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# Influence of parental education on malnutrition in infants and children aged under-five in Kampala, Uganda

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## Abstract

*Background:* Infants and children aged under-five in Kampala, Uganda, are highly vulnerable for the consequences of malnutrition. A high proportion (60%) of the child mortality can be attributed to direct and indirect consequences of malnutrition. Parental education is assumed to influence risks of child malnutrition. However, this possible association has not clearly been studied in urban Kampala. The aim of this study is to investigate the association between parental education and malnutrition in infants and children aged under-five in Kampala based on Mid-Upper-Arm- Circumference (MUAC) assessment.
*Methods:* A cross-sectional survey design was used for this research. Questionnaires have been conducted in different slums and health centers across central Kampala. 106 participants, mother and child pairs, were included in this study. Mother's age ranged between 18 and 48. Father's age ranged between 21 and 59. Questionnaires were used to measure socio-economic factors such as education, household income and occupation. The outcome, child malnutrition, was analyzed according to MUAC measurement. A cut-off point of 115 mm was used to determine malnutrition. A bivariate and multivariate logistic regression analysis was done in SPSS version 22. Odds ratios for the association between parental education and child malnutrition were obtained and regarded significant at $p < 0.05$.
*Results:* The adjusted association for mid-level maternal education in regard to low-level maternal education and risk of child malnutrition status appeared to be significant ($p = 0.026$), the OR showed a protective effect (OR=0.165, 95% CI=0.034 – 0.807). High-level education in regard to low-level education also appeared to be significant ($p = 0.049$). The OR shows an even more protective effect (OR = 0.032, 95% CI=0.001 – 0.981). Paternal education could not significantly be related to child malnutrition in this study.
*Conclusion:* Mid or high – level maternal education decreases the risk for child malnutrition in regard to low-level education. Contradictive to several other studies, paternal education cannot be significantly related to child malnutrition in this study.



Keywords: Parental education; paternal education; maternal education; infants; children; malnourishment; malnutrition; Kampala; Uganda

# 1. Introduction

Worldwide, malnutrition is seen as a lack of access to highly nutritious foods, especially in the present context of rising food prices. Children and infants aged under-five are highly vulnerable when it comes to undernutrition. Poor breastfeeding practices, offering unsuitable foods and not ensuring that the child gets enough nutritious food are factors that contribute to malnutrition. Other health consequences such as infections – diarrhea, pneumonia, measles and malaria – affect the child's nutritional status (WHO, 2014). In developing countries, malnutrition is one of the most important risk factors for high child mortality rates (WHO, 2014).

Pregnant women and children are highly vulnerable for the consequences of malnutrition. Children in sub-Saharan Africa are 15 times more likely to die before the age of five than children in developed regions. One out of six children in developing countries show signs of being underweight, this points out a total number of 100 million children in the developing world (WHO, 2014). In almost every part of the world cases of malnutrition are declining, except for African countries. In large parts of Africa, the amount of malnutrition rates does not change (Kikafunda & Tumwine, 2006). In rural and urban Uganda, research from Kikafunda, Walker, Collet and Tumwine (1998) showed that many children, aged under-five, have to deal with consequences of malnutrition such as diminished mental and physical capabilities.

Malnutrition is an overarching term that includes three different factors; stunting, wasting and underweight. These three factors all have the same cause in common, they are induced by a deficiency of certain nutrients such as proteins and micronutrients (Caulfield, Richard, Rivera, Musgrove & Black, 2006).

## 1.1 Measurements

Literature describes different ways to assess malnutrition. Three factors that are widely known and used to describe malnutrition are stunting, wasting and underweight. However, a new anthropometric measure has been introduced in 2009, assessment of the mid-upper-arm-circumference (MUAC). Most of the literature describes stunting, wasting and underweight as determinants for malnutrition. These determinants will now be explained. Use of MUAC assessment will be discussed in the next chapter.

Stunting describes low height-for-age and is an indicator to prove chronic undernourishment. The Ugandan Demographic and Health Survey (UDHS, 2011) shows that 33% of the children deals with the phenomenon of stunting. According to the cutoff point of the WHO Global Database on Child Growth and Malnutrition, a child is considered stunted when reported Z-scores are two standard deviations below the

Z-scores of the reference category, the NCHS[1]/WHO international reference population. This procedure, using Z-scores is also used to determine wasting. The UDHS (2011) shows that 5% of the Ugandan child population, aged under-five, deals with wasting. The phenomenon of wasting is described as low weight-for-height and used to indicate severe acute malnutrition. The WHO recommends to use low weight-for-height as the main indicator for malnutrition.

