**Income Inequality and Health**
**– Exploring the Association in a High-Inequality Context**

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## 1. Introduction

Is it solely the level of income that matters to health status, or does an unequal distribution of income add an additional hazard to the health of human beings? This question has been subject for intense research in economics as well as in other academic disciplines (cf. Preston 1975, Rodgers 1979, Wilkinson 1992, Kawachi and Kennedy 1997, Mellor and Milyo 2001, Leigh and Jencks, 2007).

To accurately examine the relation between income, income inequality and health it is vital to use data indicative of the situation of individuals (Wagstaff and van Doorslaer 2000). A majority of the empirical research using individual level data mirrors the situation in the USA. This literature shows evidence of that the absolute income level matters to health status but also that there exists a positive association between income inequality and poor health. On the other hand, studies using data on other developed countries by and large reject the hypothesis that large disparities in the income distribution affects health status. The contradictory empirical evidence has generated a discussion whether the lack of association between monetary inequality and health outcomes reflects the fact that the non-US societies studied have more egalitarian distributions of income. Could it be that the phenomenon is restricted to highly unequal societies and that there exists an inequality threshold?

Building on this debate this study seeks to clarify the relation between income inequality and individual health during particularly unequal circumstances, i.e. whether the association between inequality and poor health is apparent in a society with relatively large disparity in the income distribution. To address this subject, we test the two distinct, yet related, hypotheses: *the absolute income hypothesis* (AIH) - stating that income but not the inequality of income is a determinant of health - and *the income inequality hypothesis* (IIH) - emphasizing that dispersions in the distribution of income in effect matters - using Zambian data. In terms of income, Zambia is classified as one of the most unequally distributed countries in the world and, despite considerable efforts to improve the health situation during the past decade, key indicators on health are extraordinarily poor (WHO 2007). The dependent variable we employ is stunting (height-for-age z-score).

This paper contributes to the on-going discussion on the effects of economic inequality on health by examining the association in a high inequality context. Also, this study adds a novel dimension to the existing empirical literature by testing the relation between income inequality and health using data from a developing country. With the exception of a study on Ecuador (Larrea and Kawachi, 2004), previous empirical studies focus on middle or high income economies.

Employing ordinary regression as well as multilevel techniques we confirm the AIH. More economic resources are related to better health. However, testing the IIH on different contextual levels we find a significant positive association between economic inequality and health. These outcomes are robust to different inequality measures and alternative specifications of models and variables. Clearly our results do not corroborate existing literature. Interestingly an analogous relationship seems to exist in a cross-national level setting, focusing on low income countries.

## 2. Theoretical Aspects on Income, Income inequality and Health

For a long period of time researchers within different disciplines have reported a negative association between income inequality and different indicators of health status at the aggregated level (Preston 1975, Rodgers 1979, Wilkinson 1992, 1996). As elucidated by Wagstaff and Van Doorslaer (2000) various theoretical hypotheses concerning the relation between income, economic inequality and health at the individual level are consistent with this empirically observed association.

### *2.1 Absolute Income and Individual Health*

One possible explanation to the noted relation between economic inequality and population health relates to the association between individual income and health. Whether a direct causal link to health from income or some aspect of socioeconomic status exists have however been disputed. Especially this debate has taken place across disciplines (c.f. Deaton, 2003). The epidemiological and the medical literature have generally claimed that variation in socioeconomic status is what produces health disparities. A high income can lead to better health status as more resources can be devoted to health service or goods that are beneficial to health, and richer individuals may have better knowledge about what improves health (Rodgers 1975, Smith and Kingston 1997).

On the other hand, economists have to some extent questioned that individual income would be a determinant of individual health, and emphasized that there exists reverse causation (Smith 1999). In recent years the position that some effect runs from income or socioeconomic status to health, however, has gained currency among economists (Feinstein 1993, Smith 1999, Deaton 2003). However, the relation between individual income and health is not stated to be linear. Rather the impact of additional monetary means on health status diminishes with income.

Assuming that income has a protective effect on individual health and moreover that this relation is concave, redistribution of economic resources within a society, from richer to poorer individuals, will increase average health outcomes (Wagstaff and van Doorslaer 2000). In other words, population health status improves with lower inequality. The relation found between income inequality and population health may consequently be a result of that the absolute level of income matters to the health of the individual. This line of reasoning leads us to a first hypothesis:

*The Absolute Income Hypothesis (AIH): The health status of an individual is related, in a concave fashion, to the individual level of income, and is not dependent of the income level of surrounding individuals or households.*

## *2.2 Income Inequality and Individual Health*

Rather than stating that individual health solely responds to absolute income levels it has been emphasized that there on top may exist important contextual determinants affecting health status. In this strand of the literature, health differences among individuals are, directly or indirectly, associated with degree of income inequality in the society where they reside (Wilkinson 1996, Kawachi and Kennedy 1997, Kaplan et al 1996).

A couple of theories describing the potential pathways underlying the link between income inequality and individual health have been put forward in the literature. Wilkinson (1996) emphasizes that inequality affects health status through perceptions of place in the social hierarchy based on relative position according to income. Poorer individuals may e.g. feel stress, loss of respect, distrust and shame when comparing themselves to their richer counterparts in a society which in turn affect their health and well-being negatively. Either these perceptions translate directly into physical afflictions or into harmful behavior as e.g. smoking, in turn affecting health status (Lynch et al. 2000). The *psychosocial* environment may consequently be one mechanism through which economic disparities are linked to individual health.

The psychosocial pathway linking income inequality and health status has increasingly been discussed in connection to *social capital* or social cohesion (Kawachi et al., 2007). In this line of reasoning inequality and the individual's perception of his or her social rank are thought of having social consequences for how individuals interact. A number of empirical studies have established that income inequality display a strong, negative correlation with the extent to which people trusts each other (Knack and Keefer 1997, Uslaner, 2003). The literature emphasizing social capital underlines how e.g. distrust on the individual level translates into antisocial behavior and reduced civic participation at the societal level.

Lack of social capital has for long been noted to have negative consequences on health and a number of studies have shown powerful health effects of social connectedness (Durkheim 1897, Putnam 2000). Grant (2000) points to that at the individual level, socially integrated people may show more immunological resistance to certain diseases. Moreover, social isolation has been linked to unhappiness, illness as well as to a shortened lifetime. Social networks could also be important determinants of an individual's health as they are believed to promote better health education, better access to health service and faster changing norms relating to e.g. sanitation practices (Baum 1999, Kawachi and Kennedy, 1999).

