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EARLY CHILDHOOD LENGTH-FOR-AGE IS ASSOCIATED WITH THE WORK STATUS OF FILIPINO YOUNG ADULTS

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Abstract

Most studies on childhood health and human capital in developing countries examine how early childhood linear growth relates to later human productivity as reflected in schooling success. Work status is another important human capital outcome related to early child health. This study examines the relationship of linear growth restriction at two years of age to work status in young adults who have, for the most part completed their schooling and further explores whether this relationship differs by gender. The analysis sample of 1,795 was drawn from participants in the Cebu Longitudinal Health and Nutrition Survey, which followed individuals from birth to age 20–22 years. Work status in 2005 was represented by three categories: not working, working in an informal job, and working in a formal job. Formal work in the Philippines, as in most countries, is associated with regular hours, higher wages and benefits. Analyses were stratified by gender and current school enrolment, and adjusted for socioeconomic status and attained years of schooling. Among males no longer in school, higher length-for-age Z score (LAZ) at age 2 was associated with a 40% increase in likelihood of formal work compared to not working. In females, each 1 unit increase in LAZ was associated with 0.2 higher likelihood of formal vs. informal work. No significant associations were observed in the small sample of young adults still in school. To improve job prospects of young adults, it is important to provide proper nutrition in early childhood and adequate educational opportunities during schooling years.

Keywords

Philippines; length-for-age (LAZ); work status; informal jobs; formal jobs; labor force participation; nutrition

Introduction

Malnutrition persists as a primary problem among children in the developing world. Although malnutrition declined by 17% in developing countries from 1990–2000, in 2001, it was still

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associated with 60% of all childhood deaths (UNICEF, 2002). Several studies report the adverse effects of early childhood malnutrition on physical growth, cognitive development, reproduction, physical work capacity, and consequently human performance, health and survival.

Length (or height)-for-age is a widely used indicator of cumulative nutritional status, with stunting defined as sex-specific length or height-for-age Z-score more than 2 SD below the 2005 WHO standard median (de Onis et al. 2007). Stunting can affect the development of a child from the prenatal period into mid-childhood, when growth is highly sensitive to nutrition of the mother and the child. In 1996–2005, in all developing countries, 32% of children under 5 years of age (178 million) were estimated to be moderately or severely stunted, reaching 40% in South Africa and South East Asia (WHO, 2007). Because stunting is a global concern, measures have been planned and implemented to lessen its prevalence. The Philippines' Food and Nutrition Research Institute in 2001 reported that among 0–10 year-old Filipino children, 31% were stunted, representing a slight improvement compared to the 1998 prevalence of 34%. Numerous studies have documented the negative correlates of low length-for-age in general. Mendez and Adair's 1999 study of more than 2000 Filipino children showed a negative association of stunting in early childhood with the child's cognitive development and school performance. Studies in several developing country contexts, including the Philippines and Guatemala among others, suggest that low early childhood height-for-age predicts short adult stature (Waterlow, 1988, Adair, 1999, Martorell et al. 1994, Caulfield et al. Checkley et al. 2002, Case and Paxson, 2006). A deficit in height is a disadvantage in productivity as shown in a well-known study in Brazil, not only are taller men and women more likely to be in the labor force, but taller men also earn higher wages (Strauss and Thomas, 1998). Since height deficits are evident early in life, it is important to focus on its contribution to adult labor force outcomes.

The Philippines has been experiencing an increasing number of young adults in its population because of the decline in child mortality and the increase of fertility in the past six decades. This surge in young adults has significant bearing on the labor force. As of January 2005, 66% of the Philippines' adult population (15 years old and over) participated in the labor force (Labor Force Statistics, 2006). Half of the Philippine population was less than 21 years old, which means that employment options and patterns for young adults are particularly important.

Most studies on the consequences of childhood health in developing countries examine the association of early childhood stature on human productivity as reflected in schooling success, but few examine this relationship using work participation as a measure of productivity. A study in Norway on birthweight and work participation at age 29 showed that birthweight below the standardized mean was associated with increased risk of unemployment (Kristensen et al. 2004). This paper examines the association of child length for age Z-score (LAZ) at age two years to work status in early adulthood and assesses whether there are differences between sexes. This question has not been extensively explored because it requires data on individuals both in early childhood and when they are young adults. The availability of longitudinal data on about 2,000 young adults in Cebu, Philippines permits the investigation of this relationship. At these young adult ages (20–22 years), work type may be in transition, particularly for those still in school or training programs. However, since early work experience is an important predictor of later work and earnings, it is valuable to examine factors that may influence work patterns of young adults.

In the Philippines, work can be classified as formal or informal, with work in the formal sector yielding higher wages and benefits. We hypothesize that a lower LAZ at age two is associated with a lower likelihood of working in a formal job. This is likely to be true because LAZ is known to be associated with poorer cognitive development and school achievement, as well

as lower school attainment, which in turn strongly predicts formal sector work. We test this hypothesis by first examining the crude association of LAZ at age two years with the work status of male and female young adults. Second, we control for other individual, community and household characteristics that may confound this relationship. Finally, we test whether educational attainment mediates the association of LAZ at age two with work status of male and female young adults.

This study is of particular relevance for developing countries like the Philippines where investments in health and education are needed for the growing number of young people about to enter the labor force.

Study Area, Data Source and Study Design

Our study site is located in Metropolitan Cebu, the Philippines. Among the 78 provinces of the Philippines, Cebu ranks second in terms of population size (National Statistics Office, 2000). At present, it is composed of five cities and four municipalities[1].

The Cebu Longitudinal Health and Nutrition Study (CLHNS) follows a cohort of mothers and their children born between May 1, 1983 and April 30, 1984. The CLHNS started as a joint endeavor of the Carolina Population Center, University of North Carolina at Chapel Hill, the Nutrition Center of the Philippines, and the Office of Population Studies, University of San Carlos, Cebu Philippines. It used a two-stage sampling design to randomly select 17 urban and 16 rural barangays (smallest political unit) in Metro Cebu. All pregnant women in these barangays were invited to participate in the study (n=3702). From this initial eligible sample, 3,327 women were enrolled. Women with births or pregnancy losses outside of the designated one year time period were not included which defined eligibility for the sample. The refusal rate for the baseline survey was about 2%. No data were collected on those who refused, so it is not possible to determine whether they differ from those enrolled. Among the 3,327 baseline participants, there were 3,080 single live births identified[2]. After the birth survey, twelve succeeding interviews, longitudinal surveys 1 to 12, were conducted every two months. Subsequent follow-up surveys were conducted in 1991, 1994, 1998, 2002 and 2005. Sociodemographic, health, economic and community data were gathered in each survey round. This study utilizes data from baseline, the 12th longitudinal survey (when children were 2 years old) and the latest survey in 2005.

In the CLHNS 2005 survey, the 1,912 young adult participants ranged in age from 20–22 years. They were interviewed face-to-face using structured questionnaires. Attrition from the baseline sample occurred because of migration (75%), deaths (concentrated in the first 2 years of life), or refusals (fewer than 2%). The analysis excluded 24 twins because their early life experiences and growth patterns are likely to be quite different from singletons leaving a total of 1,888 young adults from the CLHNS. Of these, 1,795 had complete data on all covariates and were included in the final analysis sample.

Description of the dependent variable

Our dependent variable is the work status of the young adults in 2005 categorized as (0) not working for pay, (1) working in an informal job, and (2) working in a formal job.

A job was considered formal if it satisfied three conditions, namely (a) full time, that is 40 or more hours/week, (b) pay is equal to or above 173 pesos/day (~$3.46) minimum pay in Metro Cebu stipulated by the Department of Labor and Employment in 2005, and (c) benefits are

[1]In 1983, when the CLHNS' baseline survey was conducted, there were only three cities and six municipalities.
[2]247 cases were multiple births, stillbirths, miscarriages and migration (www.cpc.unc.edu/projects/cebu/)

included from the Social Security System/GSIS, PhilHealth/other health insurance or Pag-IBIG (Housing Program). As in most countries, working in a formal job in the Philippines has substantial advantages over working in an informal job because a formal job generally offers more security and higher wages and benefits. Examples of formal jobs for men and women include office clerks, administrative and technical staff, and production process workers.