Underweight is the third important factor in the context of malnutrition. Around 14% of the Ugandan under-five child population can be classified as being underweight (DHS, 2011). The term 'underweight' is used to indicate a growth deficiency and lack of physical development. In regard to underweight, the cutoff point is set at three standard deviations below the Z-scores of the reference population (WHO,2006).

## 1.2 Use of Mid-Upper-Arm-Circumference

A relatively new anthropometric measure to indicate severe acute malnutrition (SAM) is the Mid-Upper-Arm-Circumference (MUAC) developed by the WHO and UNICEF (WHO, 2009). Since the WHO always recommends assessment by weight-for-height, use of MUAC in this research has to be justified. There are several reasons why measurement of weight-for-height can be problematic (Berkley et al. 2005). First, this way of measuring is complex when children are in a busy clinic, even more when these children are ill or stressed. Second, children have to be weighed, and height of the children has to be measured when they lie down on a table (depending on their age). Third, measurement of both weight and height also depends on the presence of adequate and calibrated equipment that is often not available in developing countries (Berkley et al. 2005). MUAC assessment is a quick, easy and low-cost way to measure severe acute malnutrition. Research showed that children with a MUAC below a cutoff point of 115 mm are considered to be in a condition of severe acute malnutrition (WHO, 2009; Berkley et al., 2005). Research also showed that results of both weight-for-height analysis and MUAC analysis are relatively similar and use of MUAC may be even more appropriate than weight-for-height because of its benefits (WHO, 2009; Berkley et al., 2005). Therefore, MUAC can be used as a valid indicator of SAM. An important argument for using MUAC assessment in this study indicate SAM is that less equipment is needed to assess MUAC which makes it less difficult to assess nutritional status in poor regions of Kampala, Uganda, where this research is carried out.

[1] National Center for Health Statistics

## 1.3 Determinants of malnutrition

Environmental factors highly influence the malnutrition status of infants and children. Research from Kikafunda, Walker, Collet and Tumwine (1998) showed that negative socio-economic factors and environmental factors such as living in rural or urban areas, low parental education levels or a lower socio-economic status contribute to malnutrition in children. The above-mentioned research suggests that a low educational level of the mother increases the probability for child malnutrition. Second, there is evidence that children who come from households with a low socio-economic status show early signs of being underweight compared to households with a higher socio-economic status.

A more recent study of Engebretsen, Tylleskär, Wamani, Karamagi and Tumwine (2008) showed evidence for different determinants of malnutrition that are related to child growth. Distal factors such as wealth, land ownership, parental age, marital status, employment of both parents and education of both parents are associated with (un)healthy growth of the child. Results of the study showed that wealth is the most important factor to predict malnutrition in children.

In 2006, Kikafunda and Tumwine showed an association between education and malnutrition. The research focused on children who already attended school or kindergarten. Different factors were examined in this study: age of the mother, educational level of both parents, employment of both parents, economic status of the household and the nutritional pattern of the family. The study indicates a relationship between education of the mother and possible child malnutrition. Education may influence malnutrition status of the child because of the linkage and implications for household income and welfare, higher educational levels are expected to increase household income and welfare. Paternal education was also expected to be an important confounding variable in the association with child malnutrition according to Kikafunda and Tumwine (2006). According to the study, education of the father might also have a significant influence because of the linkage and implications for household income and welfare. Employment of the father is also an evident factor in the association, however, the study shows that more research is needed to strengthen the association and clarify certain statements.

Important to mention is the vicious circle that arises around education (Kassouf & Senauer, 1996). A low educational level of the parents might lead to a low income, this might eventually increase chances for child malnutrition. The cumulative effect of chronic malnutrition might lead to underdevelopment of the child's school capabilities and reduces the effectiveness of education. The circle is completed when the child is not able to reach a high level of education and will have future problems in gaining a steady financial basis.

