

**The Cost of Being an Orphan: Psychosocial Well-Being, Cognitive
Development and Educational Advancement among Orphans and Abandoned
Children in Five Low Income Countries**

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ABSTRACT

Development policymakers and child-care service providers are committed to improving the educational opportunities of the growing population of 153 million orphans worldwide. Nevertheless, the relationship between orphanhood and education outcomes is not well understood. Varying factors associated with differential educational attainment in multiple contexts leave policymakers uncertain where to intervene. Positive Outcomes for Orphans (POFO) is a longitudinal study, following a cohort of single and double orphans and abandoned children (OAC) in institutional and community-based settings, that aims to better understand the characteristics associated with child well-being. Using cross-sectional and child-level fixed effects regression analyses on 1,480 community based children, this manuscript examines associations between emotional difficulties, cognitive development, educational attainment, and a variety of correlates including trauma. Results show that factors such as trauma and lower socio-economic status are correlated with higher emotional difficulties, and that increases in emotional difficulties are associated with lags in cognitive development. In contrast, wealth and caregiver literacy rates hold stronger associations with a child's grade for age than the level of emotional difficulties experienced by the child. These findings suggest that interventions targeting both the psychosocial development of the child and the socioeconomic status and education of the caregiver may help to reduce barriers to a child's educational attainment. Family based interventions to stabilize socioeconomic conditions or increase caregiver education may also help overcome psychosocial challenges that otherwise would present as barriers to the child's educational advancement.

INTRODUCTION

The plight of orphans and abandoned children (OAC) is an increasing global problem that is particularly pervasive in Southeast Asia and Africa.¹ Development policymakers and child care service providers strive to increase the well-being of the growing population of 153 million orphans worldwide by intervening on a number of factors that are associated with a child's ability to become a productive and successful member of society (UNICEF 2010). International declarations such as the Millennium Development Goals and the Education for All Movement indicate that, among these factors, the educational attainment of vulnerable children has become a global priority. Most recently, the 2011 Political Declaration on HIV/AIDS has targeted increases in school attendance of orphans as an important and measureable indicator of progress (UNAIDS 2012).²

To understand which policies can improve educational attainment for OAC, decision makers must first understand the factors that determine these outcomes. Previous research shows that orphanhood and the loss of a parent can lead to a series of developmental disadvantages resulting in poor education (Case and Ardington 2006, Makame et al. 2002, Cas et al. 2011, Chatterji et al 2011, Evans and Miguel 2007); however, the relationship between orphanhood and education outcomes is not well understood. While some studies find that the loss of a parent influences orphans to lag on outcomes such as grade for age and attendance relative to non-orphans (Ainsworth 2005, Evans and Miguel 2007, Case and Ardington 2006), other studies find little negative impact of parental death on child education (Kamali et al. 1996, Lloyd and Blanc 1994, Ryder et al 1994), and instead find that alternative factors such as wealth, age, or the child's relationship to the head of household are better predictors of education outcomes than orphanhood itself (Kurzinger et al 2008). Many of these studies are restricted to single country analyses, rendering results arguably context specific.

Additionally, very little work has been done on the psychosocial factors that are barriers to a child's cognitive development and educational advancement. A recent study examined orphan risk of psychosocial difficulties and subsequent risk of HIV (Puffer et al. 2012), while another study examined orphan's exposure to potentially traumatic events, and its association with emotional difficulties (Whetten and Ostermann et al. 2011). Nevertheless, little is known about how these factors might relate to or influence educational attainment. Moreover, few studies examining the educational attainment of orphans move beyond outcomes such as grade for age and attendance to disentangle what factors contribute to a child's learning. Specifically, few analyses examine which characteristics of orphanhood predict a child's cognitive development and whether these predictors are the same that affect educational advancement. No study has attempted to do a cross-country analysis to address these questions. In this manuscript, I employ within-country and cross-country analyses to examine associations between trauma, other factors correlated with orphanhood and the emotional difficulties that children face, and their subsequent cognitive development and educational advancement.

¹ See Appendix A for more background on the growing problem of orphanhood

² See Appendix A for more information on international declarations on education.

DATA AND METHODS

Research Design: Positive Outcomes for Orphans (POFO)

Positive Outcome for Orphans (POFO) is an ongoing 10 year longitudinal study following one cohort of children, starting ages 6 to 12, who live in institutional or community-based settings in 5 low income countries: Cambodia, Ethiopia, Kenya, India, and Tanzania. This analysis uses 3 years of data from the community-based sample both cross-sectionally and over time to address the relationships stated above.

The sampling strategy and general characteristics of the sample have been reported elsewhere (The Positive Outcomes for Orphans Research Team, 2010; Whetten et al., 2009). The following describes the elements of the sampling strategy applicable to this analysis and specific to the community-based sample.

The POFO study utilized a two stage random sampling methodology to identify a representative sample of 1,480 orphaned and abandoned children living in community-based settings in six sites across five low and middle income countries. Within each site, geographic or administrative boundaries were used to define sampling areas (clusters), from which 50 clusters were randomly selected per site and up to five eligible children ages 6-12 years were selected from each cluster. Eligible children were defined as follows: orphans were those children for whom one or both parents had died, and an abandoned child is one whose parents had left with no expectation of return. Eligible children were randomly selected from available lists or through a house-to-house census. One child per home was selected to participate in the study. For homes with multiple age-eligible children, the child whose name started with the earliest letter in the alphabet was selected to participate. Additionally, each site enrolled 50 community-based children who were not orphaned or abandoned at baseline as a qualitative comparison group.³

Procedures

As previously published (Whetten and Ostermann et al. 2011), the following describes the procedures of data collection relevant to this analysis. Over the course of three years, children and each of their self-identified primary caregivers were contacted and interviewed twice per year. Baseline and follow up surveys collected data on numerous characteristics including the child's exposure to traumatic events, symptoms of emotional and behavioral difficulties, cognitive development, and educational attainment. Additionally, caregivers reported on their own educational attainment and household socioeconomic characteristics. The primary measures utilized in this study include child self-reports of emotional difficulties, tests assessing cognitive development through intelligence and ability, and caregiver reports of the child's grade level at baseline, and at 12-month, 24-month and 36-month follow ups. The measures used for trauma, emotional difficulties and cognitive development have been previously validated for use across cultures (see below) and were field-tested using focus groups and pilot interviews.

Measures

Measuring Trauma: The Life Events Checklist

This analysis uses the Life Events Checklist, first created by the National Center for Posttraumatic Stress Disorder (PTSD) to aid in the diagnosis of PTSD (Gray, Litz, Hsu & Lombardo, 2004). This checklist, which inquires about exposure to events such as natural disaster, witnessing someone being hurt or killed, experiencing physical or sexual abuse, or being forced to leave home, is one of the most commonly used

³ For more details on the POFO study design, see http://chpir.org/_homepage-content/research/pofo/study-design/.

research instruments to evaluate exposure to trauma across countries and cultures (Elhai, Gray, Kashdan & Franklin, 2005). Both caregivers and children were asked at each interview whether a child had witnessed or experienced each of the specified events. If exposure to an event was reported, respondents were asked if there was more than one instance of exposure. At follow-up interviews, children and caregivers were also asked if the event occurred within the past year, more than a year ago, or both. In the data collection phase, a total of 20 events were recorded. As described previously, two categories of potentially traumatic events were excluded from this analysis.⁴ The loss of a parent was added as a separate category. A cumulative total trauma count variable was generated for this analysis, which sums the total instances of trauma reported up until and within any given round.

Measuring Psychosocial Well-being and Emotional Difficulties: The Strengths and Difficulties Questionnaire

The Strengths and Difficulties Questionnaire (SDQ) is a behavioral screening tool, applied to children 4-16, that measures psychosocial well-being across five relevant dimensions: (1) emotional symptoms, (2) conduct problems, (3) hyperactivity/ inattention, (4) peer relationship problems, and (5) prosocial behavior. The subscales can be used to assess indications of cognitive and behavioral difficulties as well as developmental strengths. Each subscale has 5 items, scored on a 3-point Likert scale (0-2). The first 4 difficulties subscales add up to a total difficulties score, while the fifth subscale provides assessment of acceleration in prosocial behavior.⁵ The questionnaire can be completed in 2 versions, either by parents, teachers or caregiver report, and by child self-report (Goodman 1997). POFO researchers chose the Strengths and Difficulties Questionnaire “for its brevity, its psychometric properties, and its frequent use in other international studies” (Whetten et al. 2011). This analysis uses the Total Difficulties scale self-reported by the child as a measure of emotional difficulties.

Measuring Cognitive Development: Kaufman Assessment Battery for Children

The KABC-II is a non-verbal and individually administered test of intelligence and achievement that can be used both in educational and clinical contexts. This test series was developed with the intention of “building in sensitivity to preschoolers, minorities and exceptional populations” (Narrett 1983). Three of the tests from the Second Edition of the Kaufman Assessment Battery for Children (KABC-II), Hand Movements, Triangles and Pattern Reasoning, were assessed at each child interview to evaluate each child’s level of learning and performance.

These assessments were chosen by POFO researchers to minimize concerns about cultural differences when using cognitive and learning measures that were developed in more affluent countries. Previous analyses by POFO researchers assessed the validity of these tests as measures of learning and performance for children in non-traditional setting in low and middle income countries, finding that these tests can be successfully employed in such contexts (O’Donnell et al. 2012), and are associated both with the child’s age and educational attainment. For this analysis, I use the highest score out of all 3 KABC tests (called topscore) for each individual child at each round. This measure represents the best the child was able to do across all three subtests when tested by the interviewer. Scores have been scaled to US age standards to enable comparison across settings.

⁴ “Hearing about a family member who has died” and “had a brother or sister die” were excluded because almost all children had lost a family member. For the latter event, it was not clear whether the child witnessed the event themselves.

⁵ The Strengths and Difficulties Questionnaire. Accessed at <http://sdqinfo.com/a0.html>.

Measuring Educational Attainment: Grade for Age

Measuring grade for age requires taking into account the different school systems of each country. The grade for age variable used in this analysis describes how many years the child is ahead or behind in school given their age and expected grade within each respective system. The measure has been centered around 0, meaning that if a child is attending the correct grade for their country school system given their age, the grade for age variable lists the child as 0. Children a year behind receive a -1 and children one year ahead receive a 1 and so on.⁶

Additional Covariates: Household Wealth, Caregiver Illiteracy, and Relationship to the Child

An asset checklist including elements from the Demographic and Health Survey (DHS)⁷ was used to construct wealth indices.⁸ The indices are continuous and indicate greater affluence as the number on the scale increases. Caregiver illiteracy was assessed based on literacy tests administered at the time of each survey. Caregivers unable to read 4 statements were classified as illiterate. The caregiver illiteracy variable is a binary variable coded as “0” if the caregiver is considered literate and as “1” if the caregiver is considered illiterate. The child’s relationship to the caregiver is also included in the analysis. Children were classified as living with parents, relatives or non-relatives.

