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Association Between Family Composition and the Well-Being of Vulnerable Children in Nairobi, Kenya

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Abstract The objective of this study is to examine the relationship between a vulnerable child's family composition (family size and primary caregiver) and three child well-being indicators (immunization status, access to food, educational security). Using 2006–2009 intake data from a Kenyan non-governmental aid agency, this cross-sectional study evaluated a population of 1,424 children in two urban slum settlements in Nairobi. Logistic regression was used to obtain adjusted odds ratios and 95% confidence intervals to examine the relationship between family composition measures and child well-being. Multivariate results were also stratified by orphan status. Vulnerable children who live in household sizes of 4–6 members and vulnerable children who live with non-relatives had greater odds of inadequate immunization (OR = 1.51, 95% CI: 1.13–2.01, OR = 9.02, 95% CI: 4.62–17.62). Paradoxically, vulnerable children living with non-relative caregivers were at lower risk for inadequate food (OR = 0.19, 95% CI 0.07–0.33). Single orphans with an HIV positive parent were less likely to be fully immunized than single orphans with an HIV negative parent. The results provide information on specific groups which could benefit from increased attention related to childhood immunization education and intervention programs. The findings also underscore the need for policies which support families as a means of supporting vulnerable children. Finally, findings reinforce the wisdom of programs which target vulnerable children based on needs, rather than orphan status. These findings can be useful for informing future program and policy development designed to meet needs of vulnerable children.

Keywords Orphan and vulnerable children · Family · Africa · Child health · Immunizations

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Introduction

According to the World Health Organization (WHO), an African child faces more health risks than a child born in any other part of the world [1]. Children born in Africa are at risk for malnourishment, for contraction of preventable diseases, for the loss of a parent due to complications in childbirth or to HIV/AIDS, and for the challenges associated with poverty [1]. Such a grim assessment underscores the vulnerability of the African child.

Academic research has proposed a definition of childhood vulnerability which addresses three fundamental areas of childhood dependence: material, social, and emotional needs [2, 3]. The absence or limited access to any of these three fundamental resource areas may be used to define a vulnerable child [2, 3]. Vulnerable children, especially those who are orphaned, are exposed to fundamental losses of relationships and resources, which are "essential to the survival, protection, and development of children" [4]. Such losses may contribute directly or indirectly to poor childhood well-being.

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The East African country of Kenya estimates that approximately 8.6 million of its 18 million children are vulnerable children [5]. Many of Kenya's vulnerable children are also orphans, and many of those children are orphaned because of AIDS. The Kenyan orphan population from all causes is approximately 2.5 million children [6]; between 1 and 1.4 million of those children are orphaned by AIDS [7].

While much research has been done to evaluate the association between type of orphaning and well-being, with a specific focus on orphaning related to AIDS, little research has been done to evaluate the association between the broader category of vulnerable children, their current family composition, and their well-being [3, 8–10]. Research has shown that child well-being is associated with both who heads the household within which the child lives and how many people live in that household [11–15]. While there have been some conflicting findings for developing countries, overall, larger family sizes have been associated with lower school enrollment, lower likelihood of being at-grade-for-age, decreased educational performance, sub-optimal infant feeding patterns, and negative childhood nutritional status [11, 13, 15]. Previous studies have yielded mixed results when examining family size and immunization status among African families. Kamau and Esamai [14] found better immunization outcomes in children living in smaller families, which they attributed to younger, better educated mothers. In contrast, Gage et al. [8] reported that children living in smaller households had poorer immunization outcomes than children from larger families, possibly attributable to the greater earning potential in a large family.

The head of a child's household has also been shown to have an influence on the child's well-being. Single-parent, female-headed, or grandparent-headed households are associated with poor nutritional outcomes, lower school enrollment and attendance, and lower incidence of at-grade-for-age status [16, 17]. In addition, it has been reported that a positive maternal HIV status is associated with decreased immunizations among children [18].

Despite the fact that the orphanhood numbers in Kenya are high [7], an estimated 95% of orphans remain in some kind of family setting [19]. In rural areas, this family fostering is disproportionately provided by older, single, female family members often living in poverty [20]; there is little research however, on the nature of extended family care for orphans or vulnerable children in urban settlement settings.