Main exposure variable

Our main exposure variable is LAZ estimated using the 2005 WHO growth standard. Recumbent length was measured to the nearest 0.1 cm by teams of highly trained interviewers using custom length boards. LAZ scores at 22 months were substituted if LAZ at age 24 months was missing (n=57), resulting in available LAZ for 2,497 children. We use length at age 2 years because most child linear growth retardation has occurred by this age (Ricci and Becker, 1996, Waterlow, 1988, Adair and Guilkey, 1997). Although some catch-up growth may occur after age two (Golden, 1994, Adair, 1999, Norgan, 2000), it is less common if these children remain exposed to the same poor environment in later childhood (Martorell et al. 1994)

Other variables

Our analyses include other baseline biological, maternal and household factors that might be confounders of the association between LAZ and work outcomes of interest. These are: mother's age (years) at the time of delivery, parity, height in centimeters measured using a Microtoise stadiometer, educational attainment expressed as highest grade completed, and whether there were reading materials in the house read by the mother. Maternal education was included because of its known effects on child health, independent of other measures of socioeconomic status (Behrman and Wolfe, 1987, Menon et al. 2000). Paternal education and age were also included as covariates.

A hygiene index reflects the cleanliness of the area in and around the house, with a score of 0 to 9. The type of toilet facility used by household, amount of feces in the surrounding area, the method of garbage disposal, and cleanliness of the area where the food is kept formed the components of the score. A low score represents unsanitary condition of the neighborhood where the child lives, thus increasing exposure to harmful microorganisms causing infectious diseases, especially diarrhea and respiratory illness.

The assets score, ranging from 0 to 10, is a measure of the household's economic status. The score reflects the type of lighting used, ownership of house, the type of housing material, and ownership of selected assets including television, air conditioner, tape recorder, refrigerator, or motor vehicle.

At the community level, the urbanicity index, also measured at baseline, is a 7-component score calculated for each barangay. The components include communication, education (school types), transportation, health services, markets, population and population density of the barangay (Dahly and Adair, 2007). A higher score indicates a more highly urbanized barangay.

Statistical procedures—The Statistical Package STATA 10.0 (StataCorp. 2007. *Stata Statistical Software: Release 10.* College Station, TX: StataCorp LP.) was used for analysis. Test for multi-collinearity (i.e., pair wise correlations) showed that relevant explanatory variables were not highly correlated except for father's and mother's education level (for which the correlation is about 0.6), but both were retained because of the possibility that they may have independent influences on the work status of young adults. The bivariate association between the main exposure variable and other covariates was examined according to the form of the variables (analysis of variance (ANOVA) for continuous and Pearson's Chi-square for

categorical). *Multinomial logistic regression* was used to examine the association of LAZ at age two years with work status (not working, work in informal sector, or work in formal sector) of young adults without adjusting for covariates (Model 1), after adjusting for the individual, household and community characteristics (Model 2), and with additional adjustment for years of formal education of young adults as a potential mediator (Model 3) according to Baron and Kenny (1986). Since multinomial logistic regression assumes independence of irrelevant alternatives (IIA), we also estimated models using multinomial probits. Finding no substantive differences which would suggest that IIA is violated, we report logit results. We used multinomial logits rather than an ordered logit because the three categories represented quite different outcomes, and the multinomial logit allowed us to determine whether variables of interest had similar associations with the three different outcomes (not working vs. informal work, not working vs. formal work, and formal vs. informal work).

A small proportion of CLHNS young adults were still in school. Prior to 1995, children entered elementary school at the age of seven[3]. They typically completed 6 years of elementary school, and four years of high school thus graduating at age 16–17. After completing high school, Filipino students may continue their education at a technical or vocational institution or at a university. Students study for four years and acquire between 120 and 190 credits to obtain a bachelor's degree typical is at age 20–21. CLHNS young adults who were still in school in 2005 were less likely to be working, and if working, were more likely to be employed in part time jobs. The analysis was therefore stratified by schooling status of young adults in 2005 (in school or not). Owing to the small number of formal workers among those in school, we restrict that comparison to the informal versus non-working groups, and use *logistic regression* for that analysis.

Several studies show gender differentials in labor force participation rates, job types, wage rates and earnings. Handa and Neitzert (1998) reported that men do more energy-demanding jobs compared to women. A study conducted in selected developing countries, found differences in wage earnings with men receiving higher wages than women (Anker and Hein, 1986). Women continue to comprise a relatively smaller but growing portion of the labor force. Although the gap between women and men narrowed since 1980, men recently accounted for 59.9 per cent of the labor force in comparison to women who comprise 40.1 per cent (International Labor Organization, 2007 page 21). Furthermore, the Philippines' 2004 Labor Force Survey reported a wide disparity in the workforce wherein more males were working compared to females -19,836,000 vs. 11,905,000. In the Central Visayas region where Cebu is located, the labor force participation rates of males and females were 77 per cent and 49 per cent respectively. In view of these studies, we stratify our analysis by sex.

Attrition and missing data may introduce bias, and of particular concern is whether the association of LAZ with later work status is different in the included and excluded persons. The analysis sample (n=1795) represents about 58% of single live births. To account for possible selection bias[4], all analyses included sample weights which represented the inverse probability of being in the analysis sample, estimated using a large set of baseline exogenous parental and household characteristics (Fitzgerald et al. 1998,Wooldridge, 1999).

Results

a) Participant characteristics

The characteristics of the analysis sample are compared to those who were excluded (Table 1). Differences with a $p<0.05$ were considered to be significant. Those included in the analysis

[3]Source: Republic of the Philippines, Department of Education http://www.deped.gov.ph; The Consultative Group on ECCD. Washington D.C.: World Bank, 1999, and, Philippines-Education System: Table of Contents

sample had parents who were less educated and were more likely to have been born in rural barangays compared to those lost to follow-up.

The profile of CLHNS young adults in 2005 stratified by work status is presented in Table 2. At a mean age of 21, a higher proportion of females than males were ever married. In this predominantly urban sample, a slightly higher proportion of females were not working, but more males than females were engaged in informal work. About 74% of young adults in the analysis sample were born in urban communities, but in 2005, 70% lived in urban areas. A low percentage of women working in formal jobs were married. A higher percentage of never married compared to ever married males were engaged in informal work. Among young adults no longer in school, more females than males were high school graduates. One third of females and 28% of males with formal jobs had one or more years of college education. Most young adults who were still in school were not working and of the 4% of the total sample working and in school at the same time, few were engaged in formal jobs, providing further rationale for stratifying our models by current enrolment status. A higher proportion of those not in school in 2005 were females (Figure 1). There were no gender differences in work status among those still in school.

b) Multiple logistic regression models

Results from separate analyses of males who are not in school and who are still in school are presented in Tables 3a and 3b, respectively, and comparable results for females are in Tables 4a and 4b.