ANALYSES

Linear regression models were used to assess the relationship between emotional difficulties (Total Difficulties on the SDQ) and a host of explanatory factors, including orphan status, the caregiver’s relationship to the child, exposure to trauma, wealth, and caregiver illiteracy. Additional linear regression models with the KABC topscore and grade for age as dependent variables were used to estimate the association between emotional difficulties (described by the Total Difficulties Score) and both cognitive development and educational advancement respectively. Both outcome models controlled for age, gender, orphan and abandoned status, caregiver relationship, exposure to trauma, wealth and caregiver illiteracy. To address issues of collinearity between orphan status and caregiver relations, subcategories capturing various iterations of the interaction between the child’s orphan status and relationship to their caregiver were generated for a cleaner analysis.⁹ Models analyzed three years of data cross-sectionally (up to four time points for each child), and each model specification was run separately by site, by continent (combining all Asian sites and all African sites, respectively) and jointly for all sites.

A child-level fixed effects model was used to estimate the relationship between emotional difficulties and topscore to account for time invariant characteristics within each children that may affect outcomes. The model controlled for age and exposure to trauma as the main time variant factors likely to correlate with the child’s emotional difficulties and influence cognitive development.

All models were estimated with robust standard errors to account for error correlations within sites and between multiple observations from each child; model specifications run by continent and jointly for all sites accounted for clustering by site. Child-level fixed effects used robust standard errors clustered at the level of the child. Weights were constructed to account for the differences in the number of children and their age and gender distributions across sites and were used in all models.

⁶ See Appendix C for more info on grade for age.

⁷ Data was compiled from a variety of country specific DHS data sets. See references for further information on data used.

⁸ See Appendix C for more information on the wealth index.

⁹ See Appendix C for a complete list of variables used in analysis.

Threats to Validity

To evaluate whether attrition bias may have influenced outcomes, logistic regression models were used to assess whether those children who left the study differed significantly on all relevant factors from those who stayed. Analyses show that maternal orphans were more likely to leave the study, and that those with higher topscores at baseline are also slightly more likely to leave. However, topscore loses significance when combined with other relevant factors in the same model. Children reporting greater instances of trauma were also more likely to leave the study; however their absence from the study in later rounds is more likely to bias the results downward rather than upward, since children experiencing greater exposure to trauma are likely leaving the community to even worse situations. Otherwise, there is no significant difference between those who left the study and those who stayed across relevant factors such as caregiver relations, gender and most importantly, the level of emotional difficulties.¹⁰

Using the child self-report measure of the Total Difficulties scale results in a number of missing data points, since children do not self-report on the SDQ until they are 11 years old. To check whether missing data of this nature might change results, cross-sectional analysis was restricted to the 36-month follow up (when most children were old enough to self-report) controlling for baseline characteristics, with little change in results. Despite missing values, the child self-reported Total Difficulties is believed to be more accurate than caregiver reports based upon previous analyses showing that caregiver reports of the Total Difficulties consistently underreport the child's emotional difficulties.¹¹

¹⁰ See Appendix D for more information on attrition statistics.

¹¹ See Appendix E1B for an analysis of the relationship between caregiver and child self-reports of the Total Difficulties Score.

RESULTS

Descriptive Statistics

Table 1 shows descriptive statistics at baseline, including proportion and frequency of OAC/caregiver relation groups, and the mean and standard deviation of performance on the KABC test, child self-reported emotional difficulties, grade for age, and exposure to trauma at baseline.

Table 1. Descriptive Statistics at Baseline

	Cambodia	Ethiopia	Hyderabad	Kenya	Nagaland	Tanzania	ASIA	AFRICA	ALL SITES
Frequency of OAC/ Caregiver Relation at Baseline % / N									
Single-Parent	36.91 110	36.86 108	35.69 106	47.99 143	48.92 136	38 114	40.32 352	40.97 365	40.65 717
Single - Relative	21.81 65	16.38 48	14.14 42	20.81 62	22.66 63	21.33 64	19.47 170	19.53 174	19.5 344
Double-Relative	18.79 56	16.04 47	5.72 17	9.73 29	5.04 14	20.33 61	9.97 87	15.38 137	12.7 224
Single-Nonrelative	1.01 3	1.71 5	1.01 3	0.67 2	2.16 6	0 0	1.37 12	0.79 7	1.08 19
Double-Nonrelative	0.67 2	2.05 6	0.67 2	0 0	0.72 2	1.33 4	0.69 6	1.12 10	0.91 16
Abandoned	4.36 13	11.26 33	26.26 78	5.03 15	2.52 7	2 6	11.23 98	6.06 54	8.62 152
Non orphans	16.44 49	15.7 46	16.5 49	15.77 47	17.99 50	17 51	16.95 148	16.16 144	16.55 292
Topscore at Baseline									
Mean (SD)	7.4 (2.57)	7.6 (2.57)	6.96 (1.86)	7.43 (2.68)	6.71 (2.15)	6.61(2.27)	7.03 (2.23)	7.21 (2.55)	7.12 (2.40)
N	300	300	300	300	279	302	879	902	1781
Total Difficulties Self-Reported at Baseline									
Mean (SD)	14.22(5.49)	10.0(4.49)	13.74(4.89)	8.41(4.15)	8.25(3.37)	5.27(3.74)	12.43 (5.50)	7.28 (4.44)	10.17(5.68)
N	122	34	50	69	68	85	240	188	428
Grade for Age at Baseline									
Mean (SD)	-0.41 (1.51)	0.26 (1.31)	-1.12 (1.32)	-1.11 (1.34)	-0.37 (1.30)	-0.17 (1.01)	-0.63 (1.42)	-0.36 (1.35)	-0.49 (1.39)
N	281	271	276	300	279	296	836	867	1703
Trauma Total at Baseline									
Mean (SD)	2.83 (3.01)	1.32 (1.65)	1.85 (2.56)	1.22 (1.27)	1.05 (0.79)	2.15 (2.45)	1.93 (2.46)	1.57 (1.90)	1.74 (2.20)
N	300	300	300	300	279	302	879	902	1781

Single orphans constitute the largest group within the sample. While the average topscore at baseline is similar by site (ranging from 6.61 to 7.6), there is more variation by site on the average level of emotional difficulties, with Cambodia and Hyderabad reporting the highest average levels. Kenya and Nagaland have the lowest average levels of reported exposure to trauma at baseline. All sites, with the exception of Ethiopia, show lags in grade for age on average at baseline.

Predicting Emotional Difficulties

Table 2 describes the relationship between the Total Difficulties score and a host of explanatory variables, including age, gender, orphan status and caregiver relation, wealth, caregiver illiteracy, and trauma.

Table 2: OLS Estimate of Total Difficulties Score Predicted By Orphan Status, Caregiver Relationship, Wealth, Caregiver Illiteracy, Age, Gender and Exposure to Trauma

VARIABLES	Cambodia Total Difficulties	Ethiopia Total Difficulties	Hyderabad Total Difficulties	Kenya Total Difficulties	Nagaland Total Difficulties	Tanzania Total Difficulties	ASIA Total Difficulties	AFRICA Total Difficulties	ALL SITES Total Difficulties
Age in Months	-0.05*** (0.02)	-0.05*** (0.01)	-0.06*** (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.02 (0.02)	-0.04 (0.02)	-0.00 (0.02)	-0.02 (0.01)
Single-Parent	0.99 (0.80)	0.25 (0.55)	-0.21 (0.38)	-0.50 (0.43)	-1.85*** (0.55)	2.89*** (0.70)	-0.72 (0.87)	1.25 (1.22)	0.33 (0.88)
Single-Relative	0.35 (0.78)	0.39 (0.69)	-0.80* (0.48)	-0.63 (0.55)	-1.08* (0.60)	1.81** (0.83)	-0.64 (0.47)	0.87 (0.88)	0.15 (0.65)
Double-Relative	-0.77 (0.92)	-0.76 (0.63)	0.64 (0.62)	-1.77** (0.85)	-2.37*** (0.71)	2.29*** (0.82)	-1.09 (0.96)	0.59 (1.40)	-0.16 (0.94)
Single -Nonrelative	-1.45* (0.88)	-0.88 (0.83)	1.51 (1.43)	-1.20 (0.82)	-1.43 (0.91)	-0.66 (2.48)	-0.17 (1.00)	0.31 (0.96)	0.00 (0.61)
Double-Nonrelative	3.43 (2.24)	2.41 (1.49)	-1.21 (1.60)	0.11 (1.57)	-0.58 (1.34)	-0.11 (3.27)	-0.12 (1.11)	1.39 (1.07)	0.76 (0.72)
Abandoned	-0.78 (1.12)	-0.40 (0.75)	-0.48 (0.38)	0.12 (0.85)	-1.93*** (0.67)	1.90 (2.32)	-0.91 (0.54)	0.72 (0.75)	-0.17 (0.56)
Wealth_index	-0.63 (0.51)	-0.23 (0.32)	-0.43 (0.35)	-0.19 (0.24)	-0.43 (0.27)	-0.65 (0.51)	-0.54** (0.08)	-0.42 (0.20)	-0.45*** (0.10)
Cg_illiterate	0.07 (0.54)	-0.86** (0.35)	-0.26 (0.28)	0.24 (0.35)	1.17*** (0.29)	0.91 (0.70)	0.21 (0.46)	0.00 (0.43)	0.15 (0.29)
TraumaTotal	0.42*** (0.11)	0.81*** (0.11)	0.65*** (0.06)	0.60*** (0.07)	0.20 (0.24)	-0.03 (0.12)	0.56** (0.10)	0.34 (0.27)	0.45** (0.16)
Female	-0.68 (0.56)	0.02 (0.34)	-0.79*** (0.27)	-0.10 (0.32)	-0.75*** (0.26)	-0.71 (0.55)	-0.90*** (0.05)	-0.33 (0.22)	-0.65** (0.18)
Ethiopia								-2.63** (0.30)	-7.40*** (0.35)
Hyderabad							-3.79*** (0.14)		-3.77*** (0.09)
Kenya								3.18*** (0.10)	-1.76*** (0.18)
Nagaland							-4.14*** (0.35)		-4.50*** (0.46)
Tanzania									-4.85*** (0.19)
Constant	17.97*** (2.56)	9.60*** (1.48)	15.61*** (1.35)	10.05*** (1.41)	9.80*** (1.23)	2.88 (2.38)	17.10** (1.81)	6.00 (2.67)	13.94*** (1.96)
Observations	371	390	676	571	552	562	1,599	1,523	3,122
R-squared	0.11	0.22	0.26	0.10	0.10	0.06	0.33	0.24	0.28

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The results show that a number of factors predict a child's emotional difficulties, including exposure to trauma, wealth and gender. Specifically, higher total instances of trauma are significantly and positively correlated with higher levels of emotional difficulties in 4 individual sites, the "Asia" and "All Sites" models. Surprisingly, being female is significantly associated with lower levels of emotional difficulties in 2 sites, the "All Asia" and "All Sites" models. Additionally, for the "Asia" and "All Sites" models, an increase in the wealth index is significantly associated with decreases in emotional difficulties. In contrast, there are somewhat ambiguous results for orphan status and caregiver relation. While being a single orphan living with a parent and a double orphan living with a relative is significantly associated with higher levels of emotional difficulties in Tanzania, we see some contrasting trends in Nagaland and Kenya, with no significant associations when looking jointly within all sites. The wealth index, the trauma count, and being female are the only factors that are statistically significant in the "All Sites" model, indicating that a number of factors other than orphan status can predict emotional difficulties in some contexts.