Another field of the literature emphasizes that the interpretation of linkages relating economic inequality and health status ought to begin with *structural* explanations to why inequalities are present rather than with perceptions from the same (c.f Kaplan et al. 1996, Lynch et al. 2000). Unequal monetary distributions are assumed to reflect economic, political and institutional processes indicative of systematic underinvestment in human capital. This line of reasoning can e.g. be related to the work by Krugman (1996) and Alesina et al. (1999) on the relation between income differences and heterogeneity in preferences on one hand and the level of public expenditures on the other.

If income inequality, directly or indirectly, is detrimental to the health of the individual, population health evidently also depends on inequality. This leads us to a second hypothesis:

*The Income inequality hypothesis (IIH): Independently from the effect from income, there is a negative effect on the health of the individual from income inequality.*

### *2.3 What Does the Empirical Evidence tell us?*

Close to thirty articles assessing the relation between income inequality and individual health have been published during the past decade.[1] A majority of this empirical research mirrors the situation in the U.S. Several of these examinations find that inequality in the distribution of income is associated with an adverse impact on health. For example, Kennedy et al. (1998) conclude that income inequality is detrimental to individual health conducting a study examining inequality at state level, while also adjusting for potentially confounding individual variables. LeClere and Soobader (1999, 2000) however find that the independent effect from income inequality to the determination of self-related health is restricted to certain demographic groups.

Subramanian and Kawachi (2004) recently summarized the overall pattern of individual level studies. In particular they point to that the geographical scale at which income inequality is assessed seems to matter. The examinations on inequality and health in the U.S mainly find an association when inequality is measured at the state level. On the other hand, evidence at lower levels of aggregation are decidedly mixed.

Although several studies suggest an association between income inequality and poor health in the US, Mellor and Milyo (2001, 2002) state that these findings are over-estimated as they do not control for unobserved state specific effects. If regional variation between states exists, and there variations are correlated to income inequality, estimations will be biased. Employing a self related health variable and three measures of inequality they do not find a statistically significant association. Also studies using non-US data corroborates these findings and generally reject the IIH. For example, Shibya et al. (2002) conclude that income inequality does not seem to have a detrimental effect on health in Japan. Gerdtham and Johannesson (2004) and Jones et al. (2004) come to similar conclusions studying mortality among Swedish and UK residents, respectively.

Apparently the results from individual level studies are very mixed and the relation between income inequality and health status does not seem to be universal. The largely contradictory empirical evidence has generated a discussion whether the lack of association between

[1] Several articles review the existing literature in this research field e.g. Wagstaff and van Doorslaer (2000), Mellor and Milyo (2001), Deaton (2003), Submaranian and Kawachi (2004) and Wilkinson and Picket (2006, 2007).

economic inequality and health outcomes reflects the fact that the non-US societies studied have more egalitarian distributions of income. Accordingly the phenomenon could be restricted to relatively highly unequal societies and that there exists an inequality threshold.

To our knowledge two existing articles examine the association between income inequality and individual health status in populations where the inequality level is higher than or as high as in the USA. Subramanian et al. (2003) study the relation in Chilean communities also controlling for individual predictors. Using a self-related health measure and employing logistic estimation models, they conclude that community inequality has an independent effect on health. Also a study by Larrea and Kawachi (2005) on Ecuador support the IIH. The dependent variable here relates to child health. Their results point to that income inequality at the provincial level has a significant deleterious effect to health outcome. Economic inequality at the municipality level or at the even smaller geographical area of parishes seems not to be of importance in this Latin American context.

Turning to the absolute income hypothesis, a very large number of empirical studies have related individual income or socioeconomic status to individual health (cf. Ettner 1996, Meara 1999). Among the individual level studies in the field of the literature also examining potential effects from inequality to health status, all cases find a strong positive effect, consistent with the absolute income hypothesis supports these results (see e.g. Mellor and Milyo 2002, Gertham and Johannesson 2004).

## *2.4 Revisiting the Mechanisms – The IIH and Child Health*

A majority of the existing empirical research examines the relation between income, income inequality and health focusing on adult individuals. For this reason it seems of importance to briefly discuss the suggested pathways supporting the IIH (which often are compatible with the mechanisms explaining the AIH) in relation to the particular circumstances of current interest, i.e. the study of the association between inequality and health using child health as our dependent variable.

Clearly, the theoretical pathways discussed in relation to the income inequality hypothesis do not necessarily have to appear in the study of adults or adolescents. Olivius et al. (2004) underline that psychosocial stress from financial problems admittedly is a potential threat to parent's health, but findings also indicate that there is an indirect negative influence on the health and behavior of children. Economic stress experienced by parents seems to translate into their children. Two mechanisms may possible be at work. Either psychological stress induces parental health problems which in turn results in less economic resources for the family if the parent is less able to work. Alternatively, or simultaneously, psychological stress cause poor health and well-being of parents, in turn generating deficient child care as low levels of stimulation to the children and decreased capacity for supportive parenting etc. These relations support the IIH as well as the AIH as parental economic stress not necessarily has to be the result of welfare comparisons, but rather a consequence of scarcity of economic resources per se.

Also the level of social capital has been associated with health of young people and child development (Waterston et al. 2003). Qualitative studies on secondary school pupil stress that social relationships in the local community are critical to the well-being of this group

(Morrow, 2002). Moreover, quantitative research indicates that low levels of interpersonal trust as a measure of social capital where associated with higher rates infant mortality (Berkman and Kawachi, 2000). Harpham et al. (2006) and De Silva et al. (2007) put a particular focus on the relation between maternal social capital and child nutritional status, hypothesizing that high levels of the former might be positively related to the latter by permitting mothers access to more services, more assets and through better maternal health. In line with this reasoning they find a positive association between levels of mothers' cognitive social capital as well as mothers' social support from other individuals and better height-for-age z-scores. However, both studies find evidence of poorer child nutritional status in cases when mothers are involved in citizen activities or when being members of formal groups, although this has been posited as a mechanism for knowledge transfer and greater protection during crisis.

Reasonably, also the materialistic interpretation is consistent with health implications for the younger part of a population. E.g. recent research results on cross-national level data for developing economies conclude that the size of public health spending are linked to lower child mortality, especially where public institutions are well-functioning (Rajkumar and Swaarop, 2008). Straightforwardly, underinvestment in the infrastructure of health affects children as fewer medical check-ups are performed. Furthermore, systematic underinvestment in education seems to have an indirect effect, via the parents, on the health of children. WHO (2008) emphasizes that lack of access to food is frequently not the cause of malnutrition. Rather poor feeding practices and infections undermine nutritional status. These outcomes are in many ways related to the educational level of parents or households where children reside.