Immunization status, educational security, and access to food are three well-recognized measures of a child's well-being. Immunizations are proven public health interventions which help eradicate serious and potentially life-threatening infectious diseases, and save an estimated 2 million lives yearly [21].

Education, especially for vulnerable populations, provides a child with resources for life and is leverage for improving a child's prospects for long-term economic and social well-being [22]. For any child, the ability to remain in school has been suggested as a protective factor for reducing risky attitudes towards sexual practices [23], for reducing infection by HIV [24], and is related to later child-bearing and reduced lifetime poverty [22].

Access to an adequate supply of food is one of the most fundamental of human needs. This is especially true in children who need adequate food to prevent stunted growth and diseases related to poor nutrition [25, 26]. In addition to physical effects, inadequate nutrition has been linked to psychosocial issues, poor educational outcomes, and poor emotional well-being [25, 27, 28].

This study aims to expand on prior research related to vulnerable children and their well-being by examining the effects that family size and caregiver relationship to the child have on immunization status, educational security, and access to food among a population of vulnerable Kenyan children. The study hypothesizes that among vulnerable children, larger family size and non-parent care-givers are associated with poorer child well-being indicators.

Methods

Study Design and Sample

This cross-sectional study uses de-identified secondary data extracted from 2006 to 2009 child enrollment forms from a non-governmental agency working in the Dandora and Mukuru slums of Nairobi, Kenya. The original data came from consecutive needs assessment forms used to evaluate children, birth to 18 years of age, for enrollment into HOPE worldwide Kenya's Orphan and Vulnerable Children's (OVC) Support Program. At-risk families were referred to HOPE primarily by local school officials. Trained HOPE staff completed the forms during face-to-face interviews with each child's primary caregiver. Children were considered "vulnerable" by HOPE based on a number of criteria including chronic illness or loss of a parent, unknown birth registration or guardianship status, or inadequate housing, sanitation, income, healthcare, or food. The 1,424 children ultimately included in the study had been accepted into the HOPE OVC program and were thus considered vulnerable for the purpose of this study.

Instrument

The HOPE enrollment form comes from the *Child Needs Assessment Tool Kit*, originally created in 2002 by the Task Force for Child Survival and Development. This assessment

instrument was commissioned by the World Bank's Early Child Development Team and incorporated questions from previously administered surveys [29]. The reliability and validity of this assessment tool was evaluated using pilot surveys and cluster-sampling field tests conducted in multiple sites in southern Africa [29]. The original survey questionnaire was designed for community-based assessments in high AIDS prevalence areas, but the general nature of the survey has allowed it to be used in other settings where children are orphaned or vulnerable [30].

Family Composition Variable

The independent variable, family composition, was measured in two ways. The first measure of family composition was a categorical description of the child's primary caregiver (parent, relative, non-relative). The second measure of family composition was the size of the family, defined as the number of people living in the household, excluding the child. With no clear precedent from previous studies on the best operationalization of family size, this continuous variable was collapsed into size categories (0–3, 4–6, 7–9, ≥10 family members) for purpose of interpretation. Information on both variables was care-giver-reported during completion of the child enrollment form.

Child Well-Being Variables

Three care-giver-reported measures of child well-being were evaluated as the dependent outcomes of interest. The first variable was immunization status, measured as a dichotomous variable indicating whether a child was fully immunized for his/her age. The second outcome variable of interest was access to food. If a child averaged one or fewer meals per day, the child was not considered to have adequate access to food. If a child had two or more meals per day on average, the child was considered to have adequate access to food. The third outcome of interest was educational security, which was measured as a dichotomous variable that indicated whether a child was in school with school fees paid to date.

Covariates

Multiple covariates were collected for evaluation as potential confounders: the age (continuous) and sex of children and caregivers, parents' HIV status (yes or no), care-giver-reported access to regular income (yes or no), care-giver-reported access to health care (yes or no), and the urban settlement in which the child lived (Dandora or Mukuru). In addition, orphan status was evaluated as an effect modifier and measured as a care-giver-reported categorical variable: non-orphan, single orphan (having lost one parent), or double orphan (having lost both parents) [3].