Predicting Cognitive Development

Tables 3 and 4 show OLS and fixed effects regressions of emotional difficulties predicting cognitive development.

Table 3. OLS Estimate of Topscore Predicted By Total Difficulties, Orphan Status, Caregiver Relationship, Wealth, Caregiver Illiteracy, Age, Gender and Exposure to Trauma

VARIABLES	Cambodia topscore	Ethiopia topscore	Hyderabad topscore	Kenya topscore	Nagaland topscore	Tanzania topscore	ASIA topscore	AFRICA topscore	ALL SITES topscore
Total Difficulties	-0.10*** (0.03)	-0.07 (0.04)	-0.12*** (0.03)	-0.09*** (0.03)	-0.11*** (0.03)	-0.07*** (0.01)	-0.12*** (0.01)	-0.07** (0.01)	-0.09*** (0.01)
Age in months	-0.01 (0.01)	0.02*** (0.01)	0.00 (0.01)	-0.00 (0.01)	-0.02*** (0.00)	0.01 (0.00)	-0.01 (0.01)	0.01 (0.00)	0.00 (0.01)
Single-Parent	-0.57 (0.38)	0.07 (0.39)	0.22 (0.35)	-0.15 (0.29)	0.33 (0.27)	-0.08 (0.20)	0.18 (0.23)	-0.01 (0.02)	0.08 (0.12)
Single-Relative	0.11 (0.43)	0.30 (0.44)	0.16 (0.40)	-0.62 (0.38)	-0.08 (0.29)	0.03 (0.26)	0.06 (0.04)	-0.10 (0.22)	-0.02 (0.13)
Double-Relative	-1.02** (0.44)	0.34 (0.46)	0.20 (0.49)	-1.08** (0.48)	0.49 (0.48)	0.35 (0.25)	-0.18 (0.51)	-0.01 (0.36)	-0.07 (0.30)
Single -Nonrelative	-1.49* (0.78)	0.24 (0.69)	-0.88 (0.92)	-0.41 (0.62)	-0.40 (0.48)	-1.37 (1.53)	-0.65 (0.29)	-0.10 (0.07)	-0.32 (0.21)
Double-Nonrelative	4.49*** (0.71)	0.48 (0.59)	0.46 (0.70)	0.70 (0.80)	-0.23 (0.73)	-0.22 (0.39)	1.12 (1.17)	0.26 (0.16)	0.59 (0.37)
Abandoned	0.14 (0.84)	0.17 (0.50)	0.12 (0.33)	0.11 (0.57)	-0.05 (0.43)	1.28** (0.65)	0.05 (0.08)	0.28 (0.28)	0.08 (0.09)
Cg_illiterate	-0.10 (0.28)	-0.15 (0.22)	-0.15 (0.22)	-0.55** (0.23)	0.02 (0.17)	-0.42** (0.20)	-0.03 (0.06)	-0.36* (0.12)	-0.18 (0.09)
Female	-1.17*** (0.25)	-0.31 (0.22)	-0.13 (0.21)	-0.67*** (0.21)	-0.11 (0.16)	0.02 (0.15)	-0.41 (0.30)	-0.33 (0.20)	-0.35* (0.17)
Wealth_index	0.71*** (0.26)	0.03 (0.20)	0.19 (0.29)	0.42** (0.18)	0.17 (0.16)	0.13 (0.12)	0.33 (0.21)	0.27 (0.13)	0.29** (0.10)
TraumaTotal	0.04 (0.05)	-0.28*** (0.08)	-0.22*** (0.06)	0.19*** (0.06)	-0.03 (0.11)	-0.17*** (0.04)	-0.11 (0.11)	-0.05 (0.13)	-0.08 (0.08)
Ethiopia								1.47*** (0.09)	0.09 (0.20)
Hyderabad							2.26*** (0.02)		2.40*** (0.06)
Kenya								0.56** (0.08)	-0.73*** (0.06)
Nagaland							-1.73** (0.29)		-1.48*** (0.22)
Tanzania									-1.28*** (0.13)
Constant	10.12*** (1.27)	7.19*** (1.10)	11.93*** (1.20)	8.51*** (1.10)	10.77*** (0.71)	7.16*** (0.73)	11.06*** (1.01)	6.64*** (0.27)	9.24*** (0.83)
Observations	371	390	675	569	543	553	1,589	1,512	3,101
R-squared	0.18	0.11	0.09	0.09	0.09	0.13	0.35	0.14	0.29

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3 shows that in all sites, except Ethiopia, there is a significant negative association between emotional difficulties and the child’s topscore on the KABC tests. However, in this model, the relationship between orphan status and the child’s topscore is somewhat scattered, with orphan status mattering the most in Cambodia, and no significant associations for any group in the “All Sites” model. Notably, wealth is positive and significant in Cambodia, Kenya and the “All Sites” model. Caregiver illiteracy is negatively associated with better performance on the KABC tests, and is significant in Kenya, Tanzania and the “Africa” model. Additionally, being female is

associated with lower outcomes on the KABC tests, with significant coefficients in Cambodia, Kenya, and the “All Sites” model.¹²

Trauma count is negatively and significantly correlated with lower scores on the KABC in Ethiopia, Hyderabad and Tanzania, although there is some ambiguity with a positive and significant relationship in Kenya. This outlier, however, may be related to the unprecedented increase in trauma due to the 2007 post-election violence, and may warrant further analysis beyond the scope of this study that disaggregates data before and after the event to better understand trends in this country. Previous analyses from the POFO study have also found that following this post-election violence, respondents in the Kenya site were reporting higher instances of mental health visits, indicating an influx of community support and counseling around trauma for both families and children. This change in community level support may act as an intervening factor in this analysis and may partially explain these anomalous results.

Table 4. Fixed Effects Estimate of Topscore Predicted by Total Difficulties, Age and Exposure to Trauma

VARIABLES	Cambodia topscore	Ethiopia topscore	Hyderabad topscore	Kenya topscore	Nagaland topscore	Tanzania topscore	ASIA topscore	AFRICA topscore	ALL SITES topscore
Total Difficulties	-0.02 (0.02)	-0.07 (0.05)	-0.10*** (0.04)	-0.08*** (0.03)	-0.11*** (0.03)	-0.09*** (0.02)	-0.09*** (0.02)	-0.09*** (0.01)	-0.09*** (0.01)
Age in months	0.03*** (0.01)	0.03*** (0.01)	0.13*** (0.01)	0.02** (0.01)	0.03*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.04*** (0.00)	0.04*** (0.00)
TraumaTotal	0.02 (0.05)	-0.27*** (0.10)	0.39*** (0.07)	0.11* (0.07)	0.29* (0.16)	0.02 (0.04)	0.15*** (0.04)	-0.02 (0.03)	0.03 (0.03)
Constant	3.88** (1.52)	5.05*** (1.30)	-8.51*** (1.77)	4.77*** (1.12)	3.21** (1.38)	0.88 (0.86)	-0.01 (0.95)	3.25*** (0.59)	2.62*** (0.49)
Observations	495	429	705	586	558	645	1,758	1,660	3,418
R-squared	0.06	0.16	0.34	0.06	0.08	0.20	0.17	0.12	0.14
Number of uniqueid	232	230	276	240	210	257	718	727	1,445

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4 shows the results of a fixed effects estimation of the relationship between emotional difficulties and cognitive development, thus controlling for all time invariant characteristics within one child. Since most covariates in previous models are time invariant, age and cumulative exposure to trauma are the only other factors included in the model. The relationship between emotional difficulties and cognitive development remains negative and significant, except for Cambodia and Ethiopia, where coefficients remain negative but are no longer significant at the 10% level. These results indicate that in most cases, when separating out any effect that additional instance of trauma and age may have, there is a negative and significant relationship between Total Difficulties score and performance on the KABC tests.

The inclusion of trauma as a cumulative measure in the model shows the effect of the trauma incidence on a child’s topscore, controlling for the emotional difficulties and age of the child. Surprisingly, higher incidences of trauma are associated with higher topscores in 3 sites and the “All Asia” model. These results may be picking up some resiliency factors within children exposed to high levels of trauma, who, once controlling for the emotional difficulties the trauma produces, may actually be able to do relatively better on the KABC tests.

To check whether there was a significant interactive effect between being an orphan and the level of emotional difficulties on the child’s topscore, I also tried controlling for this interaction term; however, these results were not significant and consequently were left out of these models. Hence, there is no evidence to suggest that within

¹² See Appendix E for additional regression analyses using baseline measures.

one child, as emotional difficulties increase, being an orphan has an additional effect on the relationship between these difficulties and the child's cognitive development.

Predicting Grade for Age

Tables 5 shows an OLS estimation of the relationship between grade for age, emotional difficulties and other covariates.

Table 5. OLS Estimate of Grade for Age Predicted By Total Difficulties, Orphan Status, Caregiver Relationship, Wealth, Caregiver Illiteracy, Age, Gender and Exposure to Trauma

