of approximately $20 to households caring for OVC.

1.1 Study Aim

The present study evaluated the association between educational and literacy attainment of OVC-heads of households and participatingin a community-based OVC empowerment program that includes conditional cash transfers; further, the study explored the significance of the program-literacy/education association with other covariates related to income, food security and consumption, improved water source for primary drinking, specified program inputs, sexual behavior, general self-efficacy, psychological resilience and demographic factors.

These covariates are selected because they are relevant to OVC well-being in a high HIV prevalent area in the context of a multi-faceted community-based empowerment program, and the purpose of the study was to help parse out how these covariates may be associated with educational objectives.

1.2 Study Program

In addition to conditional cash-transfers, the study program includes psychosocial support, entrepreneurial and livelihood skills training, and material inputs necessary for starting a business ("start-up kits"). The start-up kits may include sewing machines, agricultural inputs (seed, manure, implements, etc.), merchandise for small kiosks, hair salon equipment, or equipment for auto-mechanic businesses. The allocation of material inputs, including start-up kits, school fees, books or clothing, food support, and unrestricted cash, is decided by working groups constituted by older siblings in orphan sibling groups over the age of 13 years. One program objective is to support orphan siblings and enable them to reside together, represented by the OVC-head of household in the program. Psychosocial support is given at weekly working group meetings, where OVC-heads of households share life-related concerns with peers and older community mentors, and receive support in return. Livelihood training include skills related to health, hygiene, financial management and time management.

Entrepreneurial skills are given through a train-the-trainer mechanism where older program participants who have been trained in specific areas, such as farming, tailoring, hair-styling, and auto-mechanics, train younger program participants. Participants decide what areas of training they would like to pursue, and whether they would prefer to further education or turn their efforts to beginning a small business. Working groups are comprised of approximately 20 families, and negotiate allocation of resources democratically. The methodology of the faith-based program emerged in Rwanda in response to the genocide-created orphan crisis. The program expanded to Kenya in 2007, and currently has 1300 active families in 62 working groups. Working groups meet with working groups in the same geographic region every month; the 13 regions are defined by program working groups located within a 20-minute walking distance. The Kenyan chapter of the program is based out of the community health department of a mission hospital.

Program participants are selected based on orphan and vulnerability status by community leaders: elected officials, tribal leaders, and faith leaders.

Priority for program inclusion is given in the following order: double orphan (meaning loss of both parents), vulnerable children (children in extreme poverty or abusive situations), single orphans (meaning loss of one parent), and children living with both parents, one of whom is terminally ill. Social workers employed by the program verify the eligibility of community members and determine final program membership based on available funds, giving preference to the least well off based on income, household size and parental or guardian capacity.

2. Methods

The study analyzed cross-sectional data collected using a structured interview of 1060 OVC-heads of household active in the Kenya-based program in February and March 2014. Interviewers were program participants over 18 years of age who collected data only at regions that were not tangential to their own in order to limit potential social response bias. Sample size was calculated prior to data collection using the two group comparison of proportion equation and indicated the need for 1104 total, or 368 per each of the three currently enrolled program years. All OVC-heads of household who appeared at their respective regional meeting were invited to participate in the study, and two refused. Willing participants provided informed consent prior to interview.

2.1 Statistical Analysis

Univariate analyses assessed whether the proportion of respondents who were literate, had completed primary and secondary school were equal across strata of program years, and were further stratified by gender. Analysis was also made assessing whether the number of successfully completed school years were equal across strata of program exposure and gender. Pearson's chi-squared tests were used to assess equality of proportions and Wilcoxon's rank-sum tests were used to assess equality of school years completed.

Simple logit modelswere used to analyze the association of literacy, completion of primary education and completion of secondary education with program participation, and multivariablelogit modelswere used to assess associations between response variables and potential model covariates.

Simple and multiple quantile regression was used to assess the association of school years completed with program participation and other covariates.

