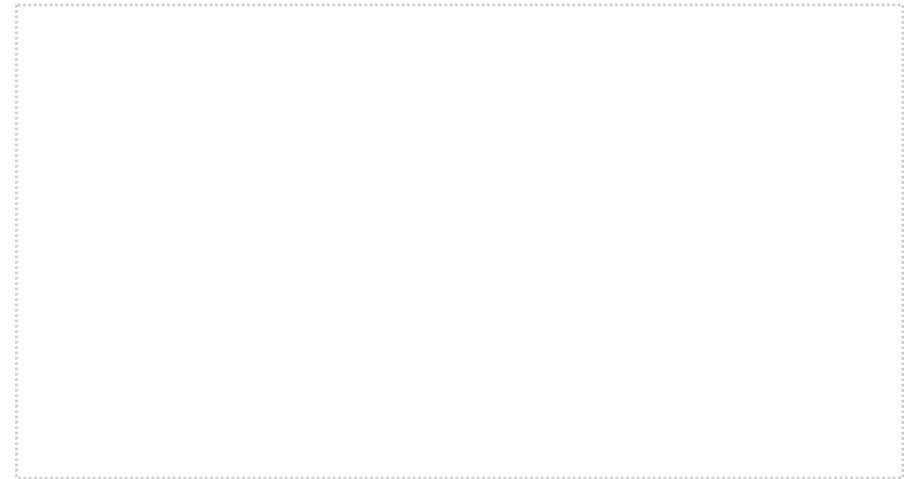**University of San Carlos**

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**Is Early Childhood Height-For-Age Associated With
The Work Status Of Filipino Young Adults?**

Delia B. Carba and Vivencia L. Tan

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Abstract

Most studies on childhood health in developing countries examine the associations of early childhood height-for-age on human productivity as reflected in schooling success. This study looked into this relationship in children who are now young adults and have for the most part completed their schooling. Specifically, it examined if height-for-age at age two years affects work status in early adulthood and whether gender differences exist. Data from the Cebu Longitudinal Health and Nutrition Survey, which covers individuals from the time of their birth up to the time when they were 20-22 years, were used. A total of 1888 young adults participated in the study. The outcome variable was work status in 2005 with three categories: not working, working in an informal job, and working in a formal job. Working in a formal job in the Philippines, as in most countries, is advantageous compared to working in an informal job. A formal job generally offers more security, higher wages and benefits. Results showed a positive relationship between height-for-age at age two years and formal work in early adulthood. Children who were taller at age two are more likely to be working in formal jobs in their early adult years. There are no pronounced gender differences in the relationship between early childhood height-for-age and work status among young adults especially if the mediating effect of education is taken into account. To improve job prospects of young adults, it is important to provide proper nutrition in early childhood and adequate educational opportunities during schooling years

KEY WORDS: height-for-age (HAZ) work status informal jobs formal jobs

Introduction

"Height-for-age is a widely used indicator of long-run nutritional status, with growth stunting defined as height-for-age below the fifth percentile on a reference growth curve (usually the WHO/NCHS median)". Childhood stunting is one of the health risks that may reduce human productivity in adult life. Because it is a global concern, measures have been planned and implemented to lessen its prevalence. The Food and Nutrition Research Institute in 2001 reported that among 0-10 year-old Filipino children, 31 out of every 100 are short or under height, a very slight improvement compared to the 1998 prevalence of stunting that was 34%. Studies have been conducted examining the negative correlates of low height-for-age in general, and in some cases stunting in particular. 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 tends to predict short adult stature. A deficit in height might be a disadvantage in work productivity because as shown in a well-known study in Brazil, not only are taller men and women more likely to be in the labor force, taller men also earn higher wages (Strauss and Thomas, 1998). This sequence of results suggests the possibility that early childhood height-for-age has significant effects on adult labor force outcomes.

The Philippines has been experiencing an increasing volume of young adults in its population because of the decline in child mortality rate and the increase of fertility rate in the past six decades. This surge in young adults has significant bearing on the labor force. As of January 2005, 66 per cent of the Philippines' adult population participates in the labor force and employment rates among these participants are 89 percent for both males and females (Labor Force Statistics, 2006). Half of the Philippine population was below 21 years old, which means that employment options and patterns for young adults are particularly important. This study is of relevance particularly for developing countries like the Philippines where investments on health and education are needed for the growing number of young people about to enter the labor force.