Multinomial logistic regression was used to examine the association of LAZ at age two years with work status (not working, work in informal sector, or work in formal sector) of young adults. For males no longer in school, a one unit increase in LAZ at age 2 is associated with an approximately 40% higher likelihood of working in the formal sector compared with either informal work or not working (Table 3a Model 1). When adjusted for correlates, this estimate was strengthened when comparing formal work to not working, but attenuated when comparing formal to informal work (Model 2). The years of schooling attained has a large effect: each additional year of schooling is associated with a 32% higher likelihood of formal work compared to not working and a 38% higher likelihood of formal versus informal work (Model

[4]It is important to note that since LAZ is measured at age 2, there is already sample attrition between birth and age 2, owing to deaths (which led to loss of the poorest, most malnourished children) and migration (which was more likely in higher SES households). Thus, any analytic strategy that involves using LAZ at age 2 does not fully capture the effects of attrition from birth.
In the first analysis, we predicted inclusion in the analysis sample (n=1795) vs. excluded from the analysis sample (n=702), including a set of baseline maternal and household exogenous characteristics interacted with LAZ at age 2. This model included sex of the child, household assets, hygiene index, the number of household members, maternal and paternal age and education, maternal height, urbanicity index, and presence of piped water in the household and interactions of each of these 12 variables with LAZ at age 2. Only one interaction term was statistically significant (z-score with household assets) and when the interaction terms were tested jointly, they were not significant (chi2 = 14.54, Prob > chi2 = 0.2676). Thus, this analysis does not suggest strong bias.
In the second analysis, we included the inverse probability of being in the sample (Mills'ratio) as a covariate in the mlogit models and interpreted the coefficient on that variable as well as its effects on the other variables in the model (most notably, LAZ). In general, the difference in coefficients on LAZ was at the third decimal place, suggesting little or no effect of including the Mill's ratio in the analysis. This inclusion had negligible effects on the estimates.
In the third analysis, we used the inverse probability of being in the analysis sample as a sample weight and compared weighted and unweighted results. As an illustration of the findings:

Coefficient (standard error) on LAZ		
no corrections:	0.290 (.126)	p=0.022
include Mill's ratio:	0.291 (.127)	p=0.021
weighted	0.335 (.133)	p=0.012

The uncorrected estimates are the most conservative, so at worst, we are understating the strength of the relationship of early child nutrition to young adult work status.

3). The attenuation of the LAZ coefficients when years of schooling is included in the model is evidence of its mediating effect. While our main focus is on the role of LAZ and work status, it is also interesting to note that even after controlling for young male's educational attainment, being a firstborn child, having an older father and being born in an urban community were associated with a reduced likelihood of informal and formal work versus not working. In addition, higher maternal education was strongly associated with formal versus informal work only before accounting for the young adult's own education suggesting that parental education operates mainly through offspring's educational attainment (Table 3a Model 2). Alternately, parents with higher education may have better jobs and be more able to provide better education and good nutrition for their children.

Among females not in school, a one unit increase in LAZ at age 2 is associated with a 32% higher likelihood of formal work vs. informal work (Table 4a Model 1). This association was not strongly affected by the inclusion of covariates (Model 2), but as in males, the effects were attenuated with the inclusion of years of schooling. Nonetheless, even considering female's educational attainment, nutritional status at age 2 was associated with a 22% increase in the likelihood of formal versus informal work (significant at p=0.06).

In both males and females, a higher urbanicity score was the only covariate that was significantly associated with work status after adjusting for the young adult's own schooling, and the direction of association was opposite of expectations (higher urbanicity at birth was associated with a lower likelihood of formal work).

c) Logistic regression models

This analysis was restricted to the comparison between informal work and not working owing to the very small number of formal workers enrolled in school. Few students are likely to be working at formal jobs, which according to our definition, require that the work be full time.

Among young adult males who were in school (Table 3b), current work status was not significantly associated with LAZ at age 2. Parental education was the only predictor of note, with opposite effects for maternal versus paternal education: young adult males whose mothers attained higher education were less likely to work in informal jobs vs. not working while increasing educational attainment of fathers was associated with increased likelihood of working in informal jobs compared to not working. These associations remained constant even when the young adult male's year of schooling was included in the model.

As was the case with males, there was no association of LAZ at age 2 with work status among young women still in school (Table 4b). Maternal education and urbanicity of residence at birth were weak predictors (p<0.10) of informal work versus not working after adjustment for the young woman's year of schooling. Each additional year of a young woman's schooling was positively associated with working in an informal job compared to not working. All of the estimates had wide confidence intervals reflecting the small sample and high level of heterogeneity of the participants still in school.

To summarize the results from multiple logistic regression: Those not in school, the comparison of formal work vs. not working, in females, the LAZ coefficient strengthens in Model 2, but after accounting for their educational attainment, the LAZ coefficient is similar to the crude model. In males, Models 1 and 3 yield similar results, but the years of schooling attenuates the effect. Comparing formal vs. informal work, in females Models 1 and 2 produce similar LAZ estimates, but LAZ is attenuated when years of schooling is included. In males, the LAZ coefficient is attenuated in the presence of covariates, and further attenuated when educational attainment is included. Each year of schooling contributes to a greater likelihood of formal vs.

informal work among males: this stronger education effect may be responsible for the greater attenuation of the coefficient in males.

Figure 2 presents the predicted probability of each work category associated with moderate to severe stunting at age 2 (LAZ=<−2.5) compared to absence of stunting (LAZ=0) among young adults (males and females combined) no longer in school, holding all other variables constant at their means. Of the CLHNS young men and women, 32% did not work in 2005, 49% were working in informal jobs and 19% engaged in formal jobs. If these young men and women were stunted at age 2, the probability of working in formal jobs is only 19% compared to about 31% if they were not stunted.

Conclusion and Discussion

Our study shows an association of early child growth restriction at age 2 with reduced likelihood of employment in formal sector jobs among young adults 20 years later. Employment in formal sector jobs is important because of its association with higher earnings i.e., 173 pesos per day, as well as important benefits such as health insurance. These results extend previous findings from CLHNS showing that poor growth in early childhood is associated with later child physical and cognitive development (Mendez and Adair, 1999, Daniels and Adair, 2004, Adair, 2007). Many studies in developing countries focus on the associations of early childhood nutritional status with later human productivity as reflected in school attainment or achievement. Less attention has been paid to other adult economic outcomes which may come into play for young adults after they terminate or complete schooling. Other studies have examined outcomes such as work capacity (reviewed in Haas et al. 1996) and earnings. Hoddinot and colleagues (Hoddinot et al. 2008), using data from a child nutrition supplementation trial in Guatemala show that nutrition supplementation before the age of 3 years resulted in higher wage rates for adult men.

While we cannot claim that the results of our study represent causal relationships owing to limitations of the estimation methods used, the strong associations point to the importance of optimizing early child nutrition. A recent Lancet series devoted to child development includes a conceptual model and comprehensive review of intervention studies that support a causal relationship of early child nutrition to developmental and human capital outcomes (Engle et al. 2007). The review provides strong evidence that interventions directed at improving child nutrition and stimulating intellectual development can be effective in enhancing cognitive development and schooling outcomes. Other investigators have exploited experimental study designs or exogenous shocks to develop causal models (Alderman et al. 2007). Malnourished children complete fewer years of schooling (reviewed in Victora et al. 2008), and may also have a reduced capacity to learn due to impaired cognition (Walker et al. 2005), and higher rates of morbidity leading to frequent absences from school or poor concentration in their studies. A study based on the CLHNS sample shows that stunting is related to lower school attainment as a result of late school entry, more grade repetition, and increased likelihood of early drop out (Daniels and Adair, 2004). Moreover, diarrhea and respiratory infections among CLHNS participants during childhood are associated with more absenteeism from school (Perez et al. 2007).

Because CLHNS participants were in their early 20s at the time of the survey, about 15% were still in school, with the majority of these in the last year of high school or in college. These are individuals who were behind in school attainment because they are more likely to have repeated a grade. Among those still in school, 32% had repeated a grade since the prior survey round in 2002, compared to only 3.5% of those no longer in school. Since the likelihood of formal work is strongly affected by current schooling status (full time students are much less likely to be working full time, particularly in formal jobs), we elected to stratify our models by current

enrolment status. Results were quite different by enrolment status, with LAZ predicting work status only among those who were no longer in school. The range of school attainment is large in this group, ranging from less than elementary school to completion of a college degree. In contrast, those enrolled in school have similar education levels, and are more homogeneous with respect to other characteristics as well. Their inclusion in the analysis sample, (as opposed to analyzing them in a separate stratum) would bias the estimates of the association of early childhood nutritional status with young adult work status toward the null hypothesis wherein higher LAZ at age 2 increased the likelihood of working in formal work in young adulthood.