Quantile regression, similar to linear regression, models the association of specified model covariates with a specific location on the response surface. An assumption in linear regression is that the error terms follow a normal distribution with random variance, allowing the identification of the mean point estimate to serve as a proxy measure for the whole distribution of the response surface (Kutner, 1998). In practice, the effect of a covariate on the predicted response is assumed to be more or less the same at the low, middle and high end of the response spectrum. Quantile regression can estimate the median location of the response variable, which under Gaussian conditions is the same as the mean location (Weisberg, 1992). Quantile regression can also model any specified quantile along the response surface, such as the 25^{th} and 75^{th} percentiles. No assumption is made in quantile regression that error terms follow a normal distribution (Koenker, 2005). Bootstrapping error terms is an adequate method of circumventing the assumption of constant variance (Buchinsky, 1998)and commercial available statistical packages are able to calculate clustered standard errors for quantile regression (Parente, P.M., & Silva, J.S., 2013).

Quantile regression is used in the present study to assess school years completed because initial linear models produced non-Gaussian error terms. The original intent was to model 25^{th}, $50^{th}$and 75^{th}quantiles of school years completed, representing the median and interquartile range (IQR). Twenty-seven percent of respondents completed 8 years of education, representing the cumulative frequency range from 61% to 88%. Thus, the 75^{th}quantile of years of school completed was fully covered by only one response level, precluding the establishment of a suitable model at the 75^{th}quantile. Instead, the 25^{th}, 33^{rd}, 50^{th}, and 66^{th}quantiles of school years completed were modelled, allowing for variations in associations between covariates and differing response levels to be made visible. Coefficients inquantile regression are interpreted as the amount of increase or decrease in the predicted value of the specified quantile given a one-unit increase in covariate level, taking into account and controlling for all other covariates (Koenker, 2005). The interpretation of coefficients within quantile regression is similar to the interpretation of coefficients in generalized linear models given by an identity link function, but applied to the quantile estimate specified in the model.

Backwards stepwise modelling was used to fit initial multiple regression models, with probability for rejection (.30) and probability for inclusion (.20). Model refinement continued manually, checking epidemiologically important but previously excluded covariates until all covariate betas had Wald test-generated p-values at or below .05. Reduced models were tested for acceptability using the likelihood ratio test with preset α at .05. Interactions between main effects model covariates and gender, time in program, and income were assessed and included if statistically significant. Residual analyses were used to assess potential leverage points of concern in the logit models. Survey adjustments were added to the finallogit models to account for potential clustering effects by working group, and insignificant covariates were removed ($p>.05$). Bootstrapping with 1000 replicates and cluster-adjustments for the error terms were used with the quantile regression models.

All data entry was done in EpiInfo v.7 and analyses were done using STATA v.13.

2.2 Definitions

Literacy has been defined in numerous ways (Bartlett, L., 2008), including the ability to read and write simple sentences in one's own language (UN, 2008) and having completed some or all of primary education (Bunyi, 2008).

The present study asked respondents to read aloud two simple sentences related to everyday life in the local language, Kimeru, and the number of years of formal education they have successfully completed. The ability to read all of two sentences is defined here as "literate," and the inability to do so is coded as "not literate."

The number of years of completed school was categorized as not having completed primary school, having completed primary school but not secondary school, and having completed primary and secondary school. In Kenya, the duration of primary school is 8 years, and the duration of secondary school is 4 years.

Program participation was coded by the year one entered the program: 2012, 2013 and 2014. The label cohort 3 was applied to those who entered the program in 2012; cohort 2 refers to those who entered the program in 2013, and cohort 1 refers to those who entered the program in 2012. Thus, higher cohort numbers indicate longer program exposure.

All cohorts entered in February of their respective years, and the study was conducted in February/March of 2014 before cohort 1 had received program inputs.

Income was recorded as the estimated average monthly income of the individual respondent and the respondent's family.

Food security was defined as going "often" or "sometimes" without sufficient food for the family in the past year and food consumption was measured using the World Food Programme's 7day recall method (World Food Programme, Vulnerability and Mapping Branch, 2008). This method asks respondents how many days in the previous 7 they consumed certain food groups, applies a weight to those food groups based on caloric content and nutrient diversity, and categorizes consumption patterns into poor, borderline and acceptable based on standard nutrient requirements.