VARIABLES	Cambodia	Ethiopia	Hyderabad	Kenya	Nagaland	Tanzania	ASIA	AFRICA	ALL SITES
	Grade for Age	Grade for Age	Grade for Age	Grade for Age	Grade for Age	Grade for Age	Grade for Age	Grade for Age	Grade for Age
Total Difficulties	-0.03 (0.02)	0.04 (0.03)	-0.01 (0.02)	-0.06*** (0.02)	0.04** (0.02)	-0.01 (0.01)	-0.00 (0.02)	-0.01 (0.01)	-0.01 (0.01)
Age in Months	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.00)	-0.03*** (0.00)	-0.03*** (0.00)	-0.02*** (0.00)	-0.03*** (0.00)	-0.03** (0.00)	-0.03*** (0.00)
Single-Parent	-0.04 (0.27)	0.36 (0.23)	-0.44*** (0.14)	-0.19 (0.17)	-0.13 (0.20)	0.25* (0.15)	-0.23 (0.11)	0.14 (0.13)	-0.08 (0.12)
Single-Relative	-0.15 (0.26)	0.50* (0.30)	-0.77*** (0.16)	-0.57** (0.22)	-0.22 (0.23)	0.15 (0.19)	-0.41 (0.17)	0.01 (0.25)	-0.24 (0.18)
Double-Relative	-0.54* (0.27)	0.40 (0.27)	-0.43 (0.26)	-0.36 (0.28)	0.25 (0.35)	-0.27 (0.21)	-0.34 (0.22)	-0.15 (0.15)	-0.27* (0.11)
Single -Nonrelative	-1.29 (1.83)	0.04 (0.27)	-0.60 (0.41)	-0.42 (0.32)	-1.25 (0.82)	0.14 (0.30)	-1.09* (0.28)	-0.11 (0.12)	-0.48 (0.27)
Double-Nonrelative	0.04 (0.35)	0.06 (0.44)	-1.20*** (0.26)	-0.03 (0.34)	-2.84** (1.40)	-0.34 (0.32)	-1.61 (0.76)	-0.12 (0.15)	-0.66 (0.42)
Abandoned	-0.89* (0.52)	-0.12 (0.29)	-0.73*** (0.15)	-0.16 (0.34)	0.32 (0.27)	-0.10 (0.53)	-0.52 (0.19)	-0.20 (0.09)	-0.39** (0.13)
Cg_illiterate	-0.35* (0.18)	-0.27 (0.17)	0.10 (0.10)	-0.34** (0.14)	0.04 (0.13)	-0.88*** (0.17)	0.00 (0.12)	-0.52* (0.16)	-0.23 (0.16)
Female	0.18 (0.18)	-0.18 (0.17)	-0.01 (0.10)	0.09 (0.13)	0.02 (0.13)	0.18 (0.12)	-0.01 (0.02)	0.05 (0.07)	0.02 (0.04)
Wealth_index	0.84*** (0.17)	0.23 (0.17)	0.27* (0.16)	0.32*** (0.08)	0.39*** (0.13)	0.07 (0.12)	0.49* (0.14)	0.23* (0.08)	0.33*** (0.07)
TraumaTotal	-0.01 (0.04)	-0.01 (0.06)	-0.09*** (0.02)	0.13*** (0.03)	-0.07 (0.09)	0.05* (0.03)	-0.07 (0.03)	0.06 (0.02)	-0.00 (0.04)
Ethiopia								0.44** (0.05)	0.41** (0.10)
Hyderabad							-0.06 (0.05)		-0.03 (0.06)
Kenya								-0.79*** (0.05)	-0.83*** (0.06)
Nagaland							-0.02 (0.11)		0.10 (0.11)
Tanzania									0.04 (0.08)
Constant	2.83*** (0.89)	2.77*** (0.90)	3.25*** (0.61)	2.99*** (0.60)	3.06*** (0.69)	1.41** (0.64)	3.12*** (0.15)	2.36* (0.64)	2.72*** (0.33)
Observations	364	377	660	555	536	544	1,560	1,476	3,036
R-squared	0.19	0.13	0.17	0.20	0.19	0.15	0.16	0.23	0.18

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5 shows mixed result on the relationship between a child's emotional difficulties and their grade for age. While there is a negative and significant relationship between a child's emotional difficulties and their educational advancement in Kenya, the significance does not hold across sites, nor is there a consistent direction of the

relationship. Exposure to trauma has an equally ambiguous relationship to grade for age, showing a negative and significant relationship in Hyderabad, but a positive and significant relationship in Kenya and Tanzania.

In contrast, wealth is the strongest predictor of a child's grade for age. There is a positive relationship between wealth and grade for age across all sites, which is significant in 4 of 6 sites, in both continents and in the "All Sites" model. Caregiver illiteracy also shows a negative and significant relationship in 3 sites (Cambodia, Kenya and Tanzania) and the "Africa" model. Additionally, double orphans living with relatives and abandoned children lag significantly on grade for age in the "All Sites" model. The overarching result from this table is that the significant associations with emotional difficulties that we saw with cognitive development no longer hold up with grade for age. Instead, wealth takes over as the strongest predictor, and caregiver illiteracy, which may be a proxy for the value of education within the household, is also a predictor of grade for age, particularly in Africa.

DISCUSSION

This is the first study to conduct a cross-country analysis examining the relationship between the emotional difficulties experienced by orphans, their exposure to trauma, and their subsequent cognitive development. As a counterpoint, I also investigate the factors predictive of these same orphans' educational advancement through grade for age, and, as a precursor, what factors predict the level of a child's emotional difficulties. Not surprisingly, grade for age is less well explained by emotional difficulties or trauma and instead is more correlated with wealth and caregiver illiteracy. While no one factor predicts the level of a child's emotional difficulties across the board, a number of factors contribute to explaining this outcome, including the child's exposure to trauma, gender and socio-economic status. The most salient finding is that there is a negative and significant relationship that holds across many sites between a child's emotional difficulties and his/her cognitive development. It appears that the level of emotional difficulties is most strongly associated with aspects that are immediate to the internal development of the child, while grade for age, a developmental outcomes that is also highly related to external factors, is less related to the child's emotional difficulties.

The child's performance on the KABC tests are not only an indication of the child's ability or IQ, but a variety of other factors associated with motivation, self-confidence, ability to interact and perform with an authority figure (the interviewer administering the test), and the child's developed non-verbal skillset. While ability itself is likely not to change over time for a child, we can interpret the variation on test scores with the child's emotional difficulties to be related to changes in these additional factors (motivation, self-confidence, ability to relate to authority figures etc).

Although no causal links can be drawn from this analysis, these results offer some additional insight into the relationship between orphanhood and educational outcomes. One common methodological complication in examining educational outcomes for orphans is unobserved heterogeneity.¹³ The use of a fixed effects model enables us to account for unobserved time-invariant cross-sectional individual level differences that are correlated with orphan status and that influence cognitive development. Consequently, the results in Table 4 gives us a less biased estimate of the relationship between a child's emotional difficulties and their cognitive development than cross-sectional analyses can yield. It is striking to find such a consistently strong explanatory factor for cognitive development across multiple contexts.

The lack of consistent schooling systems within each country may explain some of the inconsistent associations in the grade-for-age model. For example, some countries will advance children each year regardless of their development, while others will hold children back who have fallen behind in skills. Countries also have differing policies on school fees and other financial requirements of the family. Despite differences between school systems, the significant relationships between grade for age and wealth and caregiver illiteracy respectively indicate the likely presence of socioeconomic and cultural barriers to educational advancement for children in these communities. Although many school systems have technically abolished school fees at the primary level (India, Kenya, Cambodia, Ethiopia), many of the countries still require families to provide children with school supplies such as uniforms, textbooks and to pay for examination fees.¹⁴ Families experiencing resource constraints face the opportunity cost of sending to children to school versus the alternative of child labor. While some varying outcomes on grade for age may occur based on the child's cognitive development, financial constraints may pose larger barriers to educational advancement to the children living within these communities.

¹³ See Appendix B for more information on methodological challenges with analyzing outcomes for orphans.

¹⁴ See Appendix C for more details on school systems in each country.

This study offers evidence that different factors predict cognitive development and educational advancement for orphans. While child characteristics regarding mental health, such as a child's exposure to trauma and emotional difficulties, are highly predictive of a child's cognitive development, external or environmental factors such as wealth and the caregiver's education are more related to whether a child continues advancing through school. Together, these results suggest that while support for trauma and emotional difficulties may be an effective trigger point for interventions aiming to improve the child's cognitive development, improving external aspects of the child's environment may also help compensate for these challenges.

Hence, intervening on both the level of the child and on the level of the family is likely to yield improvements in education outcomes for children. If policies and programs can create financial and emotional stability for a child and the family, orphans may have a greater chance of pushing past the challenges of losing a parent and the additional traumas to which orphanhood exposes them. While stabilizing a family's socioeconomic status does not treat the trauma and subsequent emotional difficulties themselves, financial support can provide families with the necessary resources to keep children in school, rather than resorting to child labor or dropping out for other reasons related to lags in cognitive development. Additionally, when lags in cognitive development persist, wealth and caregiver education may be an additional resource that helps children overcome developmental challenges and stay in school. These findings are in line with previous POFO publications on child work and labor, which found that lower socio-economic status and a non-working caregiver are associated with increased child labor, which in turn is significantly associated with not attending school (Whetten and Messer et al. 2011).

One limitation of this study is that OLS regressions and fixed effects do not allow for causal links to be drawn, and thus do not rule out possibilities of reverse causality. In fact, it is highly likely that these relationships are circular and that, even if higher emotional difficulties may impede cognitive development, lags in cognitive development in turn may heighten emotional difficulties. For example, the significant association between a child's emotional difficulties and their cognitive development could indicate that children who have higher cognitive development due to intelligence and ability are more resilient, and thus experience less emotional difficulties when they are exposed to trauma. To check for this, I tested outcomes in the final round controlling for a child's topscore at baseline, finding similar results as the OLS and fixed effects models above.¹⁵ While this analysis is unable to separate out any circular or reverse effects, knowledge of an association between these factors still offers insight into possible interventions. Regardless of causal direction, if we know that children who are exposed to more trauma also report more emotional difficulties and perform lower on tests of cognitive ability, interventions to provide emotional support for trauma will help at least one or more of these difficulties.

These findings are not perfectly generalizable to all orphan populations, as there are many other groups of OAC, such as street children, non-community based orphans, or those that live in countries with widely different contexts than those in our sample, that may show different associations. Nevertheless, this analysis offers new insight into the relationship between psychosocial factors, resource constraints and the educational attainment of orphans in community based conditions similar to that of our sample across Southeast Asia and Africa.

¹⁵ See Appendix E for regression analysis using baseline measures.

CONCLUSION

In summary, this study indicates that exposure to trauma, including the loss of a parent, is correlated with higher emotional difficulties, and that increases in emotional difficulties are associated with lags in cognitive development. Hence, exposure to trauma and emotional difficulties are a part of the story of educational attainment for orphans. Nevertheless, higher socioeconomic status and better educated caregivers may offer buffers to these difficulties in so far as being an orphan in a household with more wealth and a better educated caregiver is associated with better outcomes on educational advancement. Interventions targeting both the psychosocial development of the child and the socio-economic and education of the caregiver may work well in tandem to improve educational outcomes for vulnerable children in a more holistic sense. Further, family based interventions to stabilize socioeconomic conditions or increase caregiver education may help overcome psychosocial challenges that otherwise would present as barriers to the child's educational advancement. Nevertheless, variation across sites on a variety of relevant correlates indicates that interventions should be context-specific. Moreover, policymakers should also be wary of the trade-off between grade for age and cognitive development. Even if we improve a child's ability to advance through school using interventions focused on the caregiver, the child's learning and cognitive development is still an important outcome that should be prioritized in the development of policies aimed to improve the well-being and outcomes of the world's most vulnerable children.

APPENDIX

APPENDIX A. Additional Background

While the definition of “orphan” varies across cultures and settings, UNICEF provides a common definition for policymakers and other global partners by defining an orphan as “a child who has lost one or both parents” (UNICEF 2004). A 2010 UNICEF report estimated a growing population of 153 million orphans worldwide. Of these orphans, an estimated 53.1 million are in sub-Saharan Africa, with 30% orphaned by AIDS. An estimated 68.9 million of these orphans are in Asia (UNICEF 2010). These numbers are continuously on the rise, due to increasing health epidemics (malaria, tuberculosis, pregnancy complications, HIV/AIDS). While parental loss is usually thought of as a result of death, increasing problems of abandoned children result when parents are unable to care for their children and leave to pursue employment elsewhere.