Our estimates illustrate that among young adults who have terminated or completed schooling, growth deficits accumulated in the first 2 years of life are associated with a reduced likelihood of being employed in the formal work sector compared to either not working or working in the lower paying informal sector. As expected, years of completed schooling in this group were strongly associated with formal sector work. Other studies show that early child height deficits are associated with lower grade attainment (Bas, 2007, Daniels and Adair, 2004). Likewise, we also estimate (estimates not shown) 2005 schooling status as a function of length for age Z score at age 2. Results reveal that LAZ is positively associated with the young adult years of education. Controlling for a wide range of baseline variables, including parental education, income, assets, birth order, maternal age and height, whether the mother reads or not, a one unit difference in LAZ at age 2 is associated with a 0.4 year difference in years of schooling in 2005.

When school attainment is included in the models, the association of LAZ at age 2 to adult work status is attenuated, suggesting a mediating role for schooling. The mediating role (Baron and Kenny, 1986) of years of formal education of the young adults is consistent with other studies (Kristensen et al. 2004). Strauss and Thomas (1998) found that education played an important role in the observed positive association between height and wages among Brazilian men. As reflected in this study, there are no pronounced gender differences in the relationship between early childhood LAZ and work status among young adults especially if the mediating effect of education is taken into account. For male and female young adults, higher LAZ in early childhood is associated with a higher likelihood of landing in formal jobs.

Results of the study reveal an unexpected relationship of work status with urbanicity at the time of birth: the likelihood of landing in a formal job was lower among young adults who were born in more highly urbanized communities. Place of residence may no longer predict place of work, as young adults are extremely mobile and seek jobs throughout Metro Cebu. Those born in more rural environments may have been more likely to seek employment in urban areas. Moreover, major development of a formerly rural area into a high tech industrial park has created jobs near rural communities. In addition, a United Nations report (United Nations ESCAP, 2000) found that in the Philippines, the labor force participation rate for rural male youth aged 21–25 years was higher compared to their urban counterparts (91.6% for males and 54.4% for females in rural areas, while 85.7% for males and 56.8% for females in urban). Rural youth may enter the labor force much earlier than those residing in urban due to the limited access for post-secondary education in rural areas.

It is important to consider the extent to which our analysis sample represents Filipino young adults, and further, whether loss to follow-up over the years of the survey might bias the results. To address the first issue, CLHNS young adults were compared with the young adult participants in a contemporary national survey, the 2002 Young Adult Fertility Survey (YAFS3). Male and female young adults, aged 20–24 years, in YAFS3 shared similar background characteristics with our analysis sample. Both surveys show a higher percentage of females than males with college education (31.3% vs. 24.4% in YAFS3 while 32.6% vs. 23.8% for the analysis sample) but slightly more males were enrolled in school (22.9% vs.

19.9%) in YAFS3 while the ratio was 15.9% vs.14.2% for the analysis sample. For the reason that more females had been married already (23.1% vs. 7.9% in YAFS3 while 35.0% vs. 20.6% for the analysis sample) and might be staying in the house without engaging in any economic activity, sex differentials in economic activity were observed. The percentage distribution of males in the labor force was greater compared to females (49.0% vs. 26.5% in YAFS3 while 63.4% vs. 58.8% for the analysis sample).

At baseline, the objective of the CLHNS was to examine the determinants and consequences of infant feeding patterns using a prospective study design. The CLHNS sample selection was biased towards urban barangays on the assumption that patterns of household child care, infant feeding and health care vary more in urban areas than in rural. In Cebu province (the island in the Central Visayas region where Metro Cebu is located) 61% of the population resided in urban areas, compared to 48.0 percent for the whole country (Zosa et al. 2004, NSO, 2002). More than half of the Philippine population resides in Luzon (where the capital of Manila is located) and the remainder is almost equally distributed between Mindanao and the Visayas islands (NSO, 2000). Thus, our sample may not be representative of all Filipino young adults. However, in the national census, the educational background and gainful employment of young adults, aged 20–24 years in Cebu province and the whole country did not differ substantially. Females dominate higher levels of education. The percentage of adults with higher academic degrees was 4.2% among females vs. 2.1% among males in Cebu, in comparison to 4.1% and 2.3% for females and males, respectively in the whole country. More Cebu males were gainfully employed compared to females (34.5% vs. 26.6 in Cebu compared to 37.2% vs. 25.8% for the whole country). As shown above, our CLHNS analysis sample follows this same pattern. No other longitudinal studies in the Philippines have examined the association of early child health and labor force outcomes in young adulthood, so comparison with other populations in the Philippines is precluded.

The second issue relates to attrition in the CLHNS. The attrition rate in the CLHNS youth is not so surprising given the length of follow-up (1983–2005), setting and the characteristics of the sample. With an almost 60% left in the study, this however provides an adequate sample, given caveats about potential attrition bias. Baseline characteristics that predict subsequent attrition were included as covariates in our models, reducing the likelihood of bias. To account for possible selection bias, our models were weighted and the use of this method tended to produce more precise estimates of key relationships.

The young adult population represented in our analysis sample is still in transition, and many may have not yet settled into the main occupations that will characterize their later adult years. These are nonetheless important years for obtaining valuable job experience which will strongly affect future employment prospects.

In sum, to enhance young adults' ability to earn adequate wages and enjoy the benefits of formal work sector employment, attention must be paid to early environments, including a focus on the prenatal period as well as early childhood. Investments to optimize early nutrition, health and educational opportunities are needed to improve job prospects in the future. Efforts from the Philippine government through the Department of Health have started as early in 1974 when the Integrated Maternal Child Health was established as one of its health programs (DOH, 2006). As a result, a drop in the mortality rate of under-five-year olds was observed from 1995 to 2002, i.e. 66% and 40% respectively (Population Reference Bureau, 2000). Moreover, in 1999, a five-year Early Childhood Development (ECD) Project was launched to help attain the country's human development goals to benefit children ages 0–6 years. A longer exposure to the program resulted to a decrease in the number of wasting and an increase in overall psychosocial development (ECD report, 2005). In a country like the Philippines where a growing number of young people are about to enter the labor force, more studies examining

the relationships of early childhood health and work participation in young adulthood are of particular importance.

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References

Adair LS. Filipino children exhibit catch-up growth from age 2 to 12 years. The Journal of Nutrition 1999;129:1140–1148. [PubMed: 10356078]

Adair LS. Size at birth and growth trajectories to young adulthood. American Journal of Human Biology 2007;19(3):327–337. [PubMed: 17421008]

Adair LS, Guilkey DK. Age-specific determinants of stunting in Filipino children. The Journal of Nutrition 1997;127:314–21. [PubMed: 9039833]

Alderman H, Behrman JR, Hoddinott J. Economic and nutritional analyses offer substantial synergies for understanding human nutrition. American Society for Nutrition 2007;137:537–544.

Anker, R.; Hein, C. The MacMillan Press Ltd. Houndmills: Basingstoke, Hampshire; 1986. Sex inequalities in urban employment in the Third World; p. RG21-2XS.

Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology 1986;51(6):1173–1182. [PubMed: 3806354]

Bas, I. Childhood stunting and schooling attainment of Filipino young adults. In: Johnson, Kiersten; Das, Maitreyi, editors. PAA Abstract, 39th year PAA Affairs; Summer 2007 Quarterly Newsletter of the Population Association of America, Inc; 2007.

Behrman JR, Wolfe BL. How does mother's schooling affect family health, nutrition, medical care usage, and household sanitation? Journal of Econometrics 1987;36:185–204.

Case A, Paxson C. Stature and status: height, ability, and labor market outcomes. NBER Working Paper No.12466 Aug;2006 I1(J3):1–53.