Improved drinking water is defined as primary sources of water which are covered or have other means of preventing external contamination. The improved water source question from the fourth round of Multiple Indicator Cluster Survey was used (Veneman, 2009).

Program inputs that were measured include whether respondents had received a start-up kit, the amount of money they received from the program, whether they had used program-derived money to pay school fees, and whether they had begun a business using program inputs.

Measured sexual behavior include recency of last intercourse and number of intercourse partners in previous 12 months. Recency of sexual intercourse was categorized as never, within past week, within past month, within past 6 months, within past year and over a year ago. Number of intercourse partners in past year was categorized as none, 1, and 2 or more.

General self-efficacy(GSE) was measured using the 10-item, 4-point Likert-type scale (Schwarzer& Jerusalem, 1995). The scale measures the degree to which an individual believes in her or his ability to cope with daily challenges and adapt to stressful life events. Within this population, the reliability coefficient, ω_h, was acceptable at .692 (Revelle, 2009).

Psychological resilience was measured using the 25-item, 7-point Likert-type scale (Wagnild, & Young, 1993). This resilience scale (RS) detects the capacity of respondents to withstand life stressors and making meaningful life challenges. Within this population, the reliability coefficient, ω_h was acceptable at .781.

Demographic factors included age, gender, years since parental death, age at most recent parental death, type of orphan (maternal, paternal, double or neither), and household size.

2.3 Ethical Review

The Committee for the Protection of Human Subjects at the University of Texas Health Science Center provided IRB approval for the use of program data for secondary analysis.

3. Results

Table 1 shows the respondent characteristics that differed across cohort years. Age, family and personal income and years since most recent parental death significantly increased across program years. Wilcoxon rank sum tests were used to assess equality of values, the test and probability values for which are included in the table.

Remaining statistically equal across program years were household size (5.14, sd: 2.20), type of orphan (maternal: 15.37%, paternal: 53.89%, double: 18.97%, and neither: 11.76%), and age at most recent parental death in years (10.94, sd: 4.98).

Table 1: Respondent Characteristics

	Cohort 1			Cohort 2			Cohort 3		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
Sample size	359	136	223	446	125	321	255	93	162
Median age	18	18	18	18	18	18	20	20	19.5
IQR*	16, 19	16, 20	16, 19	17. 20	17, 20	17, 20	18, 21	18, 21	18, 21
Wilcoxon Rank-Sum Z (p)	REF	REF	REF	-3.72 (<.001)	-.94 (.35)	-3.70 (<.001)	-8.33 (<.001)	-5.35 (<.001)	-6.38 (<.001)
Median years since most recent parental death	6	8	5	6	6.5	6	7	8	7
IQR	3, 10	4, 10	3, 10	4, 10	4, 10	4, 10	5, 11	5, 13	4, 10
Wilcoxon Rank-Sum Z (p)	REF	REF	REF	-1.29 (0.20)	-1.04 (.30)	-2.50 (.01)	-3.18 (0.002)	-1.73 (.08)	-2.55 (.01)
Monthly income (household head, USD)**	6.02	7.83	6.02	12.05	12.05	12.05	16.87	18.07	12.05
IQR	3.61, 12.05	3.61, 18.07	2.41, 12.05	6.02, 24.10	9.64, 24.10	6.02, 24.10	8.43, 36.14	12.05, 36.14	7.23, 24.10
Wilcoxon Rank-Sum Z (p)	REF	REF	REF	-7.90 (<.001)	-4.53 (<.001)	-6.89 (<.001)	-10.25 (<.001)	-5.23 (<.001)	-8.76 (<.001)
Monthly income (household, USD)**	24.1	24.1	22.29	36.14	42.17	29.52	36.14	42.17	36.14
IQR	12.05, 36.14	12.05, 36.14	12.05, 36.14	15.66, 60.24	30.12, 84.34	12.05, 54.22	24.10, 60.24	30.12, 84.34	18.07, 60.24
Wilcoxon Rank-Sum Z (p)	REF	REF	REF	-5.39 (<.001)	-3.70 (<.001)	-4.26 (<.001)	-8.24 (<.001)	-5.54 (<.001)	-6.18 (<.001)