Malnutrition also affects the economic situation of Uganda. The COHA study (Cost of Hunger Africa, 2012), set up by the Economic Commission Africa (ECA) and the UN World Food Program (WFP) revealed that Uganda loses 5% of its GDP through the problem of malnutrition. This substantial

loss can be related to the assumption that malnutrition leads to future problems in children. A child that suffers from malnutrition has higher chances to be confronted with health problems. A consequence is that financial pressure on families is built up because health care for malnourished children is expensive. The child will not be able to attend education and the productivity of the child will eventually be influenced negatively.

An argument to set up a new study for the socio-economic determinant 'education' – in relation to malnutrition in children aged under-five in Kampala - is the importance of specific demarcation for education in relation to malnutrition. This also offers opportunities to study the possible influence of effect modifiers and confounding variables. It might be thinkable that age and sex of the children influences the malnutrition status since infants and children aged under-five show higher incidences of malnutrition (Kikafunda et al., 1998). This study shows that sex of the children was not significantly related to malnutrition status. However, the study of Kikafunda, Walker, Collet and Tumwine (1998) aims for another population and was carried out more than 15 years ago. Therefore, effect modification for sex will be analyzed. Confounding might be induced by household income, employment of the father, employment of the mother and level of education of the husband or wife (Kikafunda et al., 1998).

Previous studies have shown that the SES, including educational factors, can be related to malnutrition. Moreover, this study focuses on the specific urban area of capital Kampala. Up till now, no research has been done to assess the specific relation between parental education and child malnutrition in the urban slums of Kampala. The study from Kikafunda and Tumwine (2006) is the most recent study that has been carried out to determine a relationship between education and malnutrition in Uganda. However, this study approached children that already participated in school and covered both urban and rural areas.

## 1.4 Research questions and hypothesis

The target population of this study is the group of infants and children who live in the urban slums of Kampala and are expected to have other perspectives and future chances because of poverty. Therefore, the main goal of this research is to create more insight in the association between the socio-economic factor 'parental education' and malnutrition for infants and children, aged under-five, living in urban slums of Kampala, Uganda. Parental education will be measured for mothers and fathers separately. Therefore, this study includes two sub-divisions: (1) Influence of *maternal* education on malnutrition in infants and children, aged under-five in Kampala, Uganda and (2) the influence of *paternal* education on malnutrition in infants and children, aged under-five in Kampala, Uganda. Results of both research-questions are combined to assess the influence of *parental* education. The hypothesis is that higher parental education levels decrease the risks for child malnutrition. Results of this study can be used to create recommendations to prevent or decrease levels of malnutrition for the target population.

# 2. Methods

## 2.1 Population

The target populations in this study were infants and children aged under-five years and their parents (N = 106). To determine whether or not parental education influences the malnutrition status of the target population, both malnourished and non-malnourished children were incorporated in this study. Parents were asked to provide information about the determinants (education) and environmental factors. These two populations, children and their parent(s) are involved in the study.

Exclusion criteria are used for children who are suffering from infectious diseases that are a cause for malnutrition. These are diarrhea, fever, measles, skin infection and cough (Kikafunda et al., 1998). Based on the fact that these children may induce bias because of their medical conditions, they were excluded from this study.

## 2.2 Design

This research was based on a cross-sectional survey design. Surveys were used to gather information in the included slums of Kampala. Different slums were incorporated in this research: Kireku, Kisosonkoli village, Lost city and Kirinya. Within these areas, there were 4 different health centers included: Wakiso health center, Naguru hospital, Bweyogerere health center and Kira health center.

Before the structured interviews started, a thorough plan has been made in cooperation with Ugandan researchers. Since many people are not used to the presence of white people in their areas, a sensitive approach was crucial for an increase in validity and reliability.

## 2.3 Data collection

To set up a database, collection of data was done by conducting questionnaires and collecting MUAC measurements. In cooperation with Ugandan researchers, who were needed for translation, questionnaires have been carried out in the different health clinics and slums of Kampala. Participants who were able to speak English were interviewed according to the same questionnaire by Dutch researchers.

## 2.4 Dependent variable: outcome

Malnutrition is the outcome of this study. Assessment of malnutrition took place by measuring the Mid-Upper-Arm-Circumference (MUAC) of the child. This method was used because it was impossible to obtain weight and height information through health cards of the children. Most of the time, mothers forgot their child health cards or the information was not up-to-date. The quick and easy way of assessing

MUAC by using a tape-measure, and based on the arguments mentioned in the introduction, consistent MUAC assessment appeared to be the best way to measure severe acute malnutrition. According to WHO standards, a cutoff point of 115 mm for MUAC was used to determine severe acute malnutrition (WHO, 2009). Malnutrition was dichotomized and defined as YES or NO.