Caulfield, LE.; Richard, SA.; Rivera, JA.; Musgrove, P.; Black, RE. Stunting, wasting, and micronutrient deficiency disorders. In: Jamison, DT.; Breman, JG.; Measham, AR., et al., editors. Disease control priorities in developing countries. Vol. Chapter 28. Oxford University and The World Bank; Washington D.C. and New York, N.Y:

Checkley W, Epstein LD, Gilman RH, Cabrera L, Black RE. Effects of acute diarrhea on linear growth in Peruvian children. American Journal of Epidemiology 2002;157(2):166–175. [PubMed: 12522024]

Dahly D, Adair LS. Quantifying the urban environment: a scale measure of urbanicity outperforms the traditional urban-rural dichotomy. Social Science and Medicine 2007;64(7):1407–19. [PubMed: 17196724]

Daniels MC, Adair LS. Growth in young Filipino children predicts schooling trajectories through high school. Journal of Nutrition 2004;134:1439–1446. [PubMed: 15173409]

de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. Bulletin WHO 2007;85:660–7.

Department of Health Milestone. [9/8/2006]. http://www.doh.gov.ph/doh_milestone

Engle PL, Black MM, Behrman JR, Cabral MM, Gertler PJ, Kapiriri l, Martorell R, Young ME. the International Child Development Steering Group. Child development in developing countries 3 - Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. Lancet 2007 2007;369:229–42.

Fitzgerald J, Gottschalk J, Moffitt R. An analysis of sample attrition in panel data: The Michigan panel study of income dynamics. Journal of Human Resources 1998;33:251–99.

Food and Nutrition Research Institute (FNRI). Philippine Nutritional Facts and Figures Supplement 1: 2001 Update of the Nutritional Status of 0–10 Year-Old Filipino Children. Manila: FNRI;

Golden MHN. Is complete catch-up possible for stunted malnourished children? European Journal of Clinical Nutrition 1994;48(Suppl 1):S58–S71. [PubMed: 8005092]

Haas JD, Murdoch S, Rivera J, Martorell R. Early nutrition and later physical work capacity. Nutr Rev 1996 Feb;54 (2 Pt 2):S41–8. [PubMed: 8710235]

Handa, S.; Neitzert, M. Chronic illness and retirement in Jamaica, LSMS Series. Washington, D.C.: World Bank; 1998.

Hoddinott J, Maluccio JA, Behrman J, Flores R, Martorell R. The impact of nutrition during early childhood on income, hours worked, and wages of Guatemalan adults. Lancet 2008;371:141–416.

Kapsos, S. Economic and Labour Market Papers. International Labour Organization; 2007. World and regional trends in labour force participation: Methodologies and key results. Printed by the International Labour Office, Geneva, Switzerland (1–57)

KIDS COUNT International Data Sheet. Population Reference Bureau Measure Communication; 1875 Connecticut Ave., NW, Suite 520, Washington, DC 20009 USA: 2000.

Kristensen P, Bjerkedal T, Irgens LM. Birthweight and work participation in adulthood. International Journal of Epidemiology 2004;33:849–856. [PubMed: 15166206]

Martorell R, Khan LK, Schroeder DG. Reversibility of stunting: epidemiological findings in children from developing countries. Eur J Clin Nutr 1994 Feb;48(Suppl 1):S45–57. [PubMed: 8005090]

Mendez MA, Adair LS. Severity and timing of stunting in the first two years of life affect performance on cognitive tests in late childhood. Journal of Nutrition 1999;129(8):1555–62. [PubMed: 10419990]

Menon P, Ruel MT, Morris SS. Socioeconomic differentials in child stunting are consistently larger in urban than in rural areas. Food Consumption and Nutrition Division Paper No. 97, Oct. 2000. 2000

National Statistics Office (NSO) [Philippines], and ORC Macro. National Demographic and Health Survey 2003. Labor Force Statistics. 2004 [10/02/2006]. http://www.census.gov.ph

National Wages and Productivity Commission. Current Daily Minimum Wage Rates Region VII (Central Visayas) Effective June 16, 2005. http://www.nwpc.dole.gov.ph/11/062006

Norgan NG. Long-term physiological and economic consequences of growth retardation in children and adolescents. Proceedings of the Nutrition Society (2000) 2000;59:245–256.

Office of Population Studies, University of San Carlos. A Study of the Effects of Early Childhood Interventions on Children's Physiological, Cognitive and Social Developments. Cebu City, Philippines: 2005.

Perez, L.; Cinco, M.; Adair, LS. Infant Morbidity and School Performance in Late Childhood in Cebu, Philippines; Presented at the 2007 meetings of the Population Association of America and the 6th National Social Science Congress in Manila; Philippines. 2008;

World Health Statistics 2007. Geneva: World Health Organization; 2007. Part 1. Ten statistical highlights in global public health.

Raymundo, CM.; Cruz, GT., editors. Youth Sex and Risk Behaviors in the Philippines. Young Adult Fertility and Sexuality Study 3; Demographic Research and Development Foundation, Inc. and University of the Philippines Population Institute Diliman; Quezon City. 2004; 2002. p. 14-26.

Ricci JA, Becker S. Risk factors for wasting and stunting among children in Metro Cebu, Philippines. American Journal of Clinical Nutrition 1996;63:966–975. [PubMed: 8644694]

Strauss J, Thomas D. Health, nutrition, and economic development. Journal of Economic Literature 1998;36(2):766–817.

The state of the world's children 2002. UNICEF, UNICEF House; 3 UN Plaza, New York, NY 10017, USA: p. 87-102.

United Nations Economic and Social Commission for Asia and the Pacific - Youth in the Philippines. A Review of the Youth Situation and National Policies and Programmes. United Nations; New York: p. 104-161.

Victora CG, Adair L, Fall C, Hallal PC, Martorell R, Richter L, Sachdev HS. Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: consequences for adult health and human capital. Lancet 2008 Jan 26;371(9609):340–57. [PubMed: 18206223]

Walker SP, Chang SM, Powell CA, Grantham-McGregor SM. Effects of early childhood psychosocial stimulation and nutritional supplementation on cognition and education in growth-stunted Jamaican children: prospective cohort study. Lancet 2005;366(9499):1804–7. [PubMed: 16298218]

Waterlow, JC. Observations on the natural history of stunting. Linear Growth Retardation in Less Developed Countries. In: John, C., editor. Waterlow, Nestle Nutrition Workshop Series. Vol. 14. Nestle Ltd. Vevey/Raven Press, Ltd; New York: 1988. p. 1-16.

Wooldridge J. Asymptotic properties of weighted *M*-Estimators for variable probability samples. Econometrica 1999;CXVII:1385–1406.

Zosa AR, Zosa VH, Gultiano S, Cusi D. Cebu - A Demographic and Socioeconomic Profile based on the 2000 Census 2004:7.