* IQR = interquartile range

** 83 Kenyan Shillings = 1 US dollar

Stratified by cohort and gender, table 2 shows the proportion of respondents who successfully read two complete sentences, who completed primary and secondary school and the median (IQR) number of completed school years. Pearson's chi-squared tests show that at a statistically significant level, the ability to completely read two simple sentences did not change much as respondents had longer program exposure. Only males in cohort 2 were significantly improved from their counterparts in cohort 1. Pearson's tests also showed that males and females combined in cohorts 2 and 3 were significantly more likely to have completed primary school than both genders combined in cohort 1. Wilcoxon's rank sum test showed a significant increase in number of school years completed among combined respondents and males in cohort 2, and near significance (p=.054) for combined in cohort 3, compared to counterparts in cohort 1. Female respondents in cohort 1 had completed significantly more school years than males in cohort 1 (Kruskal-Wallis X^2: 8.554; p-value: .003).

Table 2: Univariate analysis of literacy, Primary and Secondary completion, and school years completed									
	Cohort 1			Cohort 2			Cohort 3		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
Sample size	359	136	223	446	125	321	250	93	162
Literate* (%)	39.28	34.56	42.15	40.13	50.4	36.14	40.39	37.63	41.98
95% CI (%)	34.2, 44.4	26.5, 42.7	35.6, 48.7	35.6, 44.7	41.5, 59.3	30.9, 41.4	34.3, 46.5	27.6, 47.7	34.3, 49.7
Pearson chi^2 (p)	REF	REF	REF	0.061 (0.805)	6.703 (.01)	2.009 (0.156)	0.078 (0.781)	0.227 (0.634)	0.001 (0.972)
Sample size	359	136	223	446	125	321	255	93	162
Completed primary education (%)**	32.87	25.74	37.22	42.15	39.2	43.3	41.96	34.41	46.3
95% CI (%)	27.9, 37.7	18.3, 33.2	30.8, 43.6	37.5, 46.8	30.5, 47.9	37.9, 48.8	35.9, 48.1	24.6, 44.2	38.5, 54.1
Pearson chi^2 (p)	REF	REF	REF	7.275 (0.007)	5.410 (0.020)	2.015 (0.156)	5.308 (0.021)	2.007 (0.157)	3.195 (0.074)
Completed secondary education (%)	6.96	5.15	8.07	5.16	9.6	3.43	6.27	5.38	6.79
95% CI (%)	4.3, 9.6	1.4, 8.9	4.5, 11.7	3.1, 7.2	4.4, 14.8	1.4, 5.4	3.3, 9.3	0.7, 10.0	2.9, 10.7
Pearson chi^2 (p)	REF	REF	REF	1.158 (0.282)	1.913 (0.167)	5.626 (0.018)	0.114 (0.736)	0.006 (0.939)	0.221 (0.638)
Number of completed school years (median)	6	6	7	7	7	7	7	7	7
IQR***	4, 8	4, 8	5, 8	5, 8	5, 8	5, 8	5, 8	5, 8	6, 8
Wilcoxon rank-sum z (p)	REF	REF	REF	-2.412 (.016)	-3.004 (.003)	-0.472 (.637)	-1.931 (.054)	-1.812 (.070)	-1.022 (.307)

* "Literate" here indicates the ability to successfully read two simple sentences in local language.

** Primary refers to the first 8 years of public schooling in Kenya, Secondary refers to the subsequent 4 years of public education

*** IQR = interquartile range (25th, 75th percentile)

Table 3, below, shows the logistic regression of literacy. Model 1 shows the cohort-only results. There is no significant association of program participation and ability to read two simple sentences in either the simple or multivariable models.

At highly significant levels, increases in school years completed and psychological resilience were associated with improvements to literacy. General self-efficacy was associated with a decrease in literacy at a highly significant level.