A recent and growing contributing factor to these problems is the HIV/AIDS epidemic. According to UNAIDS, an estimated 2.5 million people were newly infected with HIV in 2011, and out of these people, approximately 330,000 of them are children. Young people, ages 15-24 years, account for 40% of all new adult (15+) HIV infections. Additionally, about 3.4 million children under the age of 15 were living with HIV in 2011, and an estimated 230,000 children died from AIDS-related illnesses (UNAIDS 2012). These trends have implications not only for the health and well-being of the orphans themselves, but also for the resources and stability available to children growing up in regions where these problems are pervasive.

Developmental Effects of Orphanhood

Whether a result of AIDS or other health or economic problems, previous literature has found that parental loss leads to a range of developmental disadvantages that leave orphans more vulnerable to adverse physical and mental outcomes than non-orphans. The loss of a parent is associated with a series of “family-trauma” events that in turn can lead to deterioration in the emotional, psychological and material well-being of the child (Bicego 2003). Among these factors, the educational attainment of orphans is severely jeopardized.

The Importance of Education

International declarations such as the Millennium Development Goals and the Education for All movement evidence a global focus on education outcomes. Investment in education not only increases earning potential, economic growth, and health outcomes, but also supports the growth of civil society and increases the potential for democracy and political stability (Center for Global Development 2002). Moreover, in the case of orphans, education is particularly important because it has been linked to decreased likelihood of early sexual activity and exposure to HIV/AIDS (Jukes 2008). Nevertheless, orphans remain unlikely to receive such education, as parental loss correlates with diminished chances of staying on track with one’s grade for age (Bicego 2003).

The growing international concern about the HIV/AIDS epidemic and corresponding focus on the plight of orphans offers hope for change. While the HIV/AIDS epidemic is only one cause among many of parental loss, the epidemic has tipped many communities and countries into a new state of crisis. Signifying a global commitment to mitigating this crisis, policymakers set goals in the 2011 Political Declaration on HIV/AIDS, which, if taken seriously, can have positive implications for orphans and

abandoned children. Most notably, among the list of Targets to Meet Core Indicators for the Global AIDS response, UNAIDS lists increasing orphans' school attendance as an important and measurable indicator of progress (UNAIDS 2012). These objectives are important because they offer opportunity for monetary support and global commitment to improving the educational attainment of orphans.

Nevertheless, there are mixed results in the literature indicating the degree to which orphanhood itself influences education outcomes. While some studies find parental death is associated with lags in education outcomes such as grade for age or attendance, other studies find little negative impact of parental death on child education (Kamali et al. 1996, Lloyd and Blanc 1994, Ryder et al 1994), and instead find that alternative factors such as wealth, age, or the child's relationship to the head of household are better predictors of education outcomes than orphanhood itself (Kurzinger et al). These mixed results leave researchers and policymakers uncertain where to intervene to improve education outcomes for orphans.

APPENDIX B. Full Literature Review

Education Outcomes for Orphans

Previous studies have found orphans more vulnerable than non-orphans to poor education outcomes, such as school enrollment and attendance, for a variety of reasons. Parental death itself plays a significant role. Attendance in primary school often drops both after a parental death and in months leading up to the death (Ainsworth et al 2005). These effects are often larger in the case of maternal death and for children who have low baseline academic performance (Evans and Miguel 2007). Johnson (2011) found that the presence of orphans in a household significantly increased the amount of school fees owed per household. Further, families with AIDS orphans owed higher fees relative to families with other types of orphans, though the cause of these differences is unclear. Discrimination at school may be a contributing factor.

There is evidence that the negative effects of parental death on education outcomes is even worse for maternal orphans. Case and Ardington (2006) argue that a mother's death has causal effects on orphans' education outcomes and leads to lower school enrollment. Case and Ardington also found that for children who were enrolled in school, less money was spent on orphans relative to non-orphans. The loss of a maternal figure, however, can be alleviated with grandmother support. Using 2004 Lesotho DHS data, Parker and Short find that maternal orphans who live with their grandmothers are just as likely to be in school as children living with biological mothers. These findings underscore the effects of maternal absence on schooling outcomes, and the importance of the relationship between grandmother co-residence and child outcomes (Parker and Short 2009).

In contrast, other studies find little relationship between parental death and child education. An early study examining outcomes for children in communities affected by HIV/AIDS found little impact of orphanhood on school attendance (Kamali et al. 1996). Investigating the key determinants of school enrollment and completion, another study found that the education of the head of household and socioeconomic status play a larger role in determining schooling outcomes than the biological parents, with little differences between the educational records of orphans and non-orphans when accounting for other determinants (Lloyd and Blanc 1996). A more recent study found similar results, noting that orphans lagged on attendance and grade for age relative to non-orphans, but that these differences were insignificant once accounting for other factors such as age, religion, the relationship of the child to the head of household and the dependency ratio within the household (Kurzinger et al 2008). All of these studies find that the support of the community can serve as a buffer to adverse outcomes for children who have suffered the trauma of parental loss.

Other interventions to improve schooling outcomes for orphans have been implemented with mixed results. Community based interventions in Lusaka, Zambia used home-based caregivers and community centers as 2 primary mechanisms to improve school enrollment and age-for-grade. Services were provided for education, health, HIV prevention, psychosocial support and nutrition. Provision of school supplies and payment of government school fees were also included.

Caregiver Effects and Socio-economic Status Effects

The mixed results in the literature indicate that multiple correlates to orphanhood, other than loss of a parent itself, may also influence adverse outcomes for orphans. Among these, caregiver characteristics and socioeconomic status are two prevalent factors. Case and Ablettinger (2004) find that lower school enrollment of orphans is related to the closeness of biological ties with the caregiver. Low school enrollment is correlated with tendency for orphans to live with distant relatives or unrelated caregivers. Furthermore, Chuong (2012) found that additional household dynamics besides caregiver relation can also have effects on schooling outcomes. Results indicate that orphaned children overall show 35%

greater odds of being behind in grade for age. Maternal presence, relationship to the household head, number of children in the household and socio-economic characteristics all affect a child's likelihood of educational delay. Elderly and maternal headed households also increased the likelihood of educational delay (Chuong 2012). These outcomes may be related to the willingness of caregivers to care for extra children. Freeman (2006) find that extended family are more likely to be willing to take on additional children for care, but that these caregivers also report additional stressors and the need for assistance in taking on extra childcare burdens.

Akwara et al. (2010) investigated the effect of child vulnerability indicators on wasting, school attendance, and early sexual activity, finding that both the education level of the head of household or eldest female and household wealth were two strong predictors of school attendance. This study expanded the notion of child vulnerability to include key indicators such as household wealth (Akwara et al 2010).

Psychosocial Outcomes for Orphans

Several studies have documented the presence of emotional distress and negative psychosocial outcomes for orphans. Onuoha et al. (2009) used a set of standardized psychosocial measures to compare the mental health of HIV orphans with that of "other-cause" orphans and "non-orphaned" children, finding that HIV orphans show the highest negative and lowest positive mental health factors out of the 3 groups. Using the "Ten Elements of Mental Health Promotion and Demotion," Kirkpatrick et al. (2012) documented the indicators for emotional health distress in OVC in two communities in Zambia, and recommended that further research evaluate the efficacy of emotional coping interventions. Puffer et al. (2012) examined the relationship between mental health, social support, material resources and orphanhood in Kenya, finding that orphans are at higher risk of psychosocial problems relative to non-orphans, and that emotional problems were associated with lower sex-related self efficacy (Puffer et al. 2012). Researchers further recommend that caregivers and children are given support for managing emotional health and distress.

Few studies have investigated the effect of psychosocial outcomes on educational attainment for orphans, although preliminary findings indicate that interventions aimed at psychosocial behaviors may help. Examining the effect of psychosocial support for AIDS orphans in Zimbabwe on schooling outcomes, Chitiyo et al. (2008) found that psychosocial support led to improvements in several areas of education. Despite these findings, with a sample size of 20 and only qualitative evaluation measures, further research is needed to better understand the impact of both these holistic approaches, and each of its individual components on learning outcomes for OAC.

Methodological Challenges in Analyzing Outcomes for Orphans

There are many methodological challenges to examining the underlying mechanisms that drive outcomes for orphans. To understand causal impacts, we need a credible comparison group, which, in the case of orphans, poses challenges for a number of reasons. Among these challenges is the omitted variable bias resulting from unobserved heterogeneity, time-variant or time-invariant, between orphans and any comparison group that otherwise may look like orphans. Many cross-sectional analyses suffer from these problems, but are unable to improve estimates because of the difficulty of obtaining longitudinal data on orphans. Studies utilizing a time component can obtain less biased estimates by employing household or child-level fixed effects analyses, in so far as any differences between orphans and non-orphans are time invariant. Nevertheless, most analyses aiming to estimate the impact of orphanhood on child wellbeing cannot escape endogeneity problems because parental death is usually correlated with other factors, observable and unobservable, that also affect child well-being. One exception is Cas et al.'s analysis of the impact of parental death on child-well being, which uses the tsunami in Aceh, Indonesia as a natural experiment that assigns parental death in an exogenous fashion, unrelated to other factors that often influence child-well being (Cas et al. 2011).

APPENDIX C. Measures

List of Variables Used in Analyses

VARIABLES	Type	Range	Description
Topscore	Continuous	Scale of 1 to 19	The child's top score out of 3 KABC II tests (Hands, Triangles, Pattern Reasoning)
Total Difficulties	Continuous	Scale of 0 to 30	Child Self-reported Total Difficulties on the Strengths and Difficulties Scale (emotional wellbeing, hyperactivity, conduct problems, peer relationships)
Age in months	Continuous	61-199 (5 to 16.5 years)	Child's age in months
Abandoned	Indicator	[0,1]	A child whose parents have left with no expectation of their return
Single-Parent	Indicator	[0,1]	A single orphan living with the one living parent
Single-Relative	Indicator	[0,1]	A single orphan living with a relative
Double-Relative	Indicator	[0,1]	A double orphan living with a relative
Single -Nonrelative	Indicator	[0,1]	A single orphan living with a non-relative
Double-Nonrelative	Indicator	[0,1]	A double orphan living with a non-relative
Cg_illiterate	Indicator	[0,1]	If the caregiver is illiterate: 1=illiterate
Female	Indicator	[0,1]	Gender: 1=female
Wealth_index	Continuous	0 to 4.09	A wealth index
Trauma Total	Continuous	[0,13]	Total Count of Instances of Trauma Reported by the Child or Caregiver

Grade for Age

If a child lags on grade for age, this may result from a number of factors that are country and context specific, including national or local school systems, the environmental and developmental barriers to advancement, and national policies on retention and progression. For example, financial barriers such as school fees, required uniforms or school supplies may pose barriers to resource poor families, where opportunity costs force parents to choose between sending children to school or working in the field. Alternatively, countries where children progress regardless of literacy or numeracy skills may mask problems with the child's learning and development, whereas other countries may hold back students who fail to pass national exams. Such factors may cause children who are very similar on developmental outcomes to look very different on educational advancement outcomes. The following paragraphs describe how these factors present themselves within the five countries in POFO.