The study specifically examines if height-for-age at age two years affects the work status in early adulthood and whether there are differences between sexes. This question has not been explored much because it requires data on individuals both in their 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.

We hypothesize that a child who has smaller height-for-age is less likely to work in a formal job. In this regard, we will first examine the lone effect of HAZ at age two years on the work status of male and female young adults. Secondly, we will control for other individual and household characteristics that may confound this relationship. Finally, we will examine the effect of HAZ at age two on the work status of male and female young adults with educational attainment as potential mediator.

Study Area, Data Source and Study Design

The Philippines is a tropical country of more than 7,100 islands lying in the Pacific Ocean off the coast of mainland Southeast Asia. It has two largest islands, Luzon in the north and Mindanao in the south. Between these islands lies a group of small islands called the Visayas. Part of the Visayas group of islands is Cebu, where Metropolitan Cebu is located. Among the 78 provinces of the Philippines, Cebu ranks second in terms of population size (National Statistics Office, 2000). Metro Cebu is our study area and is composed of four cities and five municipalities.

The Cebu Longitudinal Health and Nutrition Study (CLHNS) is a longitudinal study of mothers and their children born from May 1, 1983 to April 30, 1984. It started as a joint endeavor of the Carolina Population Center, University of North Carolina at Chapel Hill, Nutrition Center of the Philippines, and the Office of Population Studies, University of San Carlos, Cebu Philippines. It was a two-stage sampling design where a baseline survey was conducted in randomly selected 17 urban and 16 rural barangays (smallest political unit) in Metro Cebu. All mothers who were pregnant in their last trimester were canvassed. There were 3,080 single live births and birth information was collected on all of them. After the birth survey, twelve succeeding interviews, longitudinal surveys 1 to 12, were conducted every two months. More follow-up surveys continued in 1991, 1994, 1998, 2002 and 2005.

1 In 1983, there were only three cities and six municipalities

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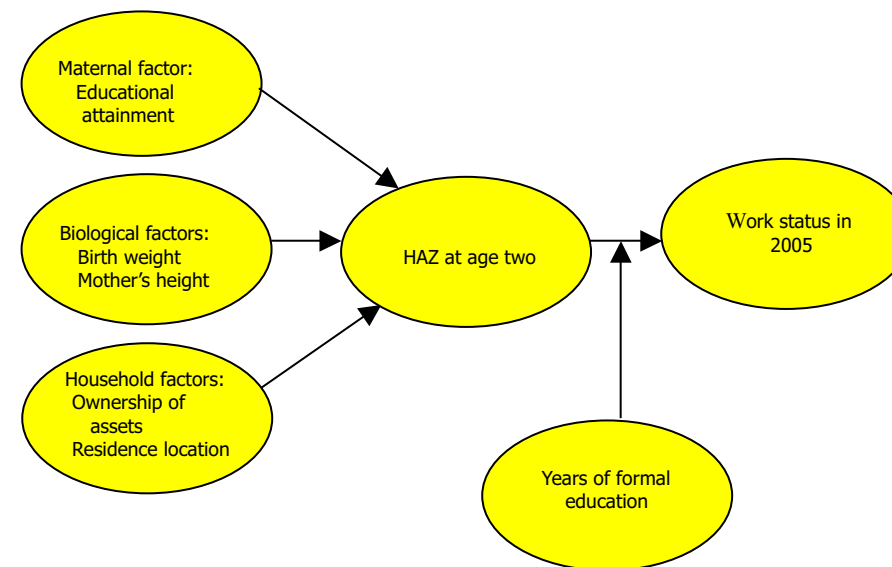Labor Force Statistics. **http://www.census.gov.ph**. 10/02/2006.
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Sociodemographic, health, economic and community data were gathered in each survey round. The baseline however, included information on infant feeding practices. Later surveys collected additional data on adolescents' health, sexuality, education and labor force participation. This study utilizes data from baseline, the 12th longitudinal survey and the latest survey in 2005.

a. Conceptual Framework

<u>Description of the dependent variable</u>

In the CLHNS' 2005 survey, the children were already 20-22 years of age. There were 1,912 young adults interviewed face-to-face using structured questionnaires. Attrition was due to migration, refusals and deaths. Our dependent variable was the work status of the young adults in 2005 and categorized into three: (0) not working, (1) working in an informal job, and (2) working in a formal job. For our sample analysis, we purposely excluded 24 non-singletons (because, as is well-known, the distribution of birth weights among twins is below that of singletons and therefore early stunting for twins is higher), so we have a total of 1,888 young adults from the CLHNS.