## 3. Data and Empirical Model

### *3.1 Data and Variables*

The data source used in this study is the Zambian Living Condition Monitoring Survey from 2004 (LCMS IV). The survey has nationwide reporting of both rural and urban areas in all 9 provinces and 72 districts of the country. It was conducted in October 2004 to January 2005 and provides information on various indicators of more than 103 200 individuals nested in 19340 households (CSO, 2005). The survey design is a multiple stage sample selection process and the sampling frame of the survey was developed from the census of population and housing carried out in the year of 2000.

Concerning information on the health status of individuals the LCMS IV includes a section on child health and nutrition reported for all children aged 0-59 months in surveyed households. This section contains data on child feeding practices, immunization as well as information on physical body measurements such as the child's height and weight.

Sample weights are applied in calculations of inequality indices, poverty rates and the descriptive statistics on the prevalence of stunting to correct for differential representation of the sample at national and sub-national levels. However, we do not apply weighting procedures in the econometric modelling.

*Health Status*

Health can be measured and characterized over various dimensions (see Warren et al. 1980 for a detailed discussion). A widely used health indicator in developing and developed countries is the nutritional status of children, generally proxied by anthropometric measures as height-for-age, weight-for-height and weight-for-age.

The height-for-age (usually referred to as stunting) is a long-term or chronic indicator of health that reflects the accumulation of health and nutrition over a child's entire lifetime (Falkner and Tanner, 1986). It is generally acknowledged as a good, objective indicator of children's general health status (c.f., Mosley and Chen 1984, WHO 1995) and an indicator of household well-being (Zere and McIntyre, 2003).

To generate our dependent variable, we derive individual height-for-age indicators for children younger than 60 months using the anthropometric statistical software Epi-Info. The indicators are expressed in the form of z-scores, which compares the height of a child with that of a child of the same age and gender from a reference population consisting of healthy individuals (WHO, 1995).

By standard convention the height-for-age z-score ($HAZ$) for individual $i$ is given by

$$HAZ_i = \frac{x_i - x_{median}}{\sigma_x}$$

where $x_i$ is the height for child $i$, $x_{median}$ is the median height for a healthy and well-nourished child from a reference population of the same age and gender, and $\sigma_x$ is the standard deviation from the mean of the reference population. Generally two criteria are used to determine whether an individual is malnourished and the degree of malnourishment. Children with a z-score of height-for-age more than 2 standard deviations below the international referenced median are conventionally defined as stunted. Children with a z-score more than 3 standard deviations below the median are defined as severely stunted (WHO, 1995).

Following recommendations (WHO, 1995), we exclude observations with a z-score lower than -6 or larger than +3. Moreover, we restrict our sample to children aged three to 59 months as the health status of younger individuals may not only be explained by environmental, social or behavioral influences, but might possibly be influenced by the weight of the mother (Skoufias, 1998). This generates a sample of 10316 children with valid information on health status.[2]

*Income, Income Inequality and Poverty*

In place of household income, household monthly per capita expenditures, *exp_pc*, is included in the estimations to test the absolute income hypothesis. Monthly expenditures per capita are defined as the sum of expenditures on food and miscellaneous good and services

[2] We drop 1797 observations from the original sample due to incomplete information concerning one or more of the variables needed in the calculations of the standardized height-for-age health indicator or due to too high or low z-scores. This represents a drop of 14.8 per cent of the original sample.

divided by the number of people living in the household. To allow for nonlinearity we also include a squared version of the expenditure variable, *exp_pc^2.*

At the contextual level we employ three measures of economic inequality to test the IIH. Firstly we include the widely used *Gini* coefficient in our estimations. As a test of sensitivity Theil's two inequality indices (*GE(0)* and *GE(1)*) are also used. In line with the IIH we expect the regression coefficient to be negative in our estimations as a higher value of inequality should be accompanied by a lower value of the dependent variable HAZ, i.e. poorer health.

To allow for confounding of basic economic development in the geographical area where children and households reside we include *poverty* rates in the models. Consequently, we control for the percentage of households below the overall consumption poverty line of 111 747 Zambian Kwacha at the geographical level of interest.

The measures of economic inequality and poverty are calculated from the full data set, not only the sub-sample of households with children, using information on household monthly per adult equivalized expenditures. As the variables *gini*, *GE(0), GE(1)* and *poverty* are contextual, inequality and poverty rates differ across regions, but not across individuals within a region. We test the level of economic inequality and poverty at three geographical divisions – province, district and constituencies. Zambia is demarcated into nine provinces, which are further divided into 72 districts, in turn divided into 155 constituencies.

### *Explanatory Variables*

To assess biological characteristics of importance to health outcomes we include the variables *gender* and *age* in the regressions. Research on gender bias and nutrition in developing countries has come to mixed conclusions. While girls seem to be disadvantaged in South-central Asia, a review of studies in an African context indicates that the relation here seems to be the opposite with significantly worse nutrition for boys than for girls (Svedberg 1990, Madise et al. 1999). Age is measured in terms of months and ranges between 3 and 59. Since there are evidence of that prevalence of stunting generally increases during the first two years of life and then stabilizes (Larrea and Kawachi, 2005) we also include the variable *age_square*.

Studies examining determinants of child health have established a relation between nutritional status and birth order as well as birth intervals. Although the underlying mechanism influencing nutrition seems to be complex, children with higher birth order generally are at higher risk of being malnourished. Behrman (1988) relates this association to first borns receiving heavier does of parental attention. On the other hand a negative outcome of having older siblings might as well arise from child competition. As a final individual element we derive the *birth_order* of the subject children.

The education of the mother is a social characteristic that have been found to correlate positively with child health (Kahn, 2002). Empirical examinations on the nutritional status of children moreover indicate that the educational level of other household members might be a strong determinant as education is related to e.g. family decision making process related to health matters and child feeding practices (Mosley, 1984). We include two indicators on the human capital embodied in a household in our models, the educational level of the mother to the child, *edu_mother*, and the maximum level of education of any person in the household older than 12, *edu_hh*. Education indicators are categorized into four levels of schooling, none (no years of schooling), primary (1-7 years of schooling), secondary (8-12 years of schooling) and higher education (more than 12 years of schooling), corresponding to the educational system of Zambia.