The Kenyan education system, starting at age 6, includes eight years of primary schooling (Standards 1-8) followed by four years of secondary school. Although primary school fees in Kenya are free, families and caregivers are still responsible for levies and other small fees, which can pose barriers to children attending school. Once children reach secondary schooling, school fees are technically subsidized by the government, but implementation is inconsistent. Acceptance into secondary schooling is based upon results of a national examination taken at the end of Standard 8.

The Indian school system also includes eight years of primary school, two years of secondary schooling, and two years of senior secondary schooling. Technically, education is free for students age 6-14 under the Right of the Child to Free and Compulsory Education (2009). However, these policies are hard to enforce, and other factors such as social exclusion, child labor, migrant children and children with special needs play a role in whether children are able to attend school. The Right to Education Act makes efforts to include these disadvantaged groups in increasing access to schooling.¹⁶

The Tanzanian school system includes two years of pre-primary education, seven years of primary schooling, four years of junior secondary and two years of advanced secondary. While primary education is free in theory, resource poor families struggle to afford school books and uniforms. Additionally, tuition fees exist at the secondary schooling level, posing additional financial barriers for resource poor families to support children in the transition from primary to secondary schooling.¹⁷

The Cambodian school system includes six years of primary education (starting at age 6) and six years of secondary education.¹⁸ Although primary education is technically free, enrollment fees tend to vary inversely with the parents' social position. Previous studies have found that the state bore very little of the expenses for primary education, often passing the burden to resource poor families. When families cannot afford the expenses of educating all of their children, parents often opt to educate the boys.¹⁹

The Ethiopian school system is comprised of six years of elementary education, two years of junior elementary and four years of senior secondary. The system faces challenges such as large pupil-teacher ratios, too few school supplies per student, and a requirement for student's to pass a promotion exam to move onto the next grade. Although no school fees exist in government schools, students must provide their own school supplies, and attendance is not compulsory, which may create incentives for resource poor families to opt out of education for some or all of their children.²⁰

Wealth Index

The POFO research team created a comparable wealth index based upon the DHS wealth index (WI) factor scores and data collected on a household's assets and physical characteristics. Using site-specific information, researchers ran linear regression models separately for rural and urban households to estimate the average contribution of these factors to the DHS wealth index. Parameter estimates from each site were used to predict WGI scores for each household, with predictions rescaled by site so the minimum score equaled zero and the mean score equaled one.²¹

¹⁶ Unicef India. "Education." Accessed at <http://www.unicef.org/india/education.html>

¹⁷ The Tanzania National Website. Accessed at <http://www.tanzania.go.tz/educationf.html>.

¹⁸ Bookbridge. The Education System in Cambodia. Accessed at <http://www.bookbridge.org/2012/03/the-education-system-in-cambodia/>

¹⁹ Classbase. Education System in Cambodia. Accessed at <http://www.classbase.com/countries/Cambodia/Education-System>

²⁰ Nguyen, Moses and Gabroy. Education in Ethiopia. Tulane University. Accessed at <http://www.tulane.edu/~rouxbee/kids98/ethiopia2.html>.

²¹ For more information on how the wealth index was constructed, see http://globalhealth.duke.edu/research-docs/POFO_Wealth_Index_Creation_sept-2010.pdf

APPENDIX D. Summary Statistics

Appendix D1. Frequency of OAC Status and Caregiver Relation by Site in All Rounds

OAC/ Caregiver Relation	Cambodia	Ethiopia	Hyderabad	Kenya	Nagaland	Tanzania	ASIA	AFRICA	ALL SITES
Single-Parent	284	325	406	503	531	382	1221	1210	2431
Single - Relative	202	130	161	181	222	202	585	513	1098
Double-Relative	152	144	69	83	56	196	277	423	700
Single-Nonrelative	12	12	12	39	26	7	50	58	108
Double-Nonrelative	8	22	8	14	8	21	24	57	81
Abandoned	27	25	87	38	15	5	129	68	197
Non orphans	140	128	188	172	196	165	524	465	989

Appendix D2. Main Variables of Interest at Baseline and 36 Month Follow Up

	Cambodia	Ethiopia	Hyderabad	Kenya	Nagaland	Tanzania	ALL SITES
Topscore at Baseline							
Mean (SD)	7.4 (2.57)	7.6 (2.57)	6.96 (1.86)	7.43 (2.68)	6.71 (2.15)	6.61(2.27)	7.12 (2.40)
Median	7	7	7	7	7	7	7
Range	[1,16]	[2,18]	[2,12]	[1,16]	[2,13]	[2,15]	[1,18]
N	300	300	300	300	279	302	1781
Topscore at 36 month follow up							
Mean (SD)	8.14 (2.63)	9.25 (2.03)	11.44 (2.25)	7.56 (2.61)	7.46 (1.56)	7.95 (1.83)	8.67 (2.61)
Median	8	9	11	7	7	7.5	8
Range	[1,17]	[1,15]	[6,18]	[3,18]	[4,14]	[4,14]	[1,18]
N	264	256	278	273	263	228	1562
Total Difficulties Self-Reported at Baseline							
Mean (SD)	14.22(5.49)	10.0(4.49)	13.74(4.89)	8.41(4.15)	8.25(3.37)	5.27(3.74)	10.17(5.68)
Median	14	10	14	8	8	5	10
Range	[2,30]	[1,17]	[3,26]	[1,19]	[1,17]	[0,18]	[0,30]
N	122	34	50	69	68	85	428
Total Difficulties Self-Reported at 36 month follow up							
Mean (SD)	11.30 (4.43)	3.58 (3.23)	7.10 (3.34)	12.23(2.88)	6.84 (2.59)	8.20 (7.66)	8.21 (5.18)
Median	11	3	7	12	7	4	8
Range	[2,29]	[0,15]	[1,18]	[4,23]	[1,13]	[0,30]	[0,30]
N	210	220	261	232	199	203	1325
Grade for Age at Baseline							
Mean (SD)	-0.41 (1.51)	0.26 (1.31)	-1.12 (1.32)	-1.11 (1.34)	-0.37 (1.30)	-0.17 (1.01)	-0.49 (1.39)
Median	0	0	-1	-1	0	0	0
Range	[-5,4]	[-6,5]	[-6,3]	[-5, 2]	[-6,3]	[-3, 3]	[-6, 5]
N	281	271	276	300	279	296	1703
Grade for Age at 36 month follow up							
Mean (SD)	-1.45 (1.84)	-1.40 (1.80)	-1.45 (1.32)	-2.34 (1.65)	-1.17 (1.52)	-1.52 (1.82)	-1.56 (1.70)
Median	-1	-1	-1	-2	-1	-1	-1
Range	[-10, 2]	[-8, 3]	[-7, 2]	[-9, 1]	[-9, 2]	[-9, 1]	[-10, 3]
N	256	253	272	264	260	218	1523
Trauma Total at Baseline							
Mean (SD)	2.83 (3.01)	1.32 (1.65)	1.85 (2.56)	1.22 (1.27)	1.05 (0.79)	2.15 (2.45)	1.74 (2.20)
Median	1	1	1	1	1	1	1
Range	[0,13]	[0,11]	[0,13]	[0,10]	[0,6]	[0,11]	[0,13]
N	300	300	300	300	279	302	1781
Trauma Total at 36 month follow up							
Mean (SD)	2.56 (1.87)	1.92 (1.64)	1.93 (1.28)	3.68 (2.16)	0.98 (0.62)	1.91 (1.71)	2.17 (1.82)
Median	2	2	2	3	1	1	2
Range	[0,12]	[0,9]	[0,7]	[0,10]	[0,3]	[0,7]	[0,12]
N	264	258	278	276	266	230	1572

The table above shows the mean, median, and range for the child's topscore, the Total Difficulties score, grade for age and cumulative exposure to trauma both at baseline and in the 36 month follow up. Overall, there are small increases over time in the topscore, with larger increases in Hyderabad. Total Difficulties vacillates by site, significantly decreasing in some sites over time, and increasing in Kenya and Tanzania. Changes in grade for age from baseline to the 36 month follow up show on average that children are falling further behind over time.

Frequency of exposure to trauma at baseline shows that children in Cambodia and Tanzania on average reported more instances of exposure to trauma (2.83 and 2.15 respectively) relative to other sites. The largest increases in exposure to trauma from baseline to the 36 month follow up occurred in Kenya (from 1.05 at baseline to 3.68 in R7), likely due to post-election violence. Nagaland maintains the lowest levels of trauma exposure of all six sites.

Appendix D3. Attrition: Likelihood of Dropping Out of the Study Given OAC Status, Gender, Site, Relation to Caregiver, Exposure to Trauma, Cognitive Development, Wealth and Emotional Difficulties

EQUATION	VARIABLES	(1) dropout	(2) dropout	(3) dropout	(4) dropout	(5) dropout	(6) dropout	(7) dropout
dropout	_Ioacstatus_1	0.20 (0.18)	0.18 (0.19)	0.17 (0.19)	-0.00 (0.20)	0.20 (0.23)	0.33 (0.32)	-0.01 (0.39)
	_Ioacstatus_2	0.29** (0.14)	0.27* (0.15)	0.27* (0.15)	0.25* (0.14)	0.47*** (0.17)	0.61** (0.25)	0.60** (0.29)
	_Ioacstatus_3	0.22 (0.17)	0.20 (0.18)	0.18 (0.18)	-0.05 (0.20)	0.41** (0.21)	0.62** (0.29)	0.20 (0.38)
	Female	0.14 (0.11)	0.14 (0.11)	0.11 (0.11)	0.12 (0.11)	0.10 (0.12)	0.13 (0.16)	0.06 (0.18)
	Ethiopia	-0.23 (0.19)	-0.20 (0.20)	-0.03 (0.20)	-0.25 (0.20)	-0.58** (0.27)	-1.24*** (0.42)	-1.27** (0.58)
	Hyderabad	-0.46** (0.20)	-0.46** (0.20)	-0.25 (0.21)	-0.46** (0.20)	0.00 (0.23)	-0.81*** (0.31)	-0.29 (0.37)
	Kenya	-0.80*** (0.22)	-0.79*** (0.22)	-0.89*** (0.23)	-0.76*** (0.22)	-1.22*** (0.32)	-1.53*** (0.38)	-1.22*** (0.45)
	Nagaland	-1.46*** (0.27)	-1.43*** (0.28)	-1.58*** (0.29)	-1.47*** (0.28)	-2.09*** (0.45)	-2.02*** (0.49)	-1.30** (0.54)
	Tanzania	1.03*** (0.16)	1.04*** (0.16)	0.91*** (0.16)	1.03*** (0.16)	1.40*** (0.20)	0.95*** (0.23)	1.35*** (0.30)
	Parent				-0.26 (0.22)			-0.27 (0.40)
	Grandparent				0.01 (0.24)			0.11 (0.42)
	Note related				-0.66 (0.44)			-0.75 (0.83)
	Relative				0.26 (0.24)			0.14 (0.44)
	TraumaTotal		0.02 (0.03)					0.12*** (0.04)
	Topscore			-0.11*** (0.02)				-0.04 (0.04)
	Pred_wealthindexf					-0.14 (0.11)		0.06 (0.16)
	Total Difficulties SR						0.01 (0.02)	-0.01 (0.02)
	Total Difficulties CGR						0.01 (0.02)	-0.00 (0.02)
	Constant	-2.89*** (0.18)	-2.93*** (0.19)	-2.00*** (0.26)	-2.68*** (0.28)	-3.33*** (0.26)	-3.31*** (0.35)	-3.50*** (0.73)
	Observations	6,304	6,304	6,036	6,304	6,107	3,343	3,247

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Using logistic regressions, I estimated the likelihood that the population of children who dropped out of the study are significantly different from those who stayed. The variable called “dropout” identifies if a child drops from the study after baseline and before the 36 month follow up. I test all relevant correlates and outcomes of interest to identify if any of these factors are driving attrition. Results show that dropout rates are higher for maternal orphans and in Tanzania. When tested individually, children with higher topscores appear more likely to drop out, but when controlling for other factors, this difference loses significance. Children reporting greater exposure to trauma are also more likely to drop out of the study. However, children who drop out are not statistically different from the children who stay in terms of wealth and emotional difficulties. These results show that, at least for the observable factors of interest, attrition is not a significant issue. However, this analysis cannot account for unobservable factors that might be driving attrition and that may cause those who stay in the study to differ from those who leave.