Statistical Analysis

HOPE provided information on 1,799 children for study purposes. Of these 1,799 children, 220 (12.2%) were removed from the analysis because they did not have at least one family composition and one well-being variable. Children who lived alone (n = 3) and children who lived in an orphanage (n = 50) were also excluded from analysis, as were children missing the following covariates: child's sex (n = 5), child's age (n = 25), caregiver's sex (n = 19), caregiver's age (n = 21), access to income (n = 25), and access to health care (n = 21). After these exclusions, 1,424 children remained for analysis. Children who were missing data on a particular family composition or well-being variable were excluded from that respective regression model, thus each regression model has a unique n-value, as listed in Table 3.

Descriptive statistics were calculated for the demographic data, and standard frequencies and percentages were calculated for each variable of interest. Logistic regression was used to calculate unadjusted odds ratios and 95% confidence intervals to identify crude associations between the family composition variables, covariates, and the various outcome measures of child well-being.

Multiple logistic regression analysis was used to evaluate the adjusted relationships between the measures of child well-being and family composition. All covariates were entered into each regression model for family composition and well-being outcomes. Using the backward elimination feature of SAS (SAS Institute, Cary, NC, USA) variables that did not contribute to each of the models at the 0.10 level were dropped and the remaining variables were retained as confounders.

Finally, stratified analyses were conducted to determine if orphan status was an effect modifier of any of the family composition-child well-being associations. All statistics were calculated using the SAS statistical software, version 9.2 (SAS Institute, Cary, NC, USA). Results were considered statistically significant at the 0.05 level.

Approval for this secondary data analysis study protocol was obtained from the Institutional Review Board for the University of North Carolina at Charlotte. HOPE worldwide Kenya provided written permission for use of their de-identified data.

Results

The univariate statistics (Table 1) describe a final study population of 1,424 vulnerable children between the ages of birth to 18 years living in the Dandora or Mukuru settlements of Nairobi. The mean age of a child was 9.3 years, with non-orphans slightly younger (mean = 7.4 years) and

Table 1 Univariate statistics for study population of vulnerable children in Dandora and Mukuru, Kenya

Characteristic	All children		Non-orphans		Single orphans		Double orphans	
	n = 1,424	%	n = 327	%	n = 760	%	n = 337	%
Age of child in years	Mean = 9.3		Mean = 7.4		Mean = 9.6		Mean = 10.3	
Sex of child								
Male	717	50.3	171	52.3	390	51.3	156	46.3
Female	707	49.7	156	47.7	370	48.7	181	53.7
Is child an orphan?								
Not an orphan	327	22.9						
Single orphan	760	53.4						
Double orphan	337	23.7						
Does child have an HIV+ parent?								
Yes	674	47.3	244	74.6	375	49.3	55	16.3
No	750	52.7	83	25.4	385	50.7	282	83.7
Age of caregiver	Mean = 36.7 years		Mean = 33.3 years		Mean = 36.3 years		Mean = 40.7 years	
Sex of caregiver								
Male	148	10.4	24	7.3	74	9.7	50	14.8
Female	1,276	89.6	303	92.7	686	90.3	287	85.2
Relationship of caregiver to child								
Parent	1,008	70.8	303	92.7	678	89.2	27	8.0
Relative	356	25.0	18	5.5	69	9.1	269	79.8
Non-relative	46	3.2	1	0.3	6	0.8	39	11.6
Missing or DK	14	1.0	5	1.5	7	0.9	2	0.6
Household size (# in home excluding child)								
0–3 people	512	36.0	95	29.1	312	41.1	105	31.2
4–6 people	632	44.4	188	57.5	323	42.5	121	35.9
7–9 people	189	13.3	34	10.4	100	13.2	55	16.3
10 or more people	50	3.5	7	2.1	16	2.1	27	8.0
Missing or DK	41	2.9	3	0.9	9	1.2	29	8.6
Slum settlement location								
Dandora	386	27.1	51	15.6	227	29.9	108	32.1
Mukuru	1,038	72.9	276	84.4	533	70.1	229	67.9
Does family have a regular source of income?								
Yes	150	10.5	53	16.2	62	8.2	35	10.4
No	1,274	89.5	274	83.8	698	91.8	302	89.6
Does the child have access to regular health care?								
Yes	681	47.8	139	42.5	388	51.1	154	45.7
No	743	52.2	188	57.5	372	48.9	183	54.3
Are child's immunizations up-to-date?								
Yes	1,037	72.8	257	78.6	590	77.6	190	56.4
No	328	23.0	60	18.3	146	19.2	122	36.2
Missing or DK	59	4.1	10	3.1	24	3.2	25	7.4
Does child have adequate access to food?								
Yes	853	59.9	220	67.3	428	56.3	205	60.8
No	562	39.5	104	31.8	327	43.0	131	38.9
Missing or DK	9	0.6	3	0.9	5	0.7	1	0.3
Is the child educationally secure?								
Yes	271	19.0	83	25.4	127	16.7	61	18.1
No	1,018	71.5	191	58.4	571	75.1	256	76.0
Missing or DK	135	9.5	53	16.2	62	8.2	20	5.9