A job was considered formal if it satisfies three conditions, namely (a) hours worked >= 40 hours/week, (b) pay is >=P 173/day (~$3.46), the minimum pay in Metro Cebu (stipulated by the Department of Labor and Employment), and (c) benefits are 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 is advantageous compared to working in an informal job because a formal job generally offers more security and higher wages and benefits.

Our main exposure variable was the height-for-age Z-score (HAZ) at age two years. We chose HAZ at age two years over other earlier or later years of childhood HAZ because it is at this age that HAZ tends to level off (Adair and Guilkey, 1997; Ricci and Becker, 1996; Waterlow, 1988). Although in Adair et. al.'s study, there were reported observations of catch-up growths probably from intervention among 5-year-old children who had smaller HAZ scores in early childhood, this condition does not usually follow if these children remain exposed to the same poor environment they have (Adair, 1999; Norgan, 2000; Golden, 1994).

All of the CLHNS surveys gathered anthropometric measurements both for mothers and children - three measurements for each type, taken by experienced and well-trained field staff. The heights of the children during births and the 12 longitudinal surveys were measured using the height measuring scale manufactured by the Nutrition Center of the Philippines. It has a sleek broad base with one sliding side adjustable to the length of the baby, has dual scale for direct reading in centimeters/inches and has folding slides for easy storage.

Independent variables

We also controlled for other independent variables (biological, maternal and household) measured during baseline survey. The birth weights were taken using baby weighing scales - Salter Type (Dial) Capacity: 10/25 Kg x 100 Gms., dial face with two suspension hooks & adjustment screw purchased from London. The measurements were in grams taken three times. The mother's height was in centimeters and was measured using Microtoise Ruban verticale 2m.
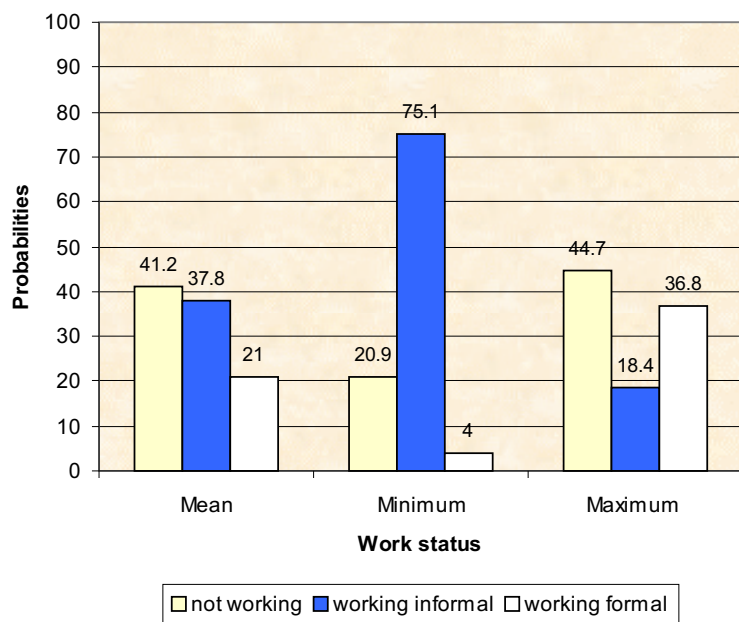
Birth weight, among other genetic, intrauterine, medical and environmental factors is one of the determinants of the child's later patterns of growth (Diamond et. al, 2001). Studies have shown that low birth weight babies are more susceptible to infectious diseases such as diarrhea, measles and respiratory illnesses, and, are more likely to have small height-for-age or become stunted in late childhood. Kristensen et. al., 2004, reported that birth weight below the standardized mean was associated with unemployment among Norwegian men and women. Genetically, some studies reveal that mother's height partly contributes to the linear growth potential of her children (Irvin et al, 2004, Spencer and Logan, 2002, Adair and Guilkey, 1997).

The educational attainment of the mothers was a continuous variable. Education has some effects on child health and nutrition that are known to be independent of the effects of socioeconomic status (Behrman and Wolfe, 1987; Menon et. al 2000). Moreover, this significant independent influence persisted even after controlling for mother's health knowledge, attitude towards health care, autonomy and reproductive behaviors (Frost et. al, 2005). Mothers who attained higher levels of education are more likely to avail of health services from government and private facilities (Pebley and Goldman, 1995), thus, positively raising her child's health and nutrition (Glewwe, 1999).