## 2.5 Independent variables: determinants

The main determinant is 'education', it was categorized in three groups (1) no or primary education, (2) A – level education and (3) higher education (Kikafunda & Tumwine, 2007) and measured separately for both parents.

*1. Education of the mother*

In this research, and based on the study of Kikafunda and Tumwine (2006), education of the mother was categorized in three separate groups, (1) low-level education, (2) mid-level education and (3) high-level education. Maternal level of education was measured by asking the last completed level of education.

*2. Education of the father*

In this research, and based on the study of Kikafunda and Tumwine (2006), paternal education was also divided into three categories, (1) low-level education, (2) mid-level education and (3) high-level education. Paternal level of education was measured by asking the last completed level of education via the mother.

## 2.6 Effect modification

The variables age, sex and HIV status of the child were taken into account to look for possible effect modification. As described, earlier research suggested that an older age (0-5 year) is significantly associated with a higher incidence of malnutrition in children under five (Kikafunda et al.,1998). This same study showed that sex is not significantly related with effect modification for malnutrition. Since this research aimed for another target population, effect modification by sex was assessed. The study from Saloojee, De Maayer, Garenne and Kahn (2007) showed that HIV infection in children is a risk factor for malnutrition. HIV was considered to be a possible effect modifier and therefore, this variable was included in this analysis.

## 2.7 Confounding variables

There were several possible confounding variables that might influence the association between parental education and malnutrition.

### 2.7.1 Household income

This variable was a possible confounder in the association between education and malnutrition. Income can be related to education opportunities for both the parents and the child, more income implies higher chances for the child or parent to attend school. In 2005, Davis-Kean explained that higher income leads to higher chances of school attendance and to higher expectations of the child.

A study from Alderman, Hoogeveen and Rossi (2006) showed the association for income and nutritional status of the child in neighboring country Tanzania. Higher household income is associated with lower rates of child malnutrition. Secondly, a higher educational level of the parents leads to a higher income.

The average income in Uganda is UGX 598,00 US$ (UGX 1.792.950) per capita (UNdata, 2015). Household income was categorized into four different groups, containing the sum of both maternal and paternal income. Since this research took place in areas with high poverty rates, the average income of Uganda is not a representative reference category. Four equal groups were created based on the amount of people included in this research. This means that cut-off values of income are related to the distribution of groups: (0) UGX 0 – 197.250, (1) 197.250 – 262.500, (2) 262.500 – 510.000 and (3) > 510.000.

### 2.7.2 Employment of the mother

It could be possible that employment of the mother influences the association between education and malnutrition. Employment of the mother had a significant effect on MUAC status of the child, these children had a higher MUAC scores compared to children from not-employed mothers (Kikafunda, Walker, Collet & Tumwine, 1998). If the mother is employed, income is generated and the child will have the opportunity to go to school and receive food.

According to the study of Nuwagaba (2012) it is likely that employed mothers received higher education compared to mothers who are unemployed. Employment of the mother was dichotomized in employed or not-employed.

### 2.7.3 Employment of the father

Based on the study of Kikafunda and Tumwine (2006) and for the same explanation as employment of the mother, employment of the father was included and dichotomized in employed or not-employed.

### 2.7.4 Child's age in months

Age of the child in months can be a confounding variable as Mishra and Retherford (2000) pointed out in their study. Younger children are less likely to be undernourished because, in most cases, they are still breastfed which decreases the chance of malnutrition. This variable is also considered to influence educational level of the mother. In Caldwell and Caldwell (1993) is suggested that having an older child affects the level of education of the mother. Child age in months was divided into quartiles and checked for confounding influence.

### 2.7.5 Education of the mother/father

Educational level of the mother was considered to be a confounding variable in the association between parental education and nutritional status of the child because it is likely that mother and father met each other during school and stayed together afterwards (Victora, Vaughan, Kirkwood, Martines & Barcelos, 1986; Engebretsen, Tylleskär, Wamani, Karamagi & Tumwine, 2008). The same counts for the opposite association.