To assess family structure and social support the regressions include *marital status* of the mother. We also control for the *age of the mother* in trying to capture her experience. On the household level we moreover take into account whether the household resides in a *rural* or an urban area and the *household size*.

Theories behind household economics suggest that household composition and characteristics may affect intra-household allocations, in turn having consequences for nutritional status of children (see e.g. Becker 1964, 1965; Behrman et. al. 1982, 1986). Studies contrasting the nutritional status of young children in male- and female-headed households respectively have so far provided contradictory evidence. On one hand the earnings in female-headed households are generally lower than in male-headed households which could have a negative effect on child health within the former group. The same conclusion could potentially be drawn if a major share of household members is women. On the other it is possible that that mothers control of resources are associated in a more equitable within-household distribution of available food, implying better nutritional status of children. We include the variables *head_hh*, and *gender_share_adult*, corresponding to the percentage of female household members older than 12 years.

Malnutrition is commonly caused by inadequate availability of energy and proteins. To capture these potential explanatory factors we derive two dummies, *meals* and *animal products*. How frequently a household eats animal products could also be a proxy on dietary diversity which has been associated with improved nutritional status for young children (Arimond and Ruel, 2004). As these variables are measured at the household level, we can not control for intra-household differences with respect to food intake. Consequently the proxies relate to how often and what the children (and their parents) may have eaten.

### 3.2 Empirical Model and Estimation Methods

The empirical model, where individuals are indexed by *i*, households by *j* and geographical level by g (or more correctly child *i* living in household *j* residing in area *g)*, is formulated as

$$HAZ_i = \alpha + V_i'\beta_i + X_j'\beta_j + Z_g'\beta_g + \varepsilon$$

HAZ is the dependent variable increasing with better child health. V is a vector corresponding to individual characteristics of the children included, X is a vector related to features of households where children live (including parental characteristics and information on the household head), while the vector Z corresponds to the contextual factors of interest. The residual term $\varepsilon$ includes unobserved child, household and community characteristics.

The hypothesized relationships are first estimated using *OLS*. As apparent from the above discussion it is however important to seek to control for potential reverse causality between household expenditures and the dependent variable. In terms of child or infant health status, parental or household behavioral responses may cause negative correlation between consumption and the regression error term. This endogeneity can be the result of families spending more money on health related expenses and medicines but may also be related to higher consumption on food. Households can finance this extra consumption by decreasing the consumption in other goods or from selling assets, increasing labor supply or from transfers (Attanasio et al. 2004). *Instrumental variable techniques* are required to solve the potential endogenity problem. We consider household amenities and housing conditions and regress per capita expenditures on a set of instruments: the type of *floor*, the main type of energy used for *lightning* in the household and the main type of *fuel* used for cooking.

As the causal processes that affect our outcome variable are assumed to operate at more than one level simultaneously, we also apply multilevel statistical techniques. These methods allow estimation of the fraction of variance of the dependent variable occurring at each level of the analysis and are generally believed to provide a technically robust framework during circumstances when data sets have a nesting structure (Hox, 2002). Ordinary regression cannot accommodate such hierarchies in the data.[3] In particular we use a *three-level random intercept model* to estimate the specific effect of individual, household and community independent variables. This model adjusts for spatial correlation and heteroscedasticity which could be of importance as the nutritional status of children and infants living in the same families and/or neighborhoods may be correlated due to common household and neighborhood influences.

## 4. Empirical Analysis

### *4.1 Descriptive Statistics*

#### *Health*

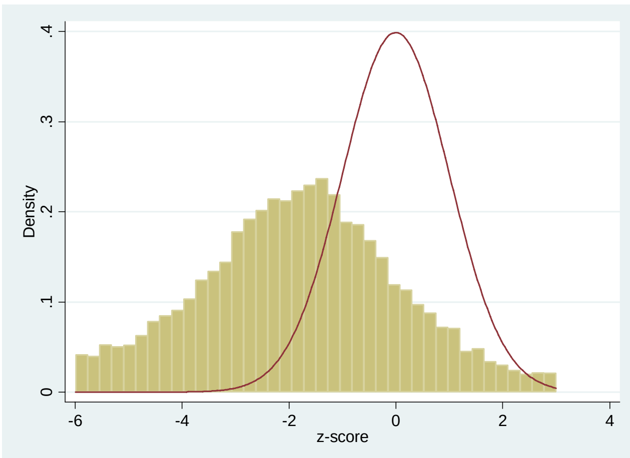
Despite considerable efforts to improve the health situation during the past decade, key indicators on health in Zambia are exceptionally poor (WHO 2007). Life expectancy at birth has decreased from 45.8 in 1990 to 38.4 in 2005 and the mortality rate of children under five has increased from 180 to 182 (per 1000) during the time period (WDI, 2005). Also in terms of prevalence malnutrition the Zambian situation is unfortunate. As presented in the below table, 47 per cent of the infants and children younger than five years in the sample are classified as stunted. This corresponds to a very high degree of population malnutrition according to WHO classification. Moreover 26 per cent of the children are severely stunted, i.e. with a height-for-age z-score equal or below -3.

[3] In single level multiple regression analysis unexplained variability is only the variance of the residual term. Consequently, data sets with a nesting structure that includes unexplained variability at each level are usually less adequately represented by the multiple regression analysis (Hox, 2002).

**Prevalence of stunting**

| Variable | Mean | Std. Dev. | % below -2 S.D | % below -3 S.D | n |
|---|---|---|---|---|---|
| HAZ | -1.88 | 1.81 | 47.30 | 25.97 | 10316 |
| HAZ - boys | -1.95 | 1.79 | 48.78 | 26.92 | 5128 |
| HAZ - girls | -1.80 | 1.82 | 45.83 | 25.02 | 5188 |

Source: Author's own calculations using LCMS IV




In the above histogram the current HAZ distribution is illustrated together with the corresponding distribution for the reference group. Clearly, the average value of the health variable is significantly lower than 0 (-1.88), the mean value of the healthy population. Moreover, by looking at the mean z-score by age-groups it is understood that the health variable of current interest reaches very low levels already when the children are as young as ten months old.

*Income inequality*

Economic inequality is generally stated to be high and Zambia is often referred to as one of the most unequal societies in the world. As measured by Gini coefficients derived from expenditure distributions the World Bank only identifies 5 countries out of 83 that are less equal (World Bank, 2006).[4] Although inequality somewhat decreased in the country during the 1990s, descriptive statistics indicate that consumption inequality at the national level slightly increased in the new millennium, with a Gini reaching 0.54 in 2004.