Table 3: Logistic regression of literacy				
Model 1		β	SE β	OR
	Cohort 1	REF	REF	REF
	Cohort 2	0.039	0.145	N/A
n=1059	Cohort 3	0.047	0.167	N/A
	Intercept	-0.436	0.173*	
Test	F†	p		
Adjusted Wald	0.98	<.464		
Goodness-of-fit	0.00	1.00		
Model 2		β	SE β	OR
	School years completed	0.337	.035***	1.401
	General self-efficacy	-0.098	.023***	0.907
	Resilience	0.019	0.007**	1.019
n=1059	Intercept	-2.618	0.272***	
Test	F†	p		
Adjusted Wald	33.8	<.001		
Goodness-of-fit	0.98	.464		
* p<.05 **p<.01 ***p<.001		OR = N/A indicates p>.10		

Table 4, below, shows the results of the logistic regression models for completion of primary and secondary school. Models 1 show the simple regression of program participation only with the predicted probability of completing primary and secondary school. The models 2 show the results of multivariable regression. Program participation was associated with increased probability of completing primary school; the magnitude of this association decreased but remained significant when age was included in the model.

Model 2 for completion of primary school showed intercourse within the past week and past 6 months was associated with decreased odds of completing primary school. Age was associated with an increase in primary school completion, as was personal monthly income. Females had higher primary completion odds than did males, after adjusting for other model covariates. Respondents who had lost fathers, as opposed to mothers, showed increased odds of completing primary school. Respondents whose primary water source was improved had significantly higher odds of completing primary school.Having had intercourse and having started a business were significantly associated with decreased odds of secondary school completion. Older respondents were more likely to have completed secondary at a significant level, and at a near significant level higher income was associated with increased secondary school completion.

Table 4: Logistic regression of school attainment		Finish Primary School			Finish Secondary School		
Model 1		β	SE β	OR	β	SE β	OR
	Cohort 1	REF	REF	REF	REF	REF	REF
	Cohort 2	0.518	0.155**	1.679	-0.317	0.363	N/A
	Cohort 3	0.462	0.178**	1.587	-0.112	0.364	N/A
n=1060	Intercept	1.051	0.120***		0.714	0.112***	
Test		F	p		F	p	
Adjusted Wald		3.68	0.017		0.38	0.683	
Goodness of Fit test		0.12	0.99		0	1	
Model 2		β	SE β	OR	β	SE β	OR
	Last intercourse, < 1 week	-0.82	0.344**	0.440	-1.13	0.719	N/A
	Last intercourse, <1 month	-0.284	0.244	N/A	-0.503	0.575	N/A
	Last intercourse, < 6 months	-0.468	0.242[t]	0.626	-1.61	0.664*	0.200
	Last intercourse, < 1 year	0.018	0.194	N/A	-0.052	0.405	N/A
	Last intercourse, > 1 year	-0.032	0.194	N/A	-0.502	0.364	N/A
	Age (years)	0.118	0.037***	1.125	0.273	0.044***	1.314
	Monthly personal income, USD[¥]	0.009	0.005*	1.009	0.016	0.009[t]	1.016
	Start-up kit	0.465	0.155**	1.592	-	-	-
	Male	REF	REF	REF	-	-	-
	Female	0.394	0.153**	1.483	-	-	-
	Maternal orphan	REF	REF	REF	-	-	-
	Paternal orphan	0.609	0.212**	1.839	-	-	-
	Double orphan	0.027	0.263	N/A	-	-	-
	Not orphan	0.569	0.284*	1.766	-	-	-
	Improved water	0.345	0.147*	1.412	-	-	-
	Start business	-	-	-	-1.421	0.342***	0.241
n=1003	Intercept	-3.39	0.692***	N/A	-7.425	0.853***	N/A
Test		F	p		F	p	
Adjusted Wald		6.41	<.001		5.64	<.001	
Goodness of Fit test		0.61	0.782		227	<.001	
* p<.05 **p<.01 ***p<.001 [t]p<0.10				OR = N/A indicates p-value <0.10			

¥ 83 Kenyan Shillings = 1 USD

Table 5 shows the results of the quantile regression models. The first models of each 4 quantiles, the 25th, 33rd, 50th and 66thquantile, show that program participation is significantly associated with completing more years of school. While not shown, the association persisted in the 33rd, 50th and 66thquantiles, but not the 25thquantile, when controlling for age. The second models show that at all four quantiles assessed, orphan status is significantly associated with school completion. Respondents who lost a father showed consistently higher probability of successfully completing more years of school than respondents who had lost a mother. Double orphans showed no difference in years of school completed compared to maternal orphans, but at the 50th and 66thquantiles non-orphans completed more years of school than did maternal orphans.