HOPE OVC enrollment data, 2006–2009

double-orphans slightly older (mean = 10.3 years). Over 75% of the children in the study had lost one or both parents. Results showed that 23% of the children were not fully immunized for their age. Over 39% percent of children averaged one or fewer meals per day and 71.5% of the children were reported educationally insecure.

Table 2 presents the unadjusted associations between household size, caregiver, and the outcomes of well-being. Vulnerable children in household sizes of 4–6 members (OR = 1.51, 95% CI: 1.13–2.01) were significantly more likely to not be fully immunized than children in the referent group (households sized 0–3). Children living with relatives (OR = 1.63, 95% CI: 1.23–2.17) or non-relatives (OR = 9.02, 95% CI: 4.62–17.62) were both significantly more likely to not be fully immunized than the referent group (children living with parents). Children living with non-relatives, however, were less likely to have inadequate food (OR = 0.19, 95% CI 0.07–0.48) than a child living with a parent.

After adjustment (Table 3) for access to health care, orphan status, slum location, and child's age, the 4–6 household size and poor immunization association

Table 2 Unadjusted odds ratios and 95% confidence intervals for family composition variables, child vulnerability indictors and selected covariates

Characteristic	Not immunized (n = 1,353)		Poor food access (n = 1,428)		Education insecure (n = 1,303)	
	OR	95% CI	OR	95% CI	OR	95% CI
Household size (excluding child)						
0–3	1.00	Referent	1.00	Referent	1.00	Referent
4–6	1.51	1.13–2.01	1.02	0.80–1.30	0.58	0.43–0.79
7–9	1.28	0.85–1.94	1.27	0.91–1.78	0.90	0.56–1.43
≥10	1.85	0.95–3.59	0.72	0.39–1.33	1.67	0.64–4.36
Caregiver						
Parent	1.00	Referent	1.00	Referent	1.00	Referent
Relative	1.63	1.23–2.17	1.24	0.97–1.58	1.38	0.99–1.92
Non-relative	9.02	4.62–17.62	0.19	0.07–0.48	0.36	0.19–0.67
Regular income						
No	1.00	Referent	1.00	Referent	1.00	Referent
Yes	0.98	0.65–1.46	0.42	0.28–0.62	0.82	0.54–1.24
Health care access						
No	1.00	Referent	1.00	Referent	1.00	Referent
Yes	0.36	0.28–0.47	0.62	0.50–0.77	1.24	0.95–1.63
Parent HIV+						
No	1.00	Referent	1.00	Referent	1.00	Referent
Yes	0.75	0.58–0.96	0.88	0.72–1.10	0.61	0.47–0.80
Caregiver's gender						
Female	1.00	Referent	1.00	Referent	1.00	Referent
Male	1.78	1.23–2.59	0.81	0.57–1.16	1.19	0.76–1.86
Child's gender						
Female	1.00	Referent	1.00	Referent	1.00	Referent
Male	0.83	0.65–1.06	0.95	0.76–1.17	0.95	0.72–1.24
Orphan status						
Non-orphan	1.00	Referent	1.00	Referent	1.00	Referent
Single orphan	1.10	0.76–1.48	1.62	1.23–2.13	1.95	1.42–2.70
Double orphan	2.75	1.92–3.95	1.35	0.98–1.86	1.82	1.25–2.67
Location						
Mukuru	1.00	Referent	1.00	Referent	1.00	Referent
Dandora	0.30	0.21–0.42	1.01	0.79–1.28	4.23	2.83–6.31
Caregiver's age	1.02	1.00–1.03	1.02	1.01–1.04	1.00	0.99–1.02
Child's age	1.10	1.06–1.13	1.09	1.06–1.11	0.99	0.96–1.03