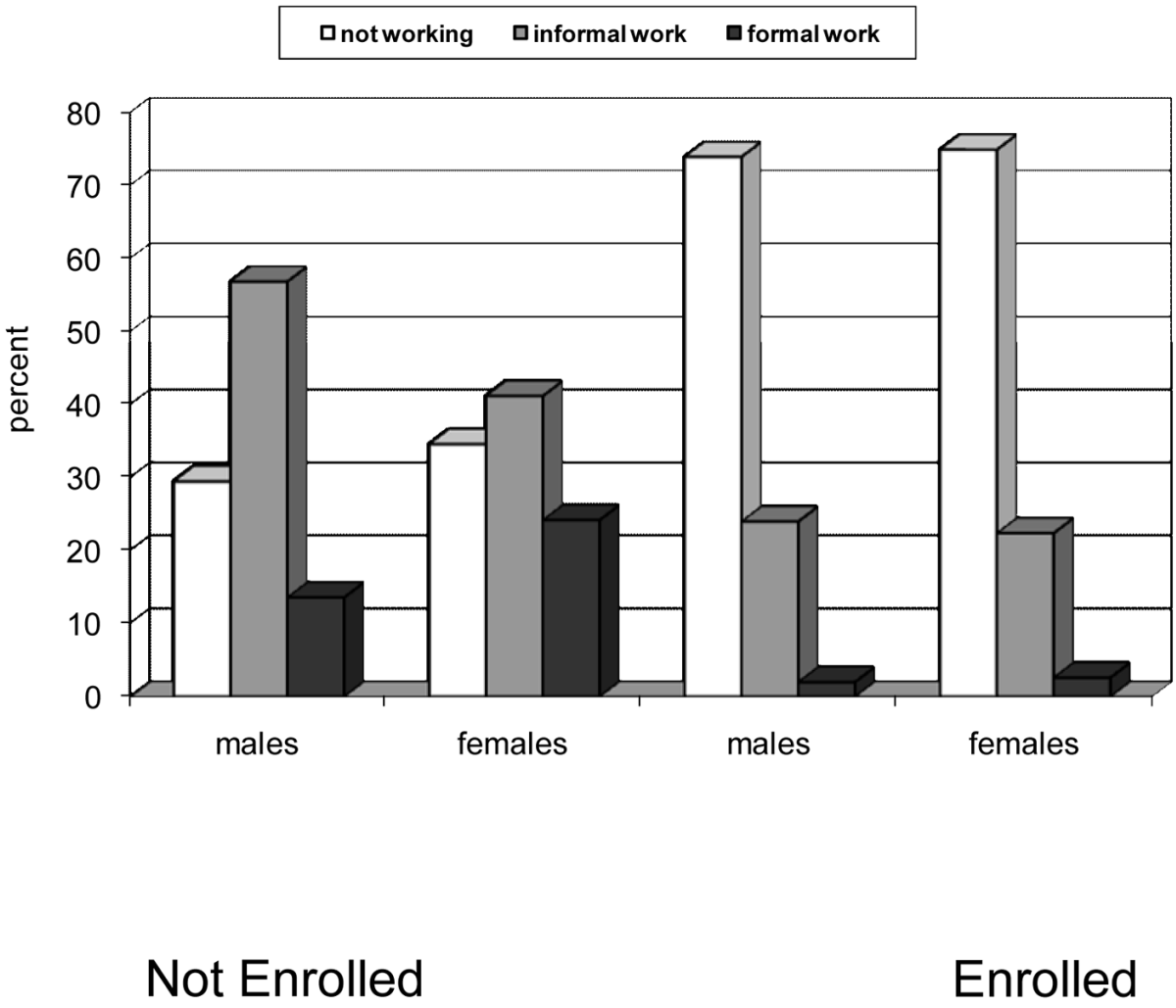

Fig. 1.
Distribution of young adults by work and school enrolment status

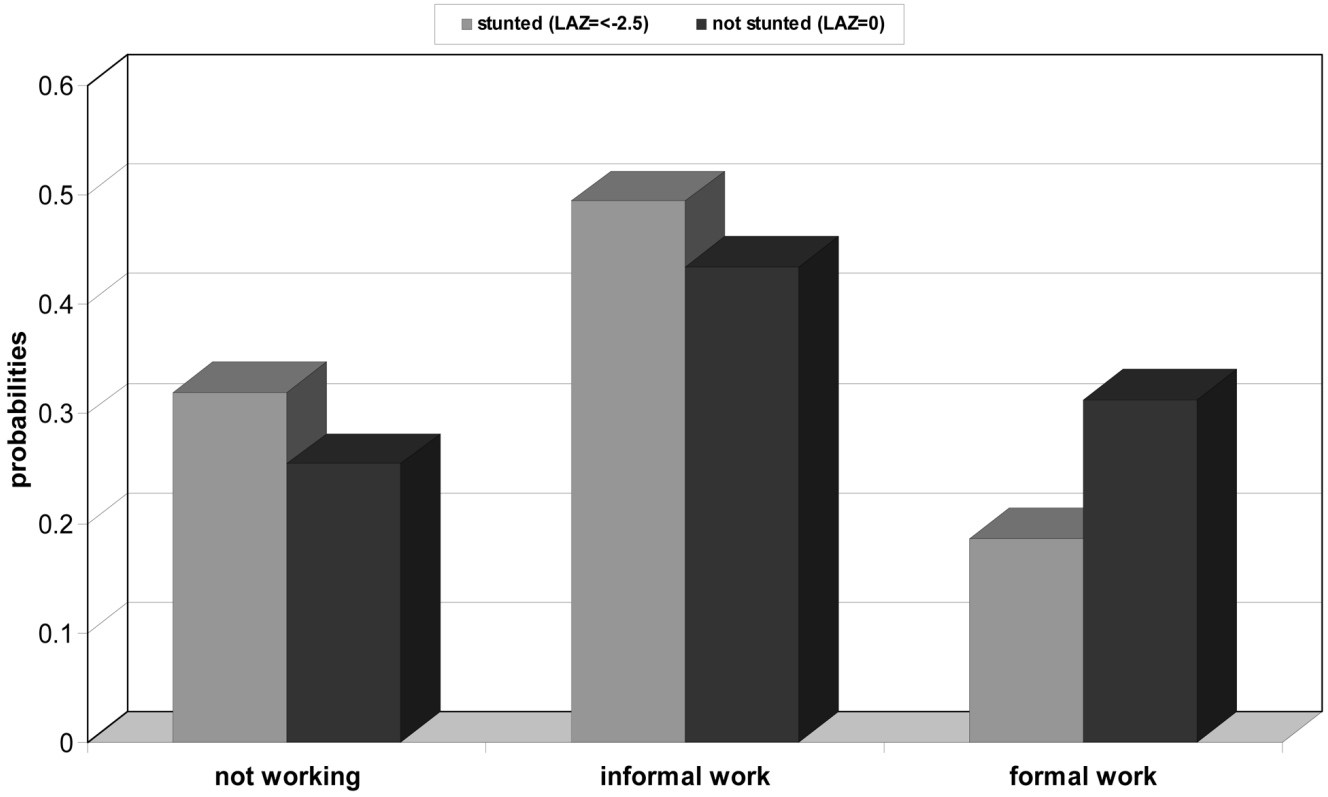

Fig. 2.
Predicted probability of work status of young adults age 20–22*, by stunting status at age 2 years

Table 1

Baseline sociodemographic characteristics of young adults, CLHNS 2005

Characteristic	In 2005 survey (n=1,795)		Attrited (n=1,285)		*P* value*
	Mean	SD	Mean	SD	
Mother's years of formal schooling	7.0	3.3	7.3	3.4	0.0022
Mother's age in years	26.0	6.0	26.0	6.0	0.5768
Mother's height (cm.)	150.5	4.9	150.6	5.1	0.7162
Father's years of formal schooling	7.2	3.4	7.8	3.5	0.0000
Father's age in years	28.7	6.6	28.8	6.7	0.5869
Household size	5.7	2.8	5.5	2.9	0.1079
LAZ score at age 2 years	−2.54	1.1	−2.60	1.2	0.2118
Mean length at age 2 years (in cm.)					
Male	79.99	3.4	79.6	4.0	
Female	78.39	3.5	78.2	3.8	
	%	n	%	n	*P* value**
Male child	52.6	945	53.5	687	0.654
Urban resident	73.4	1,317	80.8	1038	0.000
With piped water	5.3	95	10.3	132	0.000

* Values of *P* correspond to one-way ANOVA overall F-test statistics

** Values of *P* based on Pearson's chi-square test

Table 2

Background characteristics of male and female young adults age 20–22 by work status, CLHNS 2005