Respondents who were older in age, had higher monthly income, utilized improved drinking water sources, received a start-up kit and were female showed higher levels of school completion in the 25th, 33rd, and 50thquantiles.The magnitude of the association between increased schooling and having received a start-up kit from the program, being a paternal orphan, and using an improved drinking water source decreased with increases in quantiles.

Table 5: Quantile regression of school years completed		Q25		Q33		Q50		Q66	
		β	SE β	β	SE β	β	SE β	β	SE β
Model 1	Cohort 1	REF	REF	REF	REF	REF	REF	REF	REF
	Cohort 2	1	0.279**	1	0.349**	1	0.250***	1	0.155***
	Cohort 3	1	0.446*	1	0.291***	1	0.281***	1	0.169***
	Intercept	4	0.198***	5	0.213***	6	0.216***	7	0.388***
Model 2	Maternal orphan	REF	REF	REF	REF	REF	REF	REF	REF
	Paternal orphan	1.057	0.332**	0.975	0.365**	0.856	0.223***	0.556	0.226*
	Double orphan	0.289	0.372	0.16	0.402	0.035	0.28	0	0.294
	Not orphan	0.594	0.657	0.753	0.502	0.882	0.314**	0.667	0.303*
	Age (years)	0.096	0.050t	0.16	0.041***	0.155	0.036***	0.111	0.034***
	Male	REF	REF	REF	REF	REF	REF	-	-
	Female	0.606	0.304*	0.635	0.243**	0.693	0.200***	-	-
	Start-up kit	1.345	0.293***	1.025	0.257***	0.561	0.164***	-	-
	Monthly income, personal ($)	0.018	0.006***	0.015	0.006*	0.012	0.004***	-	-
	Improved water	0.992	0.32**	0.733	0.258*	0.481	0.189**	-	-
	Age at most recent parental death	0.056	0.027*	-	-	-	-	-	-
	Psychological resilience	-	-	-	-	0.02	0.007**	-	-
	General self-efficacy	-	-	-	-	-0.046	0.023*	-	-
	Pay school fees	-	-	-	-	-	-	0.333	0.171*
	Most recent intercourse, never	-	-	-	-	-	-	REF	REF
	Most recent intercourse, < 1 week	-	-	-	-	-	-	-0.778	0.289**
	Most recent intercourse, < 1 month	-	-	-	-	-	-	-0.778	0.271**
	Most recent intercourse, < 6 months	-	-	-	-	-	-	-0.667	0.259**
	Most recent intercourse, < 1 year	-	-	-	-	-	-	0.111	0.221
	Most recent intercourse, > 1 year	-	-	-	-	-	-	-0.222	0.184
	Food consumption, "poor"	-	-	-	-	-	-	REF	REF
	Food consumption, "borderline"	-	-	-	-	-	-	0.222	0.219
	Food consumption, "acceptable"	-	-	-	-	-	-	0.333	0.168*
	Intercept	0.565	1.033	0.558	0.834	2.072	0.314**	5.034	0.603***
t <.10 * p<.05 ** p<.01 *** p<.001		Q25 = 25th quantile		Q33 = 33rd quantile		Q50 = 50th quantile		Q66 = 66th quantile	

Respondents who were older when they lost a parent showed significantly more schooling at the 25thquantile only. Increased psychological resilience but decreased general self-efficacy was associated with lower median school completion. Respondents who used program fees to pay for school showed higher school attainment at the 66thquantile. Respondents who had acceptable rather than poor food consumption scores completed significantly more years of school in the 66thquantile.

Respondents who had intercourse within the past week, month and six months completed significantly less school than those who had not ever engage in intercourse.

4. Discussion

Participation in thismultisectoral empowerment program is associated with completing more schooling. In multi-variable regression models, various program inputs were associated with increases in assessed quantiles of schooling and in primary education completion.