HOPE OVC enrollment data, 2006–2009

Table 3 Adjusted odds ratios and 95% confidence intervals for family composition and child vulnerability indicators

Characteristic	Not immunized[a,d]		Poor food access[b,e]		Educationally insecure[c,f]	
	OR	95% CI	OR	95% CI	OR	95% CI
Household size						
0–3	1.00	Referent	1.00	Referent	1.00	Referent
4–6	1.80	1.32–2.46	1.02	0.80–1.31	0.53	0.39–0.73
7–9	1.19	0.77–1.85	1.20	0.84–1.70	0.82	0.51–1.32
≥10	1.71	0.84–3.50	0.63	0.33–1.20	1.22	0.46–3.24
Caregiver						
Parent	1.00	Referent	1.00	Referent	1.00	Referent
Relative	1.23	0.81–1.86	1.10	0.84–1.43	0.77	0.50–1.20
Non-relative	4.64	2.15–10.01	0.13	0.05–0.33	0.23	0.11–1.46

HOPE OVC enrollment data, 2006–2009

[a] HH size: n=1,329; adjusted for access to health care, orphan status, location, child's age

[b] HH size: n=1,374; adjusted for income, access to health care, caregiver's age, child's age

[c] HH size: n=1,250; adjusted for HIV+ parent, location

[d] Caregiver: n=1,351; adjusted for access to health care, orphan status, location, child's age

[e] Caregiver: n=1,401; adjusted for income, access to health care, caregiver's age, child's age

[f] Caregiver: n=1,276; adjusted for HIV+ parent, orphan status, location

increased in magnitude and retained significance (OR = 1.80, 95% CI: 1.32–2.46). The association between a child living with a non-relative caregiver and poor immunization outcomes also retained significance (OR = 4.64, 95% CI: 2.15–10.01) when adjusted for access to health care, orphan status, slum location, and child's age. Finally, when adjusted for access to regular income, access to health care, caregiver's age, and child's age, the association between a child living with a non-relative caregiver and inadequate access to food (OR = 0.13, 95% CI: 0.05–0.33) remained a significant protective factor.

When stratified by orphan status, most of the multivariate associations between family composition and outcomes remained consistent across the orphan status categories (data not shown). However, among double orphans, those who lived with a non-relative were significantly more likely to not be fully immunized (OR = 4.18, 95% CI: 1.80–9.71) as compared to those living with relatives, after adjustment for access to health care, location of slum, and child's age. This finding was not seen among the non-orphan or single orphan groups. A final observation showed that a single orphan who had an HIV positive parent was less likely to be fully immunized than a single orphan with an HIV negative parent.

Discussion

This cross-sectional study of vulnerable children from two urban Nairobi slums resulted in modest, but potentially useful findings. We found family composition to be associated with each of the three child well-being indicators among the full sample of children. The most notable associations were those related to a vulnerable child's immunization status.

Vulnerable children in households of 4–6 members had higher odds of not being fully immunized than children from smaller or from larger household sizes. The high risk family of 4–6 members identified in this study may help in part to explain conflicting results reported in previous research [8, 14]. A family size of 4–6 members may reflect a critical point at which the benefits of a small sized household are lost and the benefits of an extended family size are not fully realized. Thus, a vulnerable child living either in a small nuclear family or in a larger extended family may have equally good opportunities for positive immunization outcomes, while a child living in a family of 4–6 members may suffer poorer immunization outcomes. Another explanation for the lack of increased odds exhibited by households of seven or more members may lie in the extended families which are created by the cultural practice of polygamy among certain Kenyan ethnic groups [31–33]. A 1997 study estimated that 23% of Kenyan women were in polygamous unions [34]. The larger households reported in the study may actually be clusters of smaller nuclear families who then share the same lower risk factors as the families with three or fewer members.