**Inequality measures: per adult equivalent expenditure**

| | 1996 | 1998 | 2004 |
|---|---|---|---|
| **Gini** | 0.518 | 0.533 | 0.544 |
| **GE(0)** | 0.485 | 0.533 | 0.551 |
| **GE(1)** | 0.587 | 0.596 | 0.738 |

Source: Author's own calculations using LCMS III and LCMS IV and McCulloch et al. (2000)

As discussed in Subramanian and Kawachi (2004) it is doubtful that changes in income inequality have an instantaneous effect on health. Accordingly, if inequality considerably increases or decreases, the association between this contextual variable and health status should be analyzed under different assumptions about lag periods. Though levels of

[4] These countries are the Central African Republic (0.61), Lesotho (0.63), Panama (0.55), South Africa (0.58) and Zimbabwe (0.57).

economic inequality have been relatively high over a long period of time in Zambia, we test the robustness of our results by including the two inequality indices at different geographical aggregation levels from the LCMS II survey in our estimations.[5]

## *4.2 Regression analysis*

### *4.2.1 OLS and IV*

*Provincial level*

The table below contains the regression estimates employing OLS including income inequality indicators on the provincial level. Beginning from the left, models take into account individual characteristics. Further an increasing amount of control variables from the household and the contextual level respectively are added. First testing the *AIH*, we only include information on household expenditures and indicators corresponding to characteristics at the individual level in column 2. We find that larger expenditures are significantly associated with better nutritional status. Moreover the relation between monetary position and health is non-linear. Controlling for additional household variables does not change the size of these effects and does not lower the significance. This is also true when including maternal information as seen in column 7-8, somewhat decreasing the sample.

Turning to the second hypothesis, we follow the above procedure. Unexpectedly the regression coefficient for inequality at the provincial level is positive and significant. As we initially do not confound by household expenditures this result could be spurious. However the positive sign also appears in the estimations when this supplementary information is added. The same conclusion is drawn from the found in the full models in column 6 and 8. In other words, higher inequality at the provincial level seems to be significantly associated with better nutritional status of children. This is clearly in contrast to the empirical evidence in the related literature.

If there is two-way causality between expenditures and health status the initial results will be biased. Nevertheless, employing IV techniques we do not come to any different conclusions. The regression coefficient of household expenditures and household expenditures squared stay significantly positive and negative, respectively, and very similar across the different specifications. The baseline indication on the association between inequality and health is also robust to the IV estimation. Higher inequality at the provincial level seems to be correlated with better child health outcomes. Hence, our results do not support the IIH. Rather there are signs of that an opposite relationship would exist.

[5] The LCMS II was carried out in 1998. The survey has nationwide reporting, covering 93417 individuals nested into 16710 households. Also using this data set we derive the income inequality measures of particular interest employing sample weights.

**Initial estimation results - OLS and IV**

| | OLS | | | | | | | | IV | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Gender | 0.200*** | 0.203*** | 0.202*** | 0.203*** | 0.203*** | 0.202*** | 0.191*** | 0.190*** | 0.221*** | 0.203*** |
| | [5.63] | [5.76] | [5.73] | [5.80] | [5.83] | [5.80] | [5.36] | [5.34] | [6.04] | [5.50] |
| Age | -0.050*** | -0.050*** | -0.050*** | -0.052*** | -0.052*** | -0.053*** | -0.058*** | -0.058*** | -0.053*** | -0.058*** |
| | [10.56] | [10.60] | [10.64] | [11.23] | [11.22] | [11.44] | [12.22] | [12.17] | [10.96] | [11.80] |
| Age^2 | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** |
| | [7.99] | [8.09] | [8.08] | [8.30] | [8.27] | [8.48] | [9.12] | [9.04] | [8.21] | [8.86] |
| Birth_order | -0.016 | 0.011 | 0.009 | -0.066*** | -0.067*** | -0.067*** | -0.079*** | -0.079*** | -0.040** | -0.051*** |
| | [1.36] | [0.94] | [0.70] | [3.88] | [3.96] | [3.97] | [4.39] | [4.40] | [2.17] | [2.59] |
| Exp_pc | | 0.003*** | 0.003*** | 0.002*** | 0.001*** | 0.001*** | 0.002*** | 0.001*** | 0.011*** | 0.010*** |
| | | [8.98] | [9.41] | [5.61] | [4.45] | [3.61] | [4.21] | [3.28] | [5.35] | [4.52] |
| Exp_pc^2 | | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.000** | -0.000*** | -0.000** | -0.000*** | -0.000*** |
| | | [5.05] | [5.37] | [3.31] | [2.65] | [2.16] | [2.64] | [2.09] | [5.17] | [4.38] |
| Rural | | | | -0.266*** | -0.231*** | -0.166*** | -0.172*** | -0.151*** | -0.024 | -0.031 |
| | | | | [6.52] | [5.40] | [3.81] | [4.06] | [3.40] | [0.44] | [0.57] |
| HH head | | | | -0.025 | -0.003 | 0.005 | 0.012 | 0.027 | 0.1 | 0.076 |
| | | | | [0.42] | [0.05] | [0.08] | [0.16] | [0.36] | [1.53] | [0.99] |
| HH gender_share (adult) | | | | 0.244** | 0.220* | 0.221* | 0.208* | 0.2 | 0.096 | 0.106 |
| | | | | [2.07] | [1.86] | [1.88] | [1.67] | [1.61] | [0.77] | [0.81] |
| HH size | | | | 0.047*** | 0.046*** | 0.045*** | 0.047*** | 0.045*** | 0.081*** | 0.068*** |
| | | | | [5.59] | [5.41] | [5.35] | [5.33] | [5.05] | [7.04] | [6.31] |
| HH edu1 | | | | 0.294** | 0.290** | 0.250** | | | 0.221* | |
| | | | | [2.56] | [2.53] | [2.18] | | | [1.85] | |
| HH edu2 | | | | 0.384*** | 0.349*** | 0.299** | | | 0.182 | |
| | | | | [3.30] | [2.99] | [2.57] | | | [1.47] | |
| HH edu3 | | | | 0.587*** | 0.504*** | 0.470*** | | | 0.037 | |
| | | | | [4.47] | [3.80] | [3.55] | | | [0.23] | |
| Meals | | | | | 0.210*** | 0.175*** | | 0.157*** | 0.034 | 0.038 |
| | | | | | [5.47] | [4.55] | | [3.95] | [0.69] | [0.76] |
| Animal products | | | | | 0.05 | 0.102*** | | 0.107*** | -0.046 | -0.018 |
| | | | | | [1.36] | [2.73] | | [2.81] | [0.93] | [0.37] |
| Water | | | | | 0.011 | -0.034 | | -0.056 | -0.131*** | -0.139*** |
| | | | | | [0.28] | [0.86] | | [1.39] | [2.87] | [3.00] |
| Toilet facility | | | | | -0.009 | -0.009 | | -0.017 | -0.039 | -0.045 |
| | | | | | [0.18] | [0.18] | | [0.33] | [0.72] | [0.81] |
| Mother's age | | | | | | | 0.015*** | 0.016*** | | 0.017*** |
| | | | | | | | [5.46] | [5.58] | | [5.93] |
| Mother edu1 | | | | | | | 0.083 | 0.071 | | 0.043 |
| | | | | | | | [1.45] | [1.23] | | [0.73] |
| Mother edu2 | | | | | | | 0.309*** | 0.272*** | | 0.109 |
| | | | | | | | [4.67] | [4.05] | | [1.37] |
| Mother edu3 | | | | | | | 0.568*** | 0.496*** | | -0.005 |
| | | | | | | | [4.84] | [4.18] | | [0.03] |
| Marital status | | | | | | | 0.098 | 0.089 | | 0.02 |
| | | | | | | | [1.62] | [1.46] | | [0.31] |
| Gini province | | | 3.251*** | 3.080*** | 2.662*** | 3.314*** | 3.830*** | 3.488*** | 3.929*** | 4.084*** |
| | | | [6.62] | [6.29] | [5.29] | [6.52] | [7.57] | [6.71] | [7.20] | [7.35] |
| Poverty province | | | | | | -1.437*** | -1.444*** | -1.483*** | -0.822*** | -0.989*** |
| | | | | | | [7.72] | [7.83] | [7.80] | [3.54] | [4.29] |
| Constant | -1.076*** | -1.379*** | -3.037*** | -3.248*** | -3.097*** | -2.389*** | -2.823*** | -2.666*** | -3.954*** | -3.987*** |
| | [14.56] | [17.27] | [11.55] | [11.21] | [10.17] | [7.53] | [9.23] | [8.30] | [8.56] | [8.59] |
| Observations | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 | 9752 | 9752 | 10316 | 9752 |
| R-squared | 0.02 | 0.03 | 0.03 | 0.05 | 0.05 | 0.06 | 0.06 | 0.07 | | |