Characteristic	Males				Females			
	Not working	Informal work	Formal work	All	Not working	Informal work	Formal work	All
Mean age, yrs	20.9	21.0	21.0	20.9	20.9	20.9	21.0	20.9
Marital status, %								
Ever married	11.0	27.6	19.8	20.6	39.7	43.1	13.9	35.5
Education								
Not in school, % (n)	*68.3(235)*	*92.9(455)*	*97.3(111)*	*84.4(798)*	*74.2(256)*	*91.7(298)*	*98.3(177)*	*86.0 (731)*
<Grade 6	12.8	17.6	1.9	14.1	7.4	7.4	1.7	6.0
Grade 6	9.8	13.2	4.6	11.0	6.2	5.4	0.0	4.4
1–3 yrs. of HS	20.4	22.0	7.4	19.6	18.8	19.8	2.8	15.3
4 yrs. of HS	34.0	38.5	57.4	39.7	44.9	50.0	62.2	51.2
1–3 yrs. college	15.3	7.3	17.6	11.0	7.0	8.7	14.7	9.6
4–5 yrs college	7.7	1.5	11.1	4.6	15.6	8.7	18.6	13.5
In school, % (n)	*31.7(109)*	*7.1(35)*	*2.7(3)*	*15.6(147)*	*25.8(89)*	*8.3(27)*	*1.7(3)*	*14.0 (119)*
<Grade 6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grade 6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1–3 yrs. of HS	21.1	22.9	0.0	21.1	6.8	0.0	0.0	5.0
4 yrs. of HS	11.0	8.6	33.3	10.9	9.0	7.4	33.3	9.2
1–3 yrs. college	57.8	57.1	66.7	57.8	73.0	85.2	0.0	74.0
4–5 yrs college	10.1	11.4	0.0	10.2	11.2	7.4	66.7	11.8
Household location, %								
In 2005								
Rural	25.9	32.9	34.2	30.5	29.6	23.7	38.9	29.3
Urban	74.1	67.1	65.8	69.5	70.4	76.3	61.1	70.7
In 1983								
Rural	19.8	30.6	25.2	26.0	27.0	23.1	35.6	27.3
Urban	80.2	69.4	74.8	74.0	73.0	76.9	64.4	72.7
N cases	344	490	111	945	345	325	180	850

Table 3

Table 3a. Multinomial logistic regression results comparing informal vs. not working, formal vs. not working and formal vs. informal on selected indicators, males age 20–22 y, not in school

Work status	Model 1		Model 2		Model 3	
	RRR* (CI)	P	RRR* (CI)	P	RRR* (CI)	P
Informal vs. not working						
LAZ score	0.9877 (0.86–1.14)	0.866	1.1749 (1.00–1.38)	0.054	1.1954 (1.01–1.41)	0.035
Mother's height			1.0150 (0.98–1.05)	0.413	1.0142 (0.98–1.05)	0.439
Mother's educational attainment			0.9317 (0.87–1.00)	0.056	0.9413 (0.87–1.01)	0.108
Mother's age (yrs.)			0.9721 (0.93–1.02)	0.212	0.9726 (0.93–1.02)	0.224
First pregnancy of mother			0.5920 (0.38–0.93)	0.023	0.5911 (0.38–0.93)	0.023
Mother read any materials			0.9041 (0.62–1.31)	0.595	0.9143 (0.63–1.33)	0.638
Father's educational attainment			0.9415 (0.88–1.00)	0.065	0.9518 (0.89–1.02)	0.138
Father's age (yrs.)			0.9969 (0.96–1.04)	0.875	0.9965 (0.96–1.04)	0.863
Hygiene index			0.9348 (0.85–1.03)	0.170	0.9370 (0.85–1.03)	0.186
Assets' index			1.0159 (0.91–1.13)	0.777	1.0173 (0.91–1.13)	0.758
Urbanicity index			0.9824 (0.97–1.00)	0.016	0.9829 (0.97–1.00)	0.019
Young male's year of schooling					0.9524 (0.90–1.01)	0.102
Formal vs. not working						
LAZ score	1.3908 (1.12–1.72)	0.002	1.5075 (1.19–1.92)	0.001	1.3944 (1.09–1.78)	0.008
Mother's height			0.9944 (0.94–1.05)	0.829	0.9964 (0.95–1.05)	0.892
Mother's educational attainment			1.0629 (0.96–1.18)	0.235	1.0061 (0.91–1.12)	0.909
Mother's age (yrs.)			1.0053 (0.94–1.08)	0.878	1.0191 (0.95–1.09)	0.601
First pregnancy of mother			0.5316 (0.28–1.00)	0.049	0.5379 (0.28–1.02)	0.058
Mother read any materials			1.2692 (0.73–2.20)	0.394	1.2667 (0.73–2.21)	0.404
Father's educational attainment			0.9539 (0.87–1.04)	0.316	0.9225 (0.84–1.01)	0.094
Father's age (yrs.)			0.9445 (0.89–1.01)	0.077	0.9290 (0.87–0.99)	0.033
Hygiene index			0.9712 (0.84–1.12)	0.680	0.9526 (0.82–1.10)	0.512
Assets' index			0.9301 (0.80–1.08)	0.356	0.9278 (0.79–1.08)	0.348
Urbanicity index			0.9764 (0.96–1.00)	0.024	0.9721 (0.95–0.99)	0.009
Young male's year of schooling					1.3159 (1.18–1.47)	0.000

Table 3a. Multinomial logistic regression results comparing informal vs. not working, formal vs. not working and formal vs. informal on selected indicators, males age 20–22 y, not in school

Work status	Model 1		Model 2		Model 3	
	RRR* (CI)	P	RRR* (CI)	P	RRR* (CI)	P
Formal vs. informal						
LAZ score	1.4080 (1.16–1.72)	0.001	1.2831 (1.02–1.61)	0.030	1.1665 (0.92–1.47)	0.193
Mother's height			0.9797 (0.93–1.03)	0.398	0.9824 (0.94–1.03)	0.477
Mother's educational attainment			1.1408 (1.04–1.25)	0.006	1.0688 (0.97–1.18)	0.183
Mother's age (yrs.)			1.0342 (0.97–1.10)	0.302	1.0479 (0.98–1.12)	0.176
First pregnancy of mother			0.8980 (0.49–1.63)	0.725	0.9100 (0.49–1.68)	0.763
Mother read any materials			1.4038 (0.85–2.32)	0.185	1.3853 (0.83–2.32)	0.214
Father's educational attainment			1.0132 (0.93–1.10)	0.764	0.9692 (0.89–1.06)	0.489
Father's age (yrs.)			0.9474 (0.89–1.01)	0.078	0.9323 (0.87–1.00)	0.035
Hygiene index			1.0389 (0.91–1.18)	0.558	1.0167 (0.89–1.16)	0.811
Assets' index			0.9155 (0.79–1.06)	0.241	0.9121 (0.78–1.06)	0.231
Urbanicity index			0.9939 (0.98–1.01)	0.529	0.9890 (0.97–1.01)	0.273
Young male's year of schooling					1.3816 (1.24–1.54)	0.000

Table 3b. Logistic regression results comparing informal vs. not working on selected indicators, males age20–22 y, in school

Work status	Model 1		Model 2		Model 3	
	OR* (CI)	*P*	OR* (CI)	*P*	OR* (CI)	*P*
Informal vs. not working						
LAZ score	0.8526 (0.59–1.24)	0.404	0.8724 (0.54–1.40)	0.572	0.8628 (0.54–1.37)	0.534
Mother's height			1.0018 (0.92–110)	0.970	1.0006 (0.91–1.10)	0.989
Mother's educational attainment			0.8097 (0.68–0.96)	0.017	0.8036 (0.67–0.96)	0.017
Mother's age (yrs.)			1.0471 (0.91–1.20)	0.519	1.0448 (0.91–1.20)	0.536
First pregnancy of mother			1.1130 (0.34–3.67)	0.860	1.0732 (0.32–3.61)	0.909
Mother read any materials			1.1677 (0.39–3.50)	0.782	1.1888 (0.40–3.54)	0.756

Table 3b. Logistic regression results comparing informal vs. not working on selected indicators, males age20–22 y, in school