A second significant finding was that vulnerable children living with a non-relative were at increased odds for not being immunized when compared to children living with a relative or parent. Thirty-nine out of the 46 children

living with non-relatives (85%) were double orphans whose average age was 10.3 years. The caretakers for these children were the oldest of any study group (mean of 40.7 years). Since most immunizations are completed before a child is 5 years old, many double orphans may become part of a non-relative's household at an age beyond which a child is normally immunized. The child's lack of immunizations may be a reflection of the child's younger days during which one or both parents were ill or dying. While our study findings did not show caregiver's age to be significantly associated with immunization outcome, the possibility that the caregiver's increased age contributed to the vulnerable child's lack of immunizations is supported by other studies [14, 35]. Separate from the reason the child was not initially immunized, the child's subsequent lack of immunization may be attributed to the new caregiver's failure to remember the importance of immunization or lack of familiarity with current immunization guidelines.

Consistent with a population-based study of South African children [18], we noted that single orphans whose only remaining parent is HIV-positive demonstrated decreased odds of being fully immunized than a single orphan with an HIV negative parent. This study finding related to a parent's positive HIV status and decreased childhood immunizations was not apparent in the non-orphan category. This may indicate that single orphans with a remaining HIV positive parent have specific risk factors that differ from non-orphans or from the population of vulnerable children in general.

A final paradoxical finding was that living with a non-relative played a potentially protective role related to access to food in a vulnerable child's life. Children in this study who lived with non-relatives had statistically significantly lower odds of having inadequate food than children living with relatives or a parent. This finding may be attributed to the possibility that non-relatives who accept a child into their home do so by choice and because they have resources to care for that child [36]. In contrast, the placement of an orphaned child with relatives is a response to family obligation [3], but does not mean that the family has the resources needed to care for the child.

Strengths and Limitations

Several limitations in this study should be noted. First, the data were not derived from a random sample of participants, but rather from a convenience sample of children referred by school administrators. This selection method excluded important potential participants, such as vulnerable children living outside a family group or on the street. The selection method also limits the study's generalizability. The exclusion of significant participants may underestimate the magnitude of the observed associations. Because this was the only data available for use in examining this particular population, this bias could not be reduced.

Second, the results were all care-giver-reported, and thus susceptible to recall and misclassification biases. Caregivers may not accurately recall how many meals a child eats per day or may inadvertently mis-identify their relationship to a child. In addition, the data were originally collected to determine enrollment eligibility for an OVC support program, so data may have been skewed in either direction; one caregiver may report a grim picture in order to ensure acceptance into the program, while another a caregiver may report a more positive picture in order to protect herself from suspicion that she is not providing adequate care for the child. This nondifferential misclassification would have biased the results toward the null.

Third, results were limited by the questions asked on the original survey. Measures of height, weight, and arm circumference could add a level of clinical rigor to the evaluation of well-being. The collection of additional social determinant variables such as maternal education level could also have provided additional insights.

While the study does have limitations, it also offers several strengths. This dataset is a new and relatively large data set which had not been previously analyzed, thus providing an opportunity to gain insights into the health of a unique population. The study also provides new understanding about the well-being of vulnerable children, a broader category of children which includes, but is not limited to AIDS orphans. Finally, the study of a vulnerable population gives voice to the needs of a group which cannot speak for itself; thus, this study may provide impetus for new policy and program development benefitting vulnerable children.

Implications and Future Research

Findings suggest non-relatives caring for orphans could benefit from education which raises awareness of the need to ensure immunizations among older children. The paradoxical findings which described non-relative caregivers as a protective factor in access to food for vulnerable children may indirectly underscore the role that family resources play in child well-being. Findings also suggest that HIV-positive parents could benefit from added education and interventions related to immunizations for their children. Current adult HIV/AIDS treatment programs could be expanded to incorporate childhood immunization education and support. In addition, education about childhood immunizations could be presented as part of counseling or

end-of- life planning, especially for single parents with HIV/AIDS. Policies which increase family support by addressing the broader issues of household capacity and poverty could serve to improve child well-being outcomes, regardless of family size and primary caregiver.