Absolute value of t statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

### *District and Constituency level*

As it is not clear at what level of aggregation inequalities should matter, we also run regressions employing information on inequality (and poverty) at the district and the constituency level. These are clearly smaller geographical areas than a province. Once again we conclude that the *AIH* can not be rejected. Higher household expenditures are associated with better nutritional status and this relation seems to be concave. This is true regardless whether OLS or IV estimation methods are employed.

In contrast to the result when including provincial contextual variables, the sign of the regression coefficients for inequality at the district and the constituency level are negative when employing OLS. However, this effect is only significant in one single model. From the continued analysis it is evident that these results are not robust. Adding an increasing amount of household variables or information on the poverty rate the regression coefficients turns out insignificant. Moreover, there is no significant association between income inequality and health at lower geographical levels employing IV techniques.

**Estimation results for district and constituency level - OLS and IV**

| | OLS | | IV | | OLS | | IV | |
|---|---|---|---|---|---|---|---|---|
| Gender | 0.205*** | 0.205*** | 0.223*** | 0.224*** | 0.205*** | 0.205*** | 0.222*** | 0.224*** |
| | [5.80] | [5.86] | [6.05] | [6.10] | [5.81] | [5.85] | [6.05] | [6.10] |
| Age | -0.050*** | -0.052*** | -0.050*** | -0.052*** | -0.050*** | -0.052*** | -0.050*** | -0.052*** |
| | [10.59] | [11.21] | [10.20] | [10.76] | [10.58] | [11.21] | [10.20] | [10.76] |
| Age^2 | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** | 0.001*** |
| | [8.09] | [8.31] | [7.95] | [8.06] | [8.07] | [8.30] | [7.95] | [8.07] |
| Birth order | 0.011 | -0.069*** | 0.084*** | -0.043** | 0.011 | -0.069*** | 0.084*** | -0.043** |
| | [0.91] | [4.03] | [6.04] | [2.34] | [0.91] | [4.03] | [6.04] | [2.34] |
| Exp_pc | 0.003*** | 0.002*** | 0.012*** | 0.012*** | 0.003*** | 0.002*** | 0.012*** | 0.012*** |
| | [8.89] | [5.29] | [14.76] | [7.96] | [8.78] | [5.28] | [14.63] | [7.96] |
| Exp_pc^2 | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.000*** |
| | [4.97] | [3.03] | [13.17] | [7.53] | [4.87] | [3.02] | [13.06] | [7.53] |
| Gini district | -0.577* | -0.336 | -0.046 | -0.027 | | | | |
| | [1.65] | [0.96] | [0.13] | [0.07] | | | | |
| Gini constituency | | | | | -0.664** | -0.283 | 0.025 | 0.066 |
| | | | | | [2.25] | [0.96] | [0.08] | [0.21] |
| HH characteristics included | no | yes | no | yes | no | yes | no | yes |
| Constant | -1.084*** | -1.528*** | -2.244*** | -2.721*** | -1.049*** | -1.562*** | -2.281*** | -2.741*** |
| | [5.54] | [6.41] | [10.00] | [9.00] | [6.27] | [7.31] | [11.35] | [9.79] |
| Observations | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 |

Absolute value of t statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

### *4.2.2 Multilevel analysis*

If the outcomes for all observations in the sample are not independent, standard errors will be underestimated when employing OLS. Accordingly, the above results may appear significant when in fact they are not. In particular we are concerned about outcomes being related as an effect of that some children live in the same household, which could be problematic if nutritional status is dependent on characteristic common to a family, or as an effect of common influences related to the geographical part of the country where children live. To overcome potential problems we run a three-level random intercept model.

Parameter estimates in these regressions do not differ considerably from the OLS and IV estimations. Most importantly, the association between household income and health remain positive and significant, confirming the AIH, and the effect from provincial inequality is significantly positive. Inequality on district and constituency level is still insignificantly related to the dependent variable.