APPENDIX E. Additional Analyses

Time Analyses

To use the time component available in the panel data, I ran 3 analyses to check how the relationship between emotional difficulties and cognitive development progresses over time:

1. OLS Estimate of Topscore Predicted by Total Difficulties in the 36 Month Follow-Up and Caregiver Reported Total Difficulties at Baseline
2. OLS Estimate of Topscore Predicted by Total Difficulties in the 36 Month Follow-Up and Topscore at Baseline
3. Fixed Effects Estimate of Topscore Predicted by Total Difficulties and the Interaction between Total Difficulties and Topscore at Baseline

Appendix E1A. OLS Estimate of Topscore Predicted by Total Difficulties in the 36 Month Follow Up and Controlling for Caregiver Reported Total Difficulties at Baseline

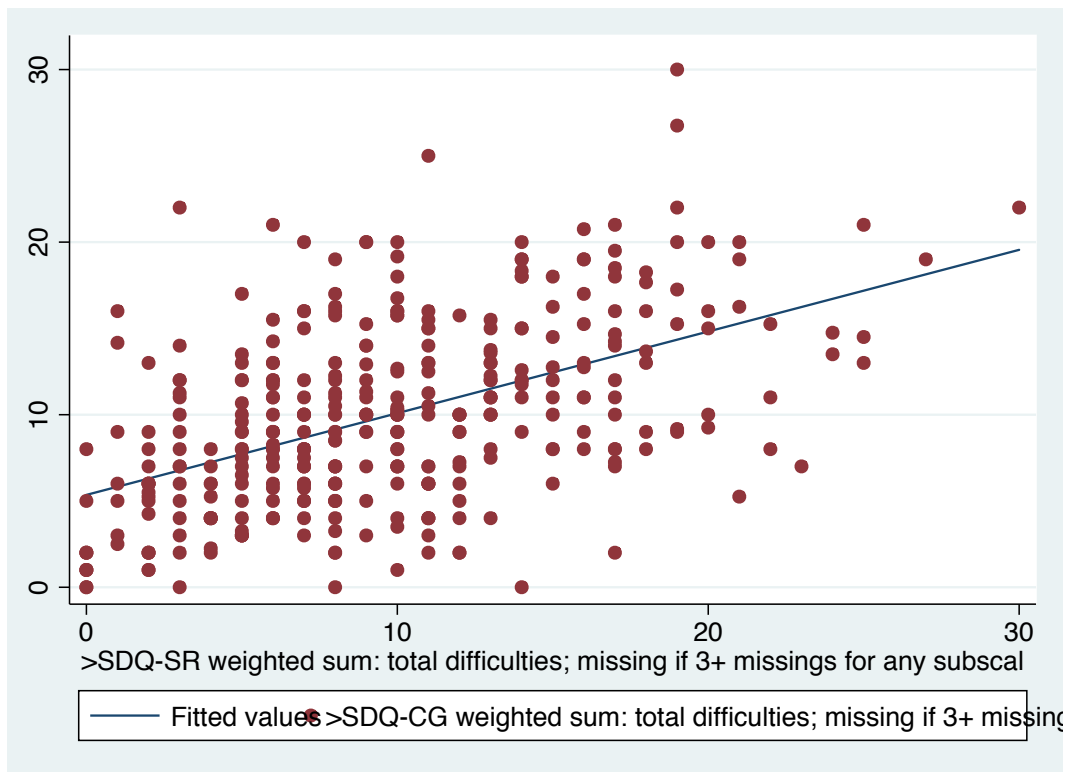
VARIABLES	Cambodia topscore	Ethiopia topscore	Hyderabad topscore	Kenya topscore	Nagaland topscore	Tanzania topscore	ASIA topscore	AFRICA topscore	ALL SITES topscore
Total Difficulties	-0.08** (0.03)	-0.14*** (0.04)	0.04 (0.05)	-0.25*** (0.06)	-0.11** (0.05)	-0.11*** (0.01)	-0.05 (0.05)	-0.13* (0.03)	-0.10*** (0.02)
Age in months	-0.01 (0.01)	0.02** (0.01)	-0.02** (0.01)	-0.00 (0.01)	-0.02*** (0.01)	0.00 (0.01)	-0.02** (0.00)	0.01 (0.00)	-0.01 (0.01)
Single-Parent	-0.74 (0.49)	0.60 (0.39)	0.84* (0.47)	-0.43 (0.44)	0.49 (0.48)	0.12 (0.37)	0.18 (0.38)	0.06 (0.30)	0.12 (0.25)
Single-Relative	-0.42 (0.52)	0.42 (0.53)	0.81 (0.54)	-1.15* (0.61)	-0.32 (0.48)	0.75* (0.41)	-0.07 (0.44)	-0.08 (0.61)	-0.08 (0.35)
Double-Relative	-1.24* (0.63)	0.74 (0.50)	1.17 (0.71)	-0.77 (0.75)	0.40 (0.85)	1.06** (0.47)	-0.14 (0.69)	0.39 (0.53)	0.17 (0.45)
Single-Nonrelative	0.28 (0.57)	0.28 (0.77)	-0.14 (0.67)	-0.15 (1.01)	-0.03 (0.62)		-0.36 (0.13)	0.24 (0.23)	-0.00 (0.21)
Double-Nonrelative	3.57*** (0.77)	0.11 (0.51)	-0.43 (0.58)	0.82 (0.99)	0.36 (0.45)	-0.21 (0.62)	0.16 (0.74)	-0.05 (0.24)	-0.01 (0.28)
Abandoned	-0.74 (1.57)	0.18 (0.57)	0.57 (0.43)	-0.65 (0.85)	0.54 (0.70)	-0.08 (1.17)	-0.02 (0.30)	-0.13 (0.22)	-0.09 (0.22)
Cg_illiterate	0.17 (0.37)	-0.06 (0.25)	0.14 (0.29)	-0.35 (0.36)	-0.08 (0.30)	0.00 (0.30)	0.02 (0.14)	-0.16 (0.16)	-0.04 (0.10)
Female	-1.16*** (0.36)	-0.14 (0.25)	-0.34 (0.30)	-0.73** (0.35)	-0.06 (0.26)	0.03 (0.22)	-0.53 (0.29)	-0.30 (0.21)	-0.44** (0.16)
Wealth_index	0.85** (0.34)	0.57** (0.23)	0.82** (0.38)	0.48* (0.29)	0.01 (0.25)	0.24 (0.19)	0.50 (0.27)	0.48* (0.11)	0.46*** (0.10)
TraumaTotal	0.10 (0.09)	-0.21** (0.09)	0.03 (0.12)	0.20** (0.09)	-0.31 (0.30)	-0.15** (0.06)	0.10* (0.03)	-0.00 (0.15)	0.03 (0.08)
CgSDQ_bl	-0.04 (0.03)	-0.03 (0.02)	-0.06** (0.03)	-0.04 (0.04)	0.01 (0.03)	-0.02 (0.03)	-0.03 (0.02)	-0.03** (0.00)	-0.02** (0.01)
Ethiopia								0.89** (0.12)	0.44* (0.21)
Hyderabad							3.17*** (0.22)		2.92*** (0.12)
Kenya								0.36 (0.24)	-0.43** (0.14)
Nagaland							-1.05** (0.17)		-1.37*** (0.17)
Tanzania									-0.48** (0.14)
Constant	11.02*** (1.53)	7.11*** (1.26)	13.88*** (1.84)	11.12*** (1.85)	10.71*** (1.27)	8.60*** (1.00)	10.94*** (0.45)	8.08** (0.86)	9.97*** (0.64)
Observations	188	217	260	228	196	201	644	646	1,290
R-squared	0.17	0.19	0.07	0.16	0.11	0.27	0.47	0.21	0.37

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The results above indicate that, even when controlling for the child's level of emotional difficulties at baseline, there is still a negative and significant relationship between a child's emotional difficulties and his/her topscore in the 36-month follow up. Since child self-reports are limited at baseline (only about 1/5 of the children are reporting on this in the baseline round), I use the caregiver reports as a proxy. Below is

a scatter plot of the relationship between the caregiver and self-report of the child’s total difficulties (for those who did report). The two variables are significantly related (p-value of 0.00 and coefficient of 0.47 when I regress the caregiver report on the child self-reports). As a child reports one additional unit on the total difficulties scale, caregivers are reporting approximately half a point increase. These data indicate that caregivers may be underreporting the child’s level of emotional difficulties, or children may be over-reporting, though the latter is less likely. Nevertheless, it is important to note that, accounting for the child’s average level of emotional difficulties at baseline, we still see a negative and significant relationship between the child’s emotional difficulties and performance on the KABC tests in the 36 month follow up.

Appendix E1B Caregiver Reported Total Difficulties v. Self-Reported Total Difficulties at Baseline



The scatterplot above shows that caregivers underreport the level of emotional difficulties experienced by the child. Children for whom the caregiver reports essentially no emotional difficulties (0 on the caregiver report scale) are all self-reporting difficulties.