## 2.8 Statistical analysis

When all data was collected, both the categorized determinant 'education of the parents' and the dichotomized variable 'malnutrition status of the children' was analyzed by a logistic regression model. This analysis was done with SPSS version 20.

First, all continuous variables such as age and income were analyzed for linearity and normality with regard to the outcome and if needed, categorized. Linearity was also checked for categorical variables.

Second, a crude overall relationship between the determinant education and the outcome malnutrition, based on MUAC cutoff point (below or above 115 mm) was established. This analysis was done separately for both the mother and the father. The importance of this crude association is to determine the univariate effect and to evaluate whether confounders are involved in further process.

Third, involvement of possible effect modifiers was included in the process. As previously described; age, sex and HIV status were possible effect modifiers and therefore analyzed. When p-values of the interaction variables were significant ($p<0.05$), stratification for both variables was needed.

A second logistic regression analysis was used to include the confounding variables. The outcome of this analysis was to determine whether or not confounding could be detected for these variables. If regression coefficients changed substantially in this model, the variable was considered to be a confounder. This method produced a final model with adjustments that presented the founded associations.

# 3. Results

## 3.1 Background characteristics

Table 1 shows different characteristics of the study population of 106 participants (N = 106) categorized for low-, mid-, and high-level education. The baseline characteristics of the population such as age, education, employment, household income, nutritional status and HIV status are presented. The mother's average age was 26.8 years, the father's average age was substantially higher with 32.3 years. In the group of children, average age was 18.16 months with a standard deviation of 12.14 months, 50.9% of the group were boys and 42.1% were girls. More than half of these children (52.8%) had mothers who had a low-level education. Table 1 shows that 73.6% of the research population was married. Most of the mothers (75.5%) had a job in the past 12 months, the other 24.5% was unemployed.

**Table 1 Baseline characteristics for mother, father and child. Categorized for low-, mid- and high-level education**

| **Baseline characteristic** | Overall (N=106) | Low–level education (N=56) | Mid–level education (N=39) | High–level education (N=11) |
|---|---|---|---|---|
| **Age mother** in years, mean (SD*) | 26.8 (5.4) | 27.8 (5.7) | 26.1 (5.4) | 26.5 (3.6) |
| **Age father** in years, mean (SD*) | 32.3 (6.7) | 31.1 (5.4) | 33.2 (7.1) | 32.2 (6.5) |
| **Age child** in months, mean (SD) | 18.2 (12.1) | 20.8 (12.1) | 17.0 (11.6) | 8.8 (9.6) |
| **Marital status** | | | | |
| Married (%) | 78 (73.6) | 40 (71.4) | 29 (74.4) | 9 (81.8) |
| Divorced / separated (%) | 24 (22.6) | 14 (25.0) | 8 (20.5) | 2 (18.2) |
| Never married (%) | 4 (3.8) | 2 (3.6) | 2 (5.1) | 0 (0.0) |
| **Sex** child | | | | |
| Male (%) | 54 (50.9) | 28 (50.0) | 18 (46.2) | 8 (72.7) |
| Female (%) | 52 (42.1) | 28 (50.0) | 21 (53.2) | 3 (27.3) |
| **Employment** mother | | | | |
| Employed (%) | 80 (75.5) | 44 (78.6) | 27 (69.2) | 9 (81.8) |
| Not employed (%) | 26 (24.5) | 12 (21.4) | 12 (30.8) | 2 (18.2) |
| **Employment** father | | | | |
| Uknown (%) | 10 (9.4) | 1 (3.4) | 5 (12.5) | 2 (7.4) |
| Employed (%) | 90 (84.9) | 27 (93.1) | 33 (82.5) | 23 (85.2) |
| Not-employed (%) | 6 (5.7) | 1 (3.4) | 2 (5.0) | 2 (7.4) |
| **MUAC** in mm, mean (SD*) | 121.8 (22.4) | 114.9 (20.5) | 129.1 (24.2) | 131.6 (12.4) |
| Well-nourished (%) | 50 (47.2) | 17 (30.4) | 23 (59.0) | 10 (90.9) |
| Malnourished (%) | 56 (52.8) | 39 (69.6) | 16 (41.0) | 1 (9.1) |
| **HIV status child** | | | | |
| HIV positive (%) | 21 (19.8) | 16 (28.6) | 5 (12.8) | 0 (0.0) |
| HIV negative (%) | 85 (80.2) | 40 (71.4) | 34 (87.2) | 11 (100.0) |
| **Household income** in UGX** in thousands, mean (SD*) | 483.1 (712.4) | 427.1 (888.9) | 455.1 (439.4) | 755.5 (476.7) |

* SD = Standard deviation
** UGX = Ugandan shilling

Data on father's employment shows that most men had a daily job (84.9%). In ten cases (9.4%), the mother did not know the occupation of the father and six fathers (5.7%) did not have a job.