Having used program funds to start a business was significantly associated with reduced odds of completing secondary education. This perhaps is due to the choice of program participants to engage in business or to complete schooling, or as a programmatic response, driven by working groups within the program, to help offset the subsequent loss in earning potential among those who did not complete secondary education.

Respondents who used program funds to pay for schooling had more years of school in the 66thquantile, but not in other places along the conditional distribution of school years. It is possible that the program participants allocate funds for schooling based on schooling previously attained, and the perception of a basic minimum of schooling to achieve. If this basic minimum is the completion of primary school, it is logical that school-directed funds are significant in the 66thquantile and no other quantile, and independent of primary school completion. In this scenario, the allocation of school-directed funds may equalize disparity in primary completion without being wasted on school-disinterested pupils.
It is also possible that school funds were directed towards other members of the family whose educational attainments were not explored here.

Having received a start-up kit was significantly associated with higher odds of completing primary education and of higher predicted 25th, 33rd and 50thquantiles of school years completed. As a cross-sectional study, the direction of this association is not known. It is possible that start-up kit is a proxy measure for increased income that can help lower the burden of opportunity costs of attending school.

As the model controls for personal income, it seems less likely that this association exists than start-up kits are less likely to be allocated to those without a modicum amount of education. If this were the case, this and similar programs should work to ensure those without a certain level of education are not disadvantaged by group-based allocative choices.

Only three covariates predicted any change in literacy. Unsurprisingly more years of school predicted higher odds of successfully reading two sentences. Higher resilience was also associated with increased odds of literacy, which may reflect an ability to overcome challenges encountered in the learning process. Surprisingly, increased general self-efficacy was associated with decreased odds of literacy. Self-efficacy has elsewhere been explored as a positive contributor to the development of literacy, where literacy is understood as a practice rather than a basic capacity (Scott, 1996). As the definition of literacy in the present study was the basic ability to read two simple sentences, rather than a measure of a mental discipline or habit, these two findings are not necessarily incompatible.

The association between intercourse and school completion has been found elsewhere (Clark, Lloyd, &Erulkar, 1999; Biddlecom, Gregory, Lloyd, & Mensch, 2008). Respondents who reported having had sexual intercourse in the past week and past 6 months showed significantly lower odds of completing primary school compared to respondents who reported never having had intercourse. Respondents who had engaged in intercourse in the past 6 months had significantly lower odds of completing secondary school. The quantile regression models showed that there was no significant association between recency of intercourse and the 25th, 33rd, or 50thquantiles of schooling. The finding that the association between school completion and intercourse is not novel, but the finding that it doesn't exist across the spectrum may be novel.

The inclusion of age in the regression models was essential to isolating other associations found in the model to respective covariates, but its significance as a predictor of school completion is expected.

Increased personal income was associated with primary and secondary completion, and increases in the 25th, 33rd and 50thquantiles. It was not associated with 66thquantile of school completion, which was unexpected.
The association between decreased income and lower school achievement has been long known (Brooks-Gunn, & Duncan, 1997), but personal monthly income was not associated with increases in the 66thquantile of school years completed. The direction of the association in the present study cannot be inferred from present data; it may be the case that more education results in higher personal income or that higher personal monthly income has afforded respondents greater ability to attend school.

Females reported higher odds of primary education completion and increased 25th, 33rd, and 50thquantiles of education, which contrasts with existing World Bank data indicating females in Kenya have lower primary and secondary completion (World Bank, 2008).The difference may reflect regional or program differences, both of which warrant further investigation.

A recent analysis of the impact of HIV on education in Kenya showed that in Eastern Province, where the study program is located, female primary completion rate was lower than that among males (Diouf, Sergeant, & Goldstein, 2014). It is possible, though unlikely, that in Meru County, a smaller geographic region within Eastern Province, female OVCs tend to complete more education than male OVCs.

Paternal orphans and not orphans completed more schooling than maternal orphans, an example of the emerging difference in developmental trajectories of orphans by orphan type (Case, &Ardington, 2006). Previous study of educational attainment among orphans by orphan type in Kenya found that prior to the policy changes promoting free primary education, paternal orphans had higher educational attainment than maternal orphans but also that this difference disappeared after the policy changes (Yamano, 2007). In Tanzania, Beegle et al. (2010) found paternal orphans eventually recovered from lower height and educational attainment compared to non-orphans, but these deficiencies persisted into adulthood among maternal orphans without recovery. The present study affirms the decreased odds of primary completion and fewer school years completed at each quantile assessed. In lower quantiles the magnitude in difference in school years completed between paternal and maternal orphan was more pronounced than in higher quantiles.