Appendix E.2 OLS Estimate of Topscore Predicted by Total Difficulties in 36 Month Follow Up Controlling for Topscore at Baseline

VARIABLES	Cambodia topscore	Ethiopia topscore	Hyderabad topscore	Kenya topscore	Nagaland topscore	Tanzania topscore	ASIA topscore	AFRICA topscore	ALL SITES topscore
Total Difficulties	-0.08** (0.04)	-0.13*** (0.05)	0.03 (0.04)	-0.23*** (0.05)	-0.11** (0.05)	-0.11*** (0.01)	-0.05 (0.04)	-0.13** (0.02)	-0.10*** (0.02)
Age in months	-0.00 (0.01)	0.02*** (0.01)	-0.01 (0.01)	0.00 (0.01)	-0.01** (0.01)	0.00 (0.01)	-0.01 (0.00)	0.01 (0.00)	0.00 (0.00)
Single-Parent	-0.47 (0.40)	0.54 (0.39)	0.98** (0.49)	-0.39 (0.39)	0.36 (0.49)	0.12 (0.36)	0.28 (0.39)	0.05 (0.27)	0.16 (0.25)
Single-Relative	-0.14 (0.39)	0.34 (0.52)	0.96* (0.57)	-1.12** (0.52)	-0.34 (0.49)	0.69* (0.40)	0.14 (0.46)	-0.13 (0.58)	-0.01 (0.34)
Double-Relative	-0.51 (0.51)	0.65 (0.49)	1.13 (0.71)	-0.48 (0.70)	0.27 (0.84)	1.01** (0.44)	0.11 (0.51)	0.38 (0.45)	0.27 (0.38)
Single-Nonrelative	-1.37*** (0.50)	0.21 (0.83)	0.45 (0.75)	-0.13 (1.06)	-0.08 (0.58)		-0.03 (0.32)	0.24 (0.24)	0.15 (0.21)
Double-Nonrelative	1.37*** (0.51)	-0.13 (0.50)	-0.37 (0.63)	0.92 (0.87)	0.14 (0.49)	-0.12 (0.59)	-0.14 (0.37)	-0.11 (0.35)	-0.09 (0.30)
Abandoned	-1.06 (1.20)	0.13 (0.54)	0.69 (0.44)	-1.19 (0.77)	0.45 (0.68)	-0.31 (1.15)	0.16 (0.30)	-0.32 (0.38)	-0.07 (0.30)
Cg_illiterate	0.14 (0.30)	-0.03 (0.25)	0.13 (0.29)	-0.39 (0.32)	-0.06 (0.29)	0.03 (0.29)	0.05 (0.11)	-0.14 (0.18)	-0.03 (0.11)
Female	-0.69** (0.30)	-0.12 (0.25)	-0.30 (0.30)	-0.85*** (0.31)	-0.08 (0.25)	0.04 (0.22)	-0.46 (0.19)	-0.29 (0.25)	-0.41** (0.14)
Wealth_index	0.46* (0.28)	0.58** (0.22)	0.92** (0.39)	0.17 (0.26)	-0.09 (0.24)	0.16 (0.19)	0.34 (0.26)	0.36 (0.17)	0.33** (0.12)
TraumaTotal	-0.01 (0.08)	-0.20** (0.09)	0.01 (0.12)	0.19** (0.08)	-0.23 (0.31)	-0.15** (0.06)	0.06** (0.01)	0.01 (0.14)	0.02 (0.07)
Topscore_bl	0.57*** (0.06)	0.08* (0.05)	0.07 (0.08)	0.39*** (0.06)	0.12** (0.06)	0.12** (0.05)	0.27 (0.17)	0.22 (0.11)	0.25** (0.08)
Ethiopia								0.54 (0.19)	0.39* (0.19)
Hyderabad							3.32*** (0.16)		3.08*** (0.12)
Kenya								0.06 (0.31)	-0.39** (0.13)
Nagaland							-0.68** (0.14)		-1.03*** (0.20)
Tanzania									-0.18 (0.16)
Constant	5.33*** (1.33)	5.59*** (1.31)	10.60*** (1.76)	7.14*** (1.82)	9.48*** (1.29)	7.58*** (1.02)	7.42** (1.53)	5.93*** (0.51)	7.14*** (0.73)
Observations	188	217	260	228	196	201	644	646	1,290
R-squared	0.44	0.20	0.05	0.32	0.13	0.29	0.50	0.27	0.41

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The results above also indicate that accounting for the child’s cognitive development at baseline, the child’s emotional difficulties still hold a negative and significant relationship to their cognitive development. The only change is in Hyderabad (where the coefficient loses significance and goes positive) and the “Asia” model, where the coefficient loses significance. The positive coefficient on the baseline topscore variable, which is significant in every site except Hyderabad and is significant in the “All Sites” model, confirms that those children who are doing better at baseline tend to do better on the KABC tests in the following rounds.

Appendix E3. Fixed Effects Estimate of Topscore Predicted by Total Difficulties Controlling for Interaction between Total Difficulties and Outcomes at Baseline

VARIABLES	Cambodia topscore	Ethiopia topscore	Hyderabad topscore	Kenya topscore	Nagaland topscore	Tanzania topscore	ASIA topscore	AFRICA topscore	ALL SITES topscore
Total Difficulties	-0.01 (0.02)	-0.07 (0.05)	-0.09** (0.04)	-0.09*** (0.03)	-0.12*** (0.03)	-0.10*** (0.02)	-0.10*** (0.02)	-0.09*** (0.01)	-0.10*** (0.01)
Age in Months	0.02* (0.01)	0.03*** (0.01)	0.13*** (0.01)	0.03*** (0.01)	0.04*** (0.01)	0.06*** (0.01)	0.07*** (0.01)	0.04*** (0.00)	0.05*** (0.00)
Trauma Total	0.02 (0.05)	-0.29** (0.11)	0.39*** (0.07)	0.11* (0.06)	0.28* (0.16)	-0.02 (0.05)	0.15*** (0.04)	-0.03 (0.03)	0.03 (0.03)
Sdq_topscore	-0.00 (0.00)	0.00 (0.01)	-0.00 (0.00)	0.01** (0.01)	0.00 (0.01)	0.02*** (0.01)	0.00 (0.00)	0.01*** (0.00)	0.00* (0.00)
Constant	4.84** (1.96)	4.93*** (1.34)	-8.33*** (1.80)	3.04** (1.38)	2.73* (1.57)	-0.02 (0.91)	-0.48 (1.02)	2.43*** (0.69)	2.26*** (0.54)
Observations	495	429	705	586	558	645	1,758	1,660	3,418
R-squared	0.07	0.16	0.34	0.07	0.08	0.23	0.17	0.13	0.14
Number of uniqueid	232	230	276	240	210	257	718	727	1,445

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The results in Appendix E3 show that controlling for an interaction between the child’s emotional difficulties and topscore at baseline, the relationship between emotional difficulties and cognitive development is still negative and significant in a fixed effects model (except for Cambodia and Kenya, which are negative but not significant). This model offers additional evidence that, accounting for child differences at baseline on both the explanatory variable and outcome, the child’s cognitive development varies negatively with increases in emotional difficulties. This analysis and the previous analysis taken together help to weaken any theories that reverse causality may fully explain the significant relationship we see. Even when accounting for the child’s cognitive development and level of emotional difficulties at baseline, we still see significant and negative associations between emotional difficulties and cognitive development.

APPENDIX E4. Mediation Analysis

To better understand the extent to which emotional difficulties plays a role in the relationship between cognitive development and orphanhood, I use a simple mediation analysis model with orphan status (1 = orphan, 0 = non-orphan) as the independent variable, cognitive development as the dependent variable, and emotional difficulties as the mediating variable. In general, a variable may be considered a mediator if it can be said to carry a portion of the influence that an independent variable has over an outcome of interest (or dependent variable). We interpret mediation to be present when the following four conditions hold:

1. The independent variable has a significant relationship with the mediating variable (path a).
2. The independent variable has a significant relationship with the outcome of interest (the dependent variable) in the absence of the mediating variable (path c).
3. The mediator has a significant and unique effect on the outcome of interest. (path b – the indirect effect)
4. The effect of the independent variable shrinks (in magnitude or significance) when adding the mediator to the model (path c' – the direct effect).²²

Using the Sobel Goodman mediation test, I tested for mediation effects controlling for age, gender, whether the caregiver was biologically related, exposure to the trauma of physical or sexual abuse, caregiver illiteracy and wealth. The table below shows the results of this analysis.

Appendix E4A Results of Mediation Analysis

EFFECT	Coefficient	P-value
Path c (Total Effect)	-0.22*	0.099
Path a	0.97***	0
Path b	-0.089***	0
Indirect Effect	-0.087***	0
Path c' (direct effect)	-0.14	0.3
Proportion of total effect that is mediated	0.39	
BOOTSTRAPPED STANDARD ERRORS		
Indirect Effect	-0.086***	0.00
Direct Effect	-0.14	0.29

The table above shows fulfillment of all four criteria. Orphan status is negatively and significantly associated at the 10% level with a child's top score on the KABC tests (coefficient is -0.22 and p-value of 0.099) (path c). Orphan status also is positively correlated with a child's emotional difficulties (p-value 0.00) – being an orphan relative to non-orphans is associated with a 0.97 level increase in the total difficulties scale (path a). Controlling for orphan status and all other factors in the model, emotional

²² Institute for Digital Research and Education. How to Perform Sobel-Goodman Mediation Tests in Stata. Accessed at <http://www.ats.ucla.edu/stat/stata/faq/sgmediation.htm>.

difficulties has a negative and significant relationship with a child's cognitive development (p-value 0.00) – as emotional difficulties increases by one unit, the child's topscore on the KABC test decreases by 0.089 (path b). The indirect effect, which is defined as the product of path a and path b, is negative and significant (coefficient -0.87 with a p-value of 0.00). Notably, when controlling for emotional difficulties, the relationship between orphan status and topscore diminished both in magnitude and in significance (coefficient decreasing in absolute value from -0.22 to -0.137, p-value increasing from 0.099 to 0.3). These results show that 39% of the total effect of orphanhood on topscore is mediated through the child's emotional difficulties.

To double check the significance of the indirect effect, I also re-ran the analysis with bootstrapped standard errors, resulting in a p-value of 0.00 for the indirect effect and 0.29 for the direct effect (similar to the initial analysis). I interpret this to suggest that once emotional difficulties are included in the model, the relationship between orphan status and cognitive development is weakened to the point where it is no longer significant at even the 15% level.

These results indicate that a proportion (approximately 0.39) of the relationship between orphan status and cognitive development is mediated by, or rather explained by, the child's emotional difficulties, thus giving us further insight into the relationship between whether a child is an orphan and their cognitive development. Nevertheless, this analysis is simplified and has several limitations. Firstly, it does not account for differences within sites, nor does it fully consider the effects of the exposure to trauma since it only controls for a binary variable identifying whether a child experience one typed of trauma, physical or sexual abuse. Additionally, this analysis does not account for changes over time, or any possible circular effects or feedback loops that may be occurring between these various factors. It also does not account for any error correlations resulting from multiple observations of each child, or within sites.

Despite its crude specification, I performed this analysis in an attempt to capture some of the nuances of the interaction amongst the many factors that predict an orphan's cognitive development. It is likely that much of the inconsistent results we find in the literature on educational attainment for orphans neglect to disentangle a host of intervening factors that work with and through each other to influence child outcomes. This analysis can offer evidence, though likely biased in its estimation, that at least a portion of the negative effects of orphanhood are working through the trauma and subsequent emotional difficulties that an orphaned child experiences.

APPENDIX F. Bibliography

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