Nutritional status of the child was determined by MUAC assessment. Important to note is that MUAC averages increase when level of education becomes higher. Based on MUAC results, Table 1 shows that 52.8% of the children were malnourished and 47.2% were well nourished. In the total population, 19.8% of the children were HIV positive and 80.2% HIV negative. Household income is based on the sum of both mother's and father's income. On average, the household income was 453.100 UGX (SD = 712.400 UGX). Important to note average household income increases when the level of education becomes higher.

### 3.2 Crude analysis: association for *maternal* education and child malnutrition

Table 2 shows the unadjusted results of the logistic regression analysis, without effect modifiers or confounding variables. The p-value of the overall Wald-test (p=0.001) showed that the overall relation between maternal education and child malnutrition is significant (p<0.05). The relationship between a higher level of maternal education and the presence of malnutrition in the child appears to be significant, compared to the reference category (low-level education) for both mid-level education (p=0.006) and high-level education (p=0.004). Odds-ratios are respectively 0.303 and 0.044. Based on Table 2, it can be stated that a higher maternal education level decreases the risk of child malnutrition.

**Table 2 Association for maternal education and child malnutrition: unadjusted and adjusted results of logistic regression**

| | Unadjusted | | | Adjusted for confounding variables*** | | |
|---|---|---|---|---|---|---|
| **Variable** | OR* | P-value | 95% CI – OR** | OR* | P-value | 95% CI – OR** |
| **Mid – level education**** | 0.303 | 0.006 | 0.129 – 0.713 | 0.165 | 0.026 | 0.034 – 0.807 |
| **High – level education**** | 0.044 | 0.004 | 0.005 – 0.368 | 0.032 | 0.049 | 0.001 – 0.981 |

* Odds-ratio
** Confidence interval
*** Adjusted for: household income, age of the child and educational level of the father
**** Compared to the reference group: low-level education

### 3.3 Adjusted results: association for *maternal* education and child malnutrition

Table 2 also shows the adjusted results of logistic regression with correction for confounding variables. Correction was necessary for household income, age of the child and educational level of the father. Employment of both the father and the mother appeared to be no confounding variables in this study.

The overall Wald-test showed that the relationship between maternal education and child

malnutrition has a significant P-value (0.024). Children from mothers with a mid-level education have are less likely to be malnourished (OR 0.165; CI 0.034 – 0.807) compared to children from mothers with low – level education. Children from mothers with a high – level education have even less risk to be malnourished (OR 0.032; CI 0.001 – 0.981) compared to children from mothers with a low – level education.

### 3.4 Crude analysis: association for *paternal* education and child malnutrition

Table 3 shows the output of the unadjusted logistic regression for the relationship between paternal education level and the presence of child malnutrition. In contrast to the crude relationship for maternal education level and child malnutrition, the overall Wald-test for paternal education showed that there is no significant relation with child malnutrition (p=0.111). Both mid-level education (p=0.745) and high-level education (p=0.109) show no signs of any significance, odds-ratios are respectively 0.745 and 0.109, based on this output.

**Table 3 Association for paternal education and child malnutrition: unadjusted and adjusted results of logistic regression**

| | Unadjusted | | | Adjusted for confounding variables*** | | |
|---|---|---|---|---|---|---|
| **Variable** | OR* | P-value | 95% CI – OR** | OR* | P-value | 95% CI – OR** |
| **Mid – level education****** | 1.176 | 0.745 | 0.443 – 3,127 | 1.616 | 0.427 | 0.495 – 5.281 |
| **High – level education****** | 0.415 | 0.109 | 0.142 – 1,127 | 0.637 | 0.538 | 0.191 – 2.375 |

* Odds-ratio
** Confidence interval
*** Adjusted for: maternal educational level, employment of the mother and age of the child
**** Compared to the reference group: low-level education

### 3.5 Adjusted results: association for *paternal* education and child malnutrition

Table 3 also shows the adjusted output for the relationship between paternal education and child malnutrition. This model includes correction for 3 confounding variables: maternal educational level, employment of the mother and age of the child. In contrast to the adjusted model for maternal education, no significant relationship can be determined. The increased p-value of the overall Wald-test (p = 0.362) showed that after correction for confounding variables, no significant relationship between paternal education and child malnutrition could be identified. Both mid-level education (p = 0.427, CI 0.495 –

5.281) and high-level education (p = 0.538, CI 0.191 – 2.375) are not significantly different in regard to the reference category: low – level education.