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Figure 3. Predicted probability and work status, female

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Parental household location during baseline survey was categorized into urban and rural. In 1980, the Census Bureau had classified 155 urban and 88 rural barangays as part of Metropolitan Cebu based on the population size and density, physical characteristics and administrative functions. In the 2000 Census of Population and Housing, the same concepts used in 1980 were followed in classifying areas as urban. Within the 22 years span of the CLHNS, the number of urban barangays tripled (it has increased to 424). Recent surveys reported that 63 per cent of Cebu's population resides in urban areas compared to the national level, which is only 48 per cent (NSO, 2000; PRB, 2002). This, therefore, conveys the rapid urbanization and increasing number of rural barangays becoming urban. Several studies revealed urban-rural disparities with regard to infrastructure and economic opportunities. Better health facilities and more job opportunities are concentrated in urban than in rural areas. As a consequence, patterns of stunting were different at 18-23 month of age with more rural children stunted compared to children living in urban areas, i.e., 50% and 40% respectively (Ricci and Becker, 1996).

The type of dwelling unit - whether owned or not, and ownership of a television set of the household were considered as measures of household's economic status. A household possession of modern equipments and strong quality type of abode showed a positive association on the estimate of child's height-for-age z score (Hong and Mishra, 2006; Aerts, et.al, 2004; Pebley and Goldman, 1995).

b) Statistical procedures

The Statistical Package STATA 8.0 was used. Test for multi-collinearity (i.e., Pairwise correlations) had been done and the relevant right-side variables were not very correlated. The bivariate associations between main exposure variable and other covariates were examined using analysis of variance for continuous and categorical variables and linear regression for both continuous variables. Multinomial logistic regressions were used to examine the effect of HAZ at age two years on the work status of young adults without adjusting for covariates (Model 1), a second model (Model 2) controlling for the effects of other individual and household characteristics, and the third model (Model 3) adjusting for covariates with years of formal education of young adults as mediating factor. In view of the studies by Daniels and Adair, 2004, Kristensen et.al., 2004, Baron M. and Kenny, 1986, McClanahan, et. al., 1999, educational attainment has been associated with HAZ in early childhood, and in a way, is affecting the type of work in adult years.

Stratification by sex

Several studies showed sex differentials in labor force participation rates, which even subsisted to job types and earnings received. In 1997, Handa and Neitzert 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 population of the labor force. Although the gap between women and men narrowed down since 1980, men recently accounted for 95.1 per cent of the prime working age population (25-54 years old) in comparison to women, which is 66.7 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, the labor force participation rates of males and females were 77 per cent and 49 per cent respectively. In view of these studies, we use sex as a stratifying variable for our sample population.

Results

a) Background characteristics

Table 1 shows the profile of our sample of young adults in 2005. There were 993 (53%) males and 895 (47%) females whose ages ranged from 20-22 years old. Most of them were never married (73%) but with greater percentage of females ever married (32.6% vs. 23.8%). Majority resided in urban areas (74%). On the average, they were in high school and almost one-third had college education. Females though had more education than males with nine-percentage points advantage. As of 2005 survey, only 15% were enrolled in school.
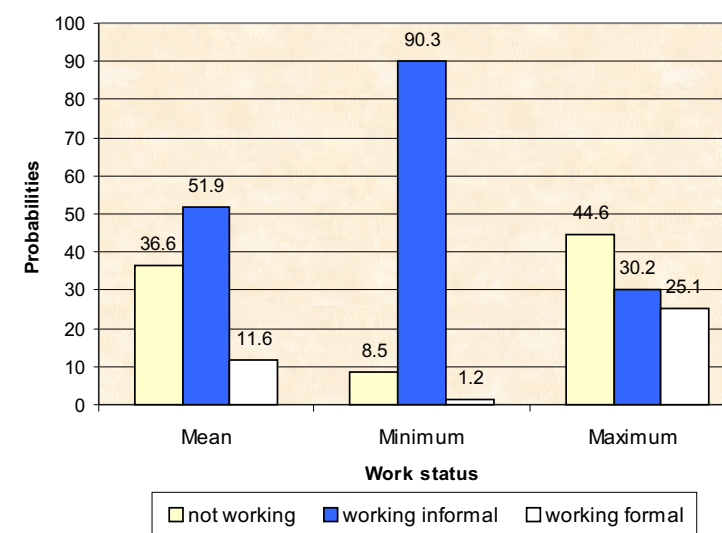
Table 1. Background characteristics of male and female young adults, CLHNS 2005