While this study has provided several new insights into the complex web of factors that influence the well-being of vulnerable children, it also prompts many opportunities for further study. The examination of additional variables such as parents' educational level and the length of time the child has been in his current household setting could provide further insight into factors associated with child well-being. The evaluation of additional well-being indicators such as psychosocial health and guardianship planning by parents with HIV/AIDS would also give a more complete picture of a vulnerable child's well-being, as would further exploration into the influence of a parent's HIV-status on child well-being indicators. Studies with larger sample sizes would be better able to assess the influence of effect modifiers.

In conclusion, this study of the well-being outcomes of children in the urban slums of Kenya shows that family composition plays a role in the vulnerable child's well-being, particularly in terms of immunization status. The fact that family composition is related to a child's well-being is a reminder that it is important to address the challenges faced by vulnerable children in the context of their family settings. Building family capacity in terms of economic strengthening, improved access to resources, and increased knowledge are all avenues that may ultimately contribute to the well-being of vulnerable children.

Finally, with few exceptions, the risks of single and double orphans within this study population were similar to the risks faced by non-orphans and by vulnerable children in general. These findings support the direction that other researchers propose: that "children's needs, not their orphan status, must be the primary focus when designing and implementing policies" [9].

While research may propose a direction for public health intervention, it remains the community at risk who must ultimately embrace a direction and participate in the planning and implementation of interventions to ensure change. The findings from this study would be important messages for key leaders and health care providers in the Dandora and Mukuru communities, as well as potential program and project funding agencies.

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References

1. WHO. (2007). The African Regional Health Report: The Health of the African People. Retrieved December 30, 2009, from the Bulletin of the World Health Organization: http://www.who.int/bulletin/africanhealth/en/index.html.
2. Skinner, D., et al. (2006). Towards a definition of orphaned and vulnerable children. *AIDS and Behavior, 10*(6), 619–626.
3. Andrews, G., Skinner, D., & Zuma, K. (2006). Epidemiology of health and vulnerability among children orphaned and made vulnerable by HIV/AIDS in sub-Saharan Africa. *AIDS Care, 18*(3), 269–276.
4. UNICEF/UNAIDS. (2004). *The Framework for the protection, care and support of orphans and vulnerable children living in a world with HIV and AIDS*. Available from: http://www.unicef.org/ceecis/Framework_English.pdf.
5. Government of Kenya. (2007). *National OVC action plan for OVC*. [cited April 9, 2010]; Available from: http://www.aidsportal.org/Article_Details.aspx?ID=6733.
6. UNICEF. (2004). Kenya: Direct cash subsidy to orphans and other children made vulnerable by HIV/AIDS (pilot project). [cited April 9, 2009]; Available from: http://www.unicef.org/evaluation/index_47633.html.
7. WHO/UNAIDS/UNICEF. (2009). *Epidemiological fact sheet of HIV and AIDS/Kenya*. [cited 2009; Available from: http://data.unaids.org/publications/Fact-Sheets01/kenya_en.pdf.
8. Gage, A. J., Sommerfelt, A. E., & Piani, A. L. (1997). Household structure and childhood immunization in Niger and Nigeria. *Demography, 34*(2), 295–309.
9. Irwin, A., Adams, A., & Winter, A. (2009). *Home truths: Facing the facts on children, AIDS, and poverty*. [cited April 20, 2009]; Available from: http://www.jlica.org/protected/pdf-feb09/Final%20JLICA%20Report-final.pdf.
10. Parikh, A., et al. (2007). Exploring the Cinderella myth: Intra-household differences in child wellbeing between orphans and non-orphans in Amajuba District, South Africa. *AIDS, 21*(Suppl 7), S95–S103.
11. Blake, J. (1981). Family size and the quality of children. *Demography, 18*(4), 421–442.
12. Dawson, D. A. (1988). Family structure and children's health: United States, 1988. *Vital Health Statistics, 10*(178), 1–47.
13. Engebretsen, I., Tylleskar, T., Wamani, H., Karamagi, C., & Tumwine, J. (2008). Determinants of infant growth in Eastern Uganda: A community-based cross-sectional study. *BMC Public Health, 8*(1), 418.
14. Kamau, N., & Esamai, F. O. (2001). Determinants of immunisation coverage among children in Mathare Valley, Nairobi. *East African Medical Journal, 78*(11), 590–594.
15. Patrinos, H., & Psacharopoulos, G. (1997). Family size, schooling, and child labor in Peru—an empirical analysis. *Journal of Population Economics, 10*, 387–405.
16. Dawson, D. (1991). Family structure and children's health and well-being: Data from the 1988 national health interview on child health. *Journal of Marriage and the Family, 53*, 573–584.
17. Kimani-Murage, E., et al. (2008). *Food security and nutritional outcomes of urban poor orphaned children in Nairobi, Kenya*. Nairobi: African Population and Health Research Center (APHRC).
18. Ndirangu, J., et al. (2009). Levels of childhood vaccination coverage and the impact of maternal HIV status on child vaccination status in rural KwaZulu-Natal, South Africa*. *Tropical Medicine and International Health, 14*(11), 1383–1393.
19. Richter, L. M., Sherr, L., Adato, M., Belsey, M., Chandan, U., Desmond, C., et al. (2009). Strengthening families to support children affected by HIV and AIDS. *AIDS Care, 21*, 3–12.