## 4. Discussion

The results of this study indicate, after correction for confounders, that a higher 'maternal education level' is significantly related to a decreased risk of child malnutrition. Logistic regression analysis shows that mid – level maternal education leads to children having less risk (OR 0.165; CI 0.034 – 0.807) of being malnourished compared to a low – level maternal education. This implicates that mid – level education, in regard to low – level education, causes a protective effect for child malnutrition. The difference for high – level, in regard to low – level maternal education, is even bigger. Children from mothers who obtained a higher educational level are even less likely to be malnourished (OR 0.032; CI 0.001 – 0.981). In this model correction for three confounding variables took place: income, educational level of the father and age of the child.

With regard to the literature mentioned in the introduction, it was expected that mothers who obtained a higher level of education are less likely to have a malnourished child compared to mothers with a low level education. This outcome also corresponds to the study of Boyle et al. (2007), the study reports that the association between weight-for-height, relatively comparable to MUAC measurements, and maternal education gains strength when the level of maternal education increases. The relation between maternal education and child health, in the context of malnutrition, is also described by Desai and Alva (1998). They report that an increased level of education enhances the use of medical services and induces favorable behaviors that positively influence child health. According to Vella et al. (1992), increased level of education positively influences the possibility of changing the child health status. Education generates confidence in responsibility, knowledge and the capability of dealing with health professionals.

While paternal education level was expected to be significantly related to child malnutrition, results of this study are not significant. This outcome contradicts some of the literature which was mentioned in the introduction. There was stated that paternal education has significant influence on child malnutrition. The study from Kikafunda and Tumwine (2006) found that education of the father had a significant (p = 0.017) association with the child's nutritional status with almost similar confounding variables included. While results of the association with paternal education in this study are not significant, other studies show that level of paternal education is indeed an important factor that influences child malnutrition. In a recent study of Semba, de Pee, Sun, Sari, Akther and Bloem (2008) carried out in Bangladesh, it has been found that an increase of paternal education causes a decrease in the odds for child malnutrition. This was caused by an increase of protective caregiving behaviors induced by an increase of knowledge about nutrition. Another study of Haddad, Alderman, Appleton, Song and Yohannes (2003)

links paternal education to an increase of household income. First, paternal education increases the ability to obtain and adequately use information about child care. Secondly, due to a higher educational level, household income will increase. This offers the opportunity to access health services more easily and will give the chance to provide and maintain good quality food for the child. These arguments prove the importance of paternal education in the association between parental education and child malnutrition.

It is interesting that the adjusted output of Table 3 shows an OR of 1.616 (CI 0.495 – 5.281) for mid-level education in regard to low-level education and a OR of 0.637 (CI 0.191 – 2.375) for high-level education in regard to low-level education. This implicates that children from fathers who obtained high-level education are less likely to be malnourished than children from fathers who obtained a low-level education. It also implicates that children from fathers who obtained mid-level education have a higher risk of being malnourished compared to children from fathers who obtained low-level education. The implication for high-level paternal education is in line with Kikafunda and Tumwine (2006) where was stated that fathers with high-level education were less likely to have malnourished children.

The reason why the risk of malnutrition in the group of fathers with mid-level education is higher may be due to the strong association between father's educational level and household income (Wamani, Tylleskär, Åstrøm, Tumwine, & Peterson. 2004; Kikafunda & Tumwine, 2006). Fathers are the ones who generate most of the income and with an increase of educational level, the income is likely to rise.

In this research, colinearity between paternal education and household income was a cause for dropping household income as a confounding variable for the association with father's education. Including household income in the association caused logistic regression models to be un-interpretable, odd-ratios were unacceptably high or differences in confidence intervals went from zero to infinite. Another reason why results for paternal education are not in line with the other studies that are carried out in Uganda is the fact that fathers are indirectly included in this study. Asking the mother questions about the paternal factors may have influenced the association. This will be further explained in the limitations paragraph.