## *4.3 Alternative specifications and robustness tests*

*Income and inequality*

All economic inequality measures implicitly make value judgments on what observations in an income distribution that are of greatest importance to the derived outcome. As a robustness test we therefore replace the Gini coefficient on different contextual levels by Theil's two inequality indices, GE(0) and GE(1), respectively. These changes do not alter our initial results. The only significant effect from inequality to health is established when inequality is measured at the provincial level. Across all estimations the effect is positive with health. Moreover, in line with the above findings, we can not reject the AIH.

As a second test of robustness related to our inequality variable, we import corresponding inequality measures from the 1998 LCMS II survey to the current dataset and re-estimate the models. As before, indices are calculated from the full data set. This exercise generates some highly interesting results. In all models income inequality is positively and significantly related to higher height-for-age z-score, irrespective of whether inequality is measured on the provincial, the district or the constituency level or what index that is brought in to play. In other words, unlike the initial results employing present measures, larger lagged inequality values are associated with better health outcomes also for the two lower geographical levels.

The robustness of the baseline as well as the alternative specifications is alluring. However, there is a concern that results could be driven by outliers. Accordingly we estimate the examined models while excluding extreme values in the income distribution. This exercise does not change our conclusions about the *AIH*. With reference to inequality a corresponding dilemma would be a measurement error problem, due to few observations in some of the calculations of contextual variables, which could bias the coefficients for income inequality and poverty. Following Gertham and Johannesson (2004) we re-estimate the results excluding constituencies with fewer than 20, 50 and 100 observations. The association between present inequality and health remain negative in this exercise, but the regression coefficient is never significant. Using lagged values of inequality the relationship is positive and significant.

**Estimation results - Lagged measures of inequality - OLS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Exp_pc | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| | [3.61] | [3.57] | [3.61] | [3.90] | [3.89] | [3.90] | [3.95] | [3.95] | [3.96] |
| Exp_pc^2 | -0.000** | -0.000** | -0.000** | -0.000** | -0.000** | -0.000** | -0.000** | -0.000** | -0.000** |
| | [2.16] | [2.15] | [2.16] | [2.30] | [2.30] | [2.30] | [2.38] | [2.38] | [2.38] |
| Gini province 1998 | 3.314*** | | | | | | | | |
| | [6.52] | | | | | | | | |
| GE(0) province 1998 | | 1.627*** | | | | | | | |
| | | [7.16] | | | | | | | |
| GE(1) province 1998 | | | 0.898*** | | | | | | |
| | | | [6.36] | | | | | | |
| Gini district 1998 | | | | 0.674*** | | | | | |
| | | | | [2.86] | | | | | |
| GE(0) district 1998 | | | | | 0.314*** | | | | |
| | | | | | [3.26] | | | | |
| GE(1) district 1998 | | | | | | 0.206*** | | | |
| | | | | | | [2.71] | | | |
| Gini constituency 1998 | | | | | | | 0.620*** | | |
| | | | | | | | [3.30] | | |
| GE(0) constituency 1998 | | | | | | | | 0.298*** | |
| | | | | | | | | [3.64] | |
| GE(1) constituency 1998 | | | | | | | | | 0.225*** |
| | | | | | | | | | [3.21] |
| Poverty province | -1.437*** | -1.610*** | -1.488*** | | | | | | |
| | [7.72] | [8.44] | [7.92] | | | | | | |
| Poverty district | | | | -0.261 | -0.305* | -0.294* | | | |
| | | | | [1.61] | [1.87] | [1.80] | | | |
| Poverty constituency | | | | | | | -0.108 | -0.127 | -0.123 |
| | | | | | | | [0.78] | [0.91] | [0.88] |
| Constant | -2.389*** | -1.378*** | -1.161*** | -1.870*** | -1.662*** | -1.626*** | -1.946*** | -1.778*** | -1.757*** |
| | [7.53] | [6.22] | [5.41] | [8.34] | [8.33] | [8.19] | [9.38] | [9.25] | [9.16] |
| R-squared | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Observations | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 | 10316 |

Absolute value of t statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Although not seen in the table, all estimations regress variables refering to child and household characteristics.

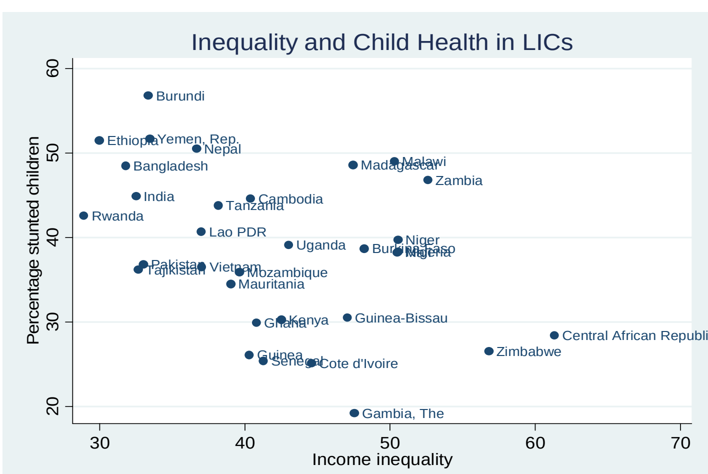
## 5. Discussion

Our results show that the relationship between household expenditures and the height-for-age measure is clearly positive, but the association is not linear. As more economic resources, in a concave fashion, always are associated to better child health in our models, we confirm the absolute income hypothesis. Although far from all studies on the relationship between individual income and health undertake preventive measures for potential reverse causality, our findings are clearly in line with the conclusion drawn in previous studies. The outcome from the IV estimations in fact points to that the income effect on health is stronger than first concluded from our baseline regressions employing OLS. Also using a multilevel modeling technique the AIH is confirmed.

The relationship between income inequalities and health is well documented in an U.S context, where several examinations find a negative association. Also studies made on Chile and Ecuador, two economies with large dispersions in the income distribution, locate a negative effect on self-rated and child health respectively. Our results do not corroborate these findings. Employing present inequality measures the regression results relating to the income inequality hypothesis come up with unexpected effects, pointing to that high inequality on the provincial level is positively associated with health status. Moreover, for lower contextual levels we find a similar relationship using lagged values of economic inequality. These outcomes are robust to different inequality measures, to different econometric methods and to alternative specifications of models and variables. Moreover, allowing for correlation of data observations within groupings by using multilevel techniques, conclusions made from the baseline specification using OLS are not altered.

Our results can not be explained by the theoretical discussion on potential pathways and mechanisms relating inequality and individual health. Speculatively the positive association could be related to the choice of location of aid and charity organization, centering their activities to distressed areas. An alternative explanation could be that poor people (that are in majority in a highly unequal society), in contradiction the more conventional view, have a healthier diet or have a different behavior which in turn is related to health outcomes. All together, the theoretical aspects on inequality and health clearly need to be revisited with the above results in mind.