20. Howard, B., Phillips, C., Matinhure, N., Goodman, K., McCurdy, S., & Johnson, C. (2006). Barriers and incentives to orphan care in a time of AIDS and economic crisis: A cross-sectional survey of caregivers in rural Zimbabwe. *BMC Public Health, 6*(1), 27.
21. WHO. (2009) *Health Topics: Immunization*. [cited October 18, 2009]; Available from: http://www.who.int/topics/immunization/en/.
22. UNAIDS. (2004). *HIV/AIDS & education*. [cited 2009; Available from: http://www.unaids.org/en/Partnerships/UNFamily/IATT-Education.asp.
23. Ainsworth, M., & Filmer, D. (2002). *Poverty, AIDS and children's schoolong: A targetting dilemma*. Washington, D.C: World Bank.
24. Birdthistle, I., et al. (2009). Is education the link between orphanhood and HIV/HSV-2 risk among female adolescents in urban Zimbabwe? *Social Science and Medicine, 68*(10), 1810–1818.
25. Alaimo, K., et al. (2001). Food insufficiency, family income, and health in US preschool and school-aged children. *American Journal of Public Health, 91*(5), 781–786.
26. Muller, O., & Krawinkel, M. (2003). Malnutrition and health in developing countries. *Canadian Medical Association Journal, 173*(3), 279–286.
27. Whitaker, R. C., Phillips, S. M., & Orzol, S. M. (2006). Food insecurity and the risks of depression and anxiety in mothers and behavior problems in their preschool-aged children. *Pediatrics, 118*(3), e859–e868.
28. Oldewage-Theron, W. H., Dicks, E. G., & Napier, C. E. (2006). Poverty household food insecurity and nutrition: Coping strategies in an informal settlement in the vaal triangle, South Africa. *Public Health, 120*(9), 795–804.
29. Development, T.T.F.f.C.S.a. (2009) *Orphans and vulnerable children and HIV/AIDS: Child needs assessment tool kit*. Decatur, GA.
30. Management Sciences for Health. (2009). *Resource center: Child needs assessment toolkit*. 2009 [cited November 16, 2009]; Available from: http://www.msh.org/global-presence/child-needs-assessment-toolkit.cfm.
31. Amornkul, P. N., et al. (2009). HIV prevalence and associated risk factors among individuals aged 13–34 years in rural Western Kenya. *PLoS ONE, 4*(7), e6470.
32. Caselli, G., Vallin, J., & Wunsch, G. J. (2006). *Demography: Analysis and synthesis*. Amsterdam, Boston: Elsevier.
33. Zeitzen, M. K. (2008). *Polygamy: A cross-cultural analysis* (p. 206). Oxford, New York, NY: Berg.
34. Hayase, Y., & Liaw, K. L. (1997). Factors on polygamy in sub-Saharan Africa: Findings based on the demographic and health surveys. *The Developing Economies, 35*(3), 293–327.
35. Breiman, R. F., et al. (2004). Effect of infant immunisation on childhood mortality in rural Bangladesh: Analysis of health and demographic surveillance data. *Lancet, 364*(9452), 2204–2211.
36. Khisa, G. (2010). NPI-SHAP Program Manager, HOPE worldwide. In E. Radcliff (Personal communication). Nairobi, Kenya.