The founded associations for maternal level of education with regard to child malnutrition are comparable to the associations that are found in literature. While a lack of significance for paternal education changes the outcome of this research, literature supports the results that are mentioned in Table 3 and described in this discussion.

### 4.1 Limitations

The cross-sectional design of this study comes with certain limitations. Causal relationships cannot be established through this sort of research, only the founded associations can be described and recall bias is likely to be involved.

Cooperation of a translator was needed to complete questionnaires. Since this translator was a Ugandan man, cultural aspects could have been biasing answers given by the mothers. Men and women in Uganda are not equal (Mirembe & Davies. 2001). Since male dominance is still prevalent gender factor, it is highly possible that sensitive questions such as HIV status and might have been answered socially desirable (Podsakoff, MacKenzie, Lee & Podsakoff. 2003). A consequence of socially desirable answering may be that women said to be HIV negative while they are in fact HIV positive. This bias might have created an underestimation of the association because HIV increases chances for malnutrition (Melchior et al., 1999).

Participants may have been inconsequent about income (Alwin, Zeiser & Gensimore, 2013), a confounder in the association. If income was in reality lower than answered in the questionnaire, the association might be overestimated because chances for malnutrition decrease with a higher household income (Wamani, Tylleskär, Åstrøm, Tumwine, & Peterson, 2004).

In line with the previous described bias, it is an important factor that fathers have not been questioned directly in this research. The mother answered all questions since most of the fathers had to earn money for their family and were not around. Men are not likely to be found in a health centers since it is the task of the mother to take care of the child and paying visits to health centers. For this reason, more missings are included for variables concerning the father. These missings, for example for income, may cause an decrease in statistical power and reliability for the association with paternal education (Graham, 2009).

Another limitation of this research is the relatively small study population (N = 106). Many variables such as education, income and employment were categorized in groups. For example, educational level was measured in six different levels including the year of dropout. The six categories were: no education, primary, O-level (secondary), A-level (secondary), tertiary and university. During logistic regression analysis, un-interpretable models became an evident problem. To solve this problem, categories with small groups had to be transferred into more equally distributed groups. This lead to a new division where low – level education included respondents with no or primary education. Mid – level education included O-level education and high – level education included tertiary or higher education. Unfortunately, the new distribution of education groups meant a loss of valuable data.

### 4.2 Strengths

In regard to validity of the study, questionnaires were based on the Ugandan Demographic and Health Survey 2011. This means that a valid and a widely acknowledged questionnaire was used to conduct data analysis. Most of the questions in the questionnaire are copied from the UDHS questionnaire, others were slightly adapted to different situations but were in essence the same.

Despite the small study population, findings of this research are applicable according to existing literature. Other studies were able to include great amounts of participants which positively gained the founded associations. This research has been able to find relatively comparable outcomes with a small study population. This phenomenon strengthens the argument for the used way of measuring and analyzing in this research.

Based on the previously mentioned phenomenon, another strength of this research is that it has been able to identify the most important confounding variables based on literature study and by its way of measuring, this means that internal validity of the study is high. According to this strength, and the founded similarities with other studies, this study may be generalizable to other major cities in Uganda and neighboring countries.

## 5. Conclusion

With regard to the main question of the research: "What is the influence of parental education on malnutrition in children aged under-five in Kampala, Uganda?", and the hypothesis, which states that a higher parental education level decreases the risk of child malnutrition, it can be assumed that maternal education is of significant influence. An increased maternal education level, mid and high level education, decreases the chance of child malnutrition. This association is influenced by income, educational level of the father and age of the child. Paternal education cannot be related to child malnutrition based on the results of this research.

## 6. Recommendations

Based on the results, focus on maternal education for future interventions or developments will have positive results in regard to the nutritional status of the child. New policies and campaigns, executed by the government or NGOs, aiming at increasing female school attendance and decreasing school dropouts might be successful. This emphasizes with the need for promoting the education of the girl child with an aim of improving child health which was also stated as a recommendation by UNICEF (2014). However, for this to be successful there is need for a comprehensive approach that includes a strategic and collaborative relationship between different sectors of government and NGOs.

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