Interestingly our result on the provincial level is also comes across in a cross-national level setting with aggregate data on low income countries (LICs) where we examine the association between economic inequality and stunting.




Data on inequality is here gathered from the broadest existing database on Gini coefficients (WIID, 2007b). Information on the prevalence of malnutrition is derived from World

Development Indicators (2005). We choose to examine the association using data from the year of 2000. When data is not available for this exact time point, we content ourselves with data from years close in time.

In addition to graphical analysis, we examine the association between inequality and malnutrition using OLS. Starting with a full sample, including 90 countries at all levels of economic development, estimations generate a positive but not significant regression coefficient for the dispersion in income distribution. However, the corresponding coefficient in a stratified analysis on the sub-sample referring to LICs is negative and significant while positive and significant for the countries not classified as middle or high income countries. The relation stated by the IIH is thus found in developed countries (although the caveats on using aggregated data here should be kept in mind), while a reverse association seems to exist in less developed economies. The same results appear when including the level of GDP per capita, squared GDP per capita, health care expenditures per capita and adult literacy rates as additional explanatory variables. This is not in line with recent conclusions on the relation between inequality and infant mortality on the aggregate level, where higher income inequality is associated to poorer population health (Schell et al. 2007, Babones 2008).

**OLS estimates on aggregate data - LICs and non-LICs**

| | | | | | | | With the assumtion that OECD countries have no prevalence of stunting | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Full | | LIC | | Non-LIC | | Full | | Non_LIC | |
| Gini | 0.166 | 0.076 | -0.293* | -0.344** | 0.374*** | 0.354** | 0.04 | 0.067 | 0.288*** | 0.278** |
| | [1.66] | [0.70] | [1.95] | [2.33] | [3.28] | [2.51] | [0.44] | [0.70] | [3.30] | [2.38] |
| GDPC | -0.005*** | -0.004*** | -0.033** | -0.039*** | -0.004*** | -0.003* | -0.003*** | -0.004*** | -0.001*** | -0.003*** |
| | [8.90] | [4.34] | [2.59] | [2.97] | [4.16] | [1.97] | [10.90] | [5.35] | [6.50] | [3.12] |
| GDPC^2 | 0.000*** | 0.000*** | 0.000* | 0.000** | 0.000*** | 0 | 0.000*** | 0.000*** | 0.000*** | 0.000** |
| | [5.76] | [3.26] | [2.01] | [2.69] | [2.91] | [1.68] | [6.75] | [3.61] | [4.30] | [2.37] |
| Litteracy | | -0.183*** | | -0.108 | | -0.194 | | -0.191*** | | -0.222* |
| | | [2.78] | | [1.48] | | [1.45] | | [3.06] | | [1.77] |
| Health expc | | -0.008 | | -0.26 | | -0.017 | | -0.005 | | -0.004 |
| | | [0.47] | | [1.13] | | [0.95] | | [0.42] | | [0.36] |
| Dummy exp | | -1.219 | | | | 2.315 | | -0.863 | | 1.579 |
| | | [0.35] | | | | [0.66] | | [0.27] | | [0.50] |
| Constant | 34.739*** | 52.266*** | 74.399*** | 89.725*** | 17.141*** | 31.721* | 32.929*** | 52.363*** | 12.269*** | 38.202** |
| | [7.83] | [6.27] | [6.63] | [7.29] | [3.02] | [1.95] | [7.61] | [6.91] | [2.74] | [2.69] |
| R^2 | 0.57 | 0.65 | 0.34 | 0.53 | 0.42 | 0.50 | 0.65 | 0.71 | 0.62 | 0.6 |
| Obs. | 90 | 72 | 37 | 27 | 53 | 45 | 117 | 78 | 80 | 51 |

Absoulte value of t statitstics in brackets. * significant at 10%, ** significant at 5 %, *** signifcant at 1%

Several high-income countries lack information on malnutrition wherefore we suspect a bias to be present in the above analysis. As an attempt to set this right, we assume the variable stunting to equal 0 for all OECD countries. This modification does not change our conclusions for the full sample, nor for the sub-sample consisting of non-LICs.

Our intention is not to draw any far-reaching conclusions from these simple estimations and the above results clearly need to be further examined and discussed within an appropriate theoretical framework.[6] However, the overall outcome gives a preliminary indication on that the relation found, with less malnutrition in areas where inequality is high, may not be atypical for Zambia. Rather, the situation examined could potentially be representative for very poor developing countries.

[6] Preferable such framework should not only include a discussion on biological, social and contextual explanatory factors of malnutrition, but also outline particular characteristics of LICs, such as high aid dependency and debt burden, which could be related to child health outcomes.

## 6. Conclusion

For a long period of time the question whether economic inequality adds an additional hazard to individual health has been a subject of discussion in academic disciplines. Zambia suffers from high rates of poverty and economic inequality. Moreover, the health status of adults as well as children is poor and topical studies suggest that health outcomes have deteriorated during the past decade. A highly relevant question related to the recent discussion on a potential inequality threshold is evidently what association that exists between inequality and health during such circumstances.

Inline with the objective of this study, we have examined the relation between on one hand income and health and contextual inequality and health on the other, using an anthropometric measure on child health and different quantitative methods. Some highly interesting results come out from this exercise. First of all, income is clearly a determinant of child health. However this relation is not linear. The relationship between income and health outcomes is even stronger when trying to correct for endogeneity and also holds in the multilevel estimations. This is completely in line with the absolute income hypothesis (AIH) stating that the health status of an individual is relate to, in a concave fashion, to the individual level of monetary resources.

Secondly, although the association is tested within a high-inequality context, there is no evidence of the income inequality hypothesis (IIH). On the contrary we find that the level of inequality, measured at different contextual levels, is significantly positively related to health outcomes. In other words, higher inequality is associated with better child health. This is true irrespective of what inequality measure we employ. Consequently we can not confirm the existence of an inequality threshold.

Interestingly the positive association between inequality and child health is also found in a cross-national level setting. Although no far-reaching conclusions is (or should) be drawn from this particular exercise, the overall outcome gives a preliminary indication on that the context here studied may not be unrepresentative. Possibly this is where we could continue our analysis on the association between economic inequality and health to test alternative pathways and mechanisms. Irrespective of focusing on an aggregate or an individual level our result show that the there clearly is a need for further research.

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