In the 50th and 66thquantiles of school years completed, paternal and non-orphans showed comparable improvements over maternal orphans; the same pattern was found in odds of completing primary school. Double orphans were not significantly different in educational attainment than maternal orphans in any model.

These differences illustrate that which parent is lost is important for developmental trajectories for orphans, and that targeting OVCs should be informed by probabilities of disparities related to orphan type – maternal, paternal or double.

Having an improved primary water source was a significant predictor of increased educational attainment at the 25th, 33rd and 50thquantile and in probability of completing primary school. Recent studies (Sorenson, Morssink, & Campos, 2011; Dreibelbis, et al., 2013) explained similar findings through the extended time to carry water from unimproved point sources (lakes, streams, etc.) and increased diarrheal prevalence. The time to carry water among users of unimproved primary drinking sources was not assessed, and the effort to measure household diarrheal prevalence in the present study produced unbelievable results. In the present study, increased knowledge of diarrhea and household care provided by respondents resulted in higher probability of reporting diarrheal cases within the previous two weeks. As such, the potential link between improved primary water source and educational attainment does not find much explanation. It does, however, affirm a recent finding that supports the interdependence of developmental targets (Khoo, 2005), and the need to address household characteristics to improve educational attainment (Filmer, & Pritchett, 1999).

Respondents whose food consumption in the previous week was “acceptable” as opposed to “poor” had completed more school in the 66thquantile, but not elsewhere. Given the apparent importance of adequate nutrition to academic performance (Jyoti, Frongillo, & Jones, 2005), and educational attainment (Grantham-McGregor, 2005), one may expect food consumption or food security to have been consistently associated with school years completed across all pertinent models.

As with literacy, general self-efficacy and psychological resilience have opposite associations with years of schooling completed at the 66thquantile. Higher resilience but lower general self-efficacy predict more years of schooling in the 66thquantile.It is possible, again, that resilience allows pupils the ability to overcome obstacles, whereas higher general self-efficacy inspires the belief that one might succeed in ventures outside of school. Further investigation is required to parse out these associations.

4.1 Study Limitations

A limitation of this study was its use of cross-sectional data which prevents causal inferences or even clear direction of association between covariates found to be significant. A benefit of this study design is the investigation of associations not previously considered, or to support associations found elsewhere.

Another study limitation is the use of respondent-dependent interviews, opening the possibility of forms of response bias, especially social desirability bias and recall bias. Respondents may have under or over reported the number of school years completed, as well as erred in estimations of monthly income, and other measures found significant in the regression models. There is no way to know which direction these misclassifications may run, and whether they are differential to one group or not.
Therefore, it is not possible to know what effect, if any, these potential biases may have on found associations (Dosemeci, Wacholder, &Lubin, 1990).

Another limitation of the study is its definition of "literacy." As there are multiple definitions of literacy, applying associations found with one definition to another definition is fraught with danger. The present study intended only to measure the potential access to basic information, rather than the habitual use of information, or the comprehension of complex information. By exploring associations between covariates and educational attainment and the ability to read basic sentences, the current study presents covariates conceivably relevant to the manner in which these utilities might be applied.

5. Conclusion

The present study furthers understanding of determinants of basic literacy and educational attainment among orphan and vulnerable children in Sub-Saharan Africa within the setting of a multisectoral empowerment program targeting OVC families. Program participation was associated with increased probability of completing primary education, and varying quantiles of school years, even when adjusting for age. Increased psychological resilience, never having engaged in sexual intercourse, having lost a father or no parent as opposed to a mother, older age and utilizing an improved primary water source are associated with higher educational attainment of OVC heads-of-households.

By modelling varying quantiles of school completion, in addition to primary and secondary completion, the present study allows for the exploration of an array of potential factors predicting increased school attainment.

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