Work status	Model 1		Model 2		Model 3	
	OR* (CI)	*P*	OR* (CI)	*P*	OR* (CI)	*P*
Father's educational attainment			1.2461 (1.07–1.46)	0.006	1.2489 (1.06–1.47)	0.007
Father's age (yrs.)			0.9862 (0.88–1.11)	0.812	0.9867 (0.88–1.11)	0.820
Hygiene index			1.1434 (0.86–1.52)	0.352	1.1332 (0.85–1.51)	0.390
Assets' index			0.8117 (0.65–1.01)	0.062	0.8109 (0.65–1.01)	0.062
Urbanicity index			0.9778 (0.94–1.01)	0.233	0.9787 (0.94–1.02)	0.254
Young male's year of schooling					1.0573 (0.83–1.35)	0.651

*RRR refers to the relative risk ratio derived from the multinomial logit (e^b), i.e. the risk of the outcome relative to the base outcome

*OR (odds ratio) is the ratio of the odds of an event occurring in one group to the odds of it occurring in another group, or to a sample-based estimate of that ratio are the quantity $p/(1 - p)$

Table 4

Table 4a. Multinomial logistic regression results comparing informal vs. not working, formal vs. not working and formal vs. informal on selected indicators, females age 20–22 y, not in school

Work status	Model 1		Model 2		Model 3	
	RRR* (CI)	P	RRR* (CI)	P	RRR* (CI)	P
Informal vs. not working						
LAZ score	0.8899 (0.76–1.04)	0.141	0.9641 (0.82–1.14)	0.665	0.9584 (0.81–1.13)	0.617
Mother's height			0.9872 (0.95–1.02)	0.490	0.9875 (0.95–1.02)	0.496
Mother's educational attainment			0.9301 (0.86–1.00)	0.061	0.9276 (0.86–1.00)	0.061
Mother's age (in yrs.)			0.9995 (0.95–1.05)	0.984	0.9990 (0.95–1.05)	0.969
First pregnancy of mother			1.4823 (0.91–2.41)	0.114	1.4764 (0.90–2.41)	0.119
Mother read any materials			0.7752 (0.53–1.13)	0.186	0.7752 (0.53–1.13)	0.187
Father's educational attainment			0.9534 (0.89–1.02)	0.192	0.9512 (0.88–1.02)	0.178
Father's age (yrs.)			1.0073 (0.96–1.05)	0.738	1.0072 (0.96–1.05)	0.743
Hygiene index			0.9713 (0.88–1.07)	0.571	0.9685 (0.88–1.07)	0.535
Assets' index			1.0648 (0.95–1.20)	0.288	1.0677 (0.95–1.20)	0.274
Urbanicity index			1.0001 (0.99–1.01)	0.984	1.0002 (0.99–1.01)	0.975
Young female's year of schooling					1.0137 (0.94–1.09)	0.700
Formal vs. not working						
LAZ score	1.1797 (0.99–1.41)	0.067	1.2755 (1.05–1.55)	0.013	1.1654 (0.95–1.43)	0.143
Mother's height			0.9770 (0.94–1.02)	0.266	0.9805 (0.94–1.02)	0.369
Mother's educational attainment			1.0289 (0.94–1.12)	0.514	0.9765 (0.89–1.07)	0.608
Mother's age (yrs.)			0.9865 (0.94–1.04)	0.618	0.9724 (0.92–1.03)	0.324
First pregnancy of mother			1.1727 (0.68–2.03)	0.570	1.1321 (0.64–2.00)	0.668
Mother read any materials			0.6753 (0.44–1.04)	0.072	0.6565 (0.42–1.02)	0.061
Father's educational attainment			0.9816 (0.90–1.07)	0.669	0.9409 (0.86–1.03)	0.185
Father's age (yrs.)			1.0242 (0.98–1.07)	0.319	1.0234 (0.98–1.07)	0.342
Hygiene index			1.0605 (0.95–1.19)	0.305	1.0390 (0.93–1.16)	0.510
Assets' index			1.0028 (0.88–1.14)	0.967	0.9958 (0.87–1.14)	0.952
Urbanicity index			0.9741 (0.96–0.99)	0.002	0.9760 (0.96–0.99)	0.007
Young female's year of schooling					1.2949 (1.18–1.42)	0.000
Formal vs. informal						
LAZ score	1.3256 (1.12–1.57)	0.001	1.3230 (1.10–1.60)	0.004	1.2160 (0.99–1.49)	0.057
Mother's height			0.9896 (0.95–1.03)	0.621	0.9929 (0.95–1.04)	0.748
Mother's educational attainment			1.1063 (1.02–1.20)	0.019	1.0527 (0.96–1.15)	0.249
Mother's age (yrs.)			0.9870 (0.94–1.04)	0.617	0.9733 (0.92–1.03)	0.319
First pregnancy of mother			0.7911 (0.46–1.34)	0.387	0.7667 (0.44–1.32)	0.339
Mother read any materials			0.8712 (0.57–1.33)	0.520	0.8468 (0.55–1.30)	0.448
Father's educational attainment			1.0295 (0.94–1.12)	0.501	0.9892 (0.91–1.08)	0.809

Table 4a. Multinomial logistic regression results comparing informal vs. not working, formal vs. not working and formal vs. informal on selected indicators, females age 20–22 y, not in school

Work status	Model 1		Model 2		Model 3	
	RRR* (CI)	P	RRR* (CI)	P	RRR* (CI)	P
Father's age (yrs.)			1.0167 (0.97–1.06)	0.467	1.0161 (0.97–1.06)	0.487
Hygiene index			1.0919 (0.98–1.21)	0.103	1.0728 (0.96–1.19)	0.195
Assets' index			0.9418 (0.83–1.07)	0.363	0.9326 (0.82–1.06)	0.291
Urbanicity index			0.9740 (0.96–0.99)	0.002	0.9758 (0.96–0.99)	0.005
Young female's year of schooling					1.2774 (1.17–1.39)	0.000

Table 4b. Logistic regression results comparing informal vs. not working on selected indicators, females age 20–22 y, in school

Work status	Model 1		Model 2		Model 3	
	OR* (CI)	*P*	OR* (CI)	*P*	OR* (CI)	*P*
Informal vs. not working						
LAZ score	0.9574 (0.62–1.48)	0.845	0.9686 (0.56–1.66)	0.908	0.9189 (0.52–1.61)	0.769
Mother's height			0.9902 (0.88–1.11)	0.865	0.9654 (0.86–1.08)	0.554
Mother's educational attainment			0.9169 (0.77–1.09)	0.324	0.8517 (0.71–1.02)	0.090
Mother's age (yrs.)			1.0340 (0.90–1.19)	0.638	1.0412 (0.90–1.21)	0.600
First pregnancy of mother			0.7992 (0.22–2.95)	0.737	0.7604 (0.19–3.02)	0.697
Mother read any materials			0.8046 (0.29–2.20)	0.672	0.5736 (0.19–1.69)	0.314
Father's educational attainment			1.0062 (0.83–1.22)	0.951	1.0049 (0.82–1.23)	0.962
Father's age (yrs.)			0.9933 (0.87–1.13)	0.920	0.9897 (0.86–1.13)	0.879
Hygiene index			0.8661 (0.64–1.17)	0.352	0.9270 (0.68–1.27)	0.639
Assets' index			1.0212 (0.79–1.31)	0.870	0.9720 (0.72–1.30)	0.850
Urbanicity index			1.0243 (0.99–1.06)	0.211	1.0399 (1.00–1.08)	0.061
Young female's year of schooling					1.8980 (1.28–2.82)	0.002

*RRR refers to the relative risk ratio derived from the multinomial logit (e^b), i.e. the risk of the outcome relative to the base outcome

*OR (odds ratio) is the ratio of the odds of an event occurring in one group to the odds of it occurring in another group, or to a sample-based estimate of that ratio are the quantity $p/(1 - p)$