Characteristic	Male (%)	Female (%)	Both sexes (%)
Age			
20	8.1	9.5	8.8
21	88.5	87.5	88.0
22	3.4	3.0	3.2
Marital status			
Never married	79.4	65.0	
Ever married	20.6	35.0	72.6
			27.4
Schooling status			
Not enrolled	84.3	85.8	
Enrolled	15.7	14.2	
			85.0
			15.0
Educational level			
Elementary	20.9	8.8	
High school	55.3	58.6	
College	23.8	32.6	
			15.2
			56.8
Household location			
Rural	25.9	26.6	28.0
Urban	**74.1**	73.4	
	Mean	Mean	Mean
HAZ at age 2 years	**-2.12**	**-2.14**	-2.13
			73.8
N cases	993	**895**	**1888**

(Right column)

Similar simulations for female young adults were applied (Figure 3). The predicted probability of working in formal jobs is very low with only four percentage points in comparison to informal jobs if they grow up in very disadvantaged situations (HAZ at age two years is -6.4, low birth weights of 1700 g., mothers with no schooling, do not own TV sets or houses, mothers have short stature of 134.2 cm., reside in rural areas and young adults' educational attainment was only a year of elementary education). When these female young adults are in a better environment such that their HAZ at age two years is 0.34, heavier birth weights of 4800 g, their mothers complete three years of high school, household owns TV and house, with taller mothers (~166.7 cm), live in urban areas, and they finished four years of college education, the probability for them to work in formal jobs compared to be working in informal jobs doubled, i.e., 36.8 % and 18.4 %.

The results of our study, per se, may suggest that labor market outcomes in young adulthood, health in early childhood and schooling outcomes are significantly interrelated. If the predicted probability for a male and female young adult to be working in a formal job is difficult to achieve because of the "poor environment" surrounding him/her, a bigger budgetary allocation for children is needed. Regardless of sex, it is important to provide children with proper nutrition and adequate educational opportunities to improve their job prospects in the future. Efforts from the Philippine government through the Department of Health has 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). 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.

Figure 2. Predicted probability and work status, male

Our study might be contested for external validity - whether it is a good representation of the Filipino youth in general. Surprisingly, male and female young adults in the YAFS3 2002 national survey shared almost similar background characteristics with our analysis sample. A higher percentage of females has college education than males (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).

The study in particular has limitation. Longitudinal data are essential if the research purpose is to measure social change. However, the use of such data poses crucial theoretical and methodological problems. Firstly, given the long span of years since the CLHNS baseline survey was conducted up to the latest survey in 2005, about 62 per cent remained in the sample and some of the characteristics were significantly different from those who left. The analysis sample was from lower socioeconomic status which was characterized by having parents who attained less than high school education, a greater proportion were rural residents and who had no piped water connections in their houses. However, taking into account the important variable -HAZ at age two years, there was no significant difference between the sample analysis and those who dropped from the study. This relates the possibility that linear growth retardation at age two years is one of the good measures of associations between early childhood health and labor outcomes in young adulthood. In fact, when we predicted probabilities for young adults to be working in an informal job and working in formal job applying scenarios of "better environment" (e.g. highest HAZ score, heaviest birth weight, ownership of house and TV, maternal education is three years of high school, young adult's educational attainment is four years in college and reside in urban areas) and of "poor condition" (e.g. lowest HAZ score, birth weight, mother's height, do not own any household asset, no grade completed for mother and young adult and the residence is in the rural area), results revealed a direct relationship between better condition and landing in formal jobs for both males and females.

The first simulation (Figure 2) is on male young adults with the assumptions of HAZ scores at age two years of -6.4, birth weights of 907.2 g., mothers with no education, do not own house or television set, maternal height is 136.1 cm., parental residences in rural areas, and male young adults has no formal schooling. Almost all of the male young adults who are assumed to be living in the above poor condition will be working in informal jobs compared to only 1.2% probability of landing in formal jobs. In comparison with those who have HAZ scores of 0.58, birth weights of 4195.7 g., mothers completed three years of high school, households own TV, their dwelling units are made of strong materials, live in urban areas and the young adults have attained four years of college education, the probability for them to work in formal jobs vs. working in informal jobs differed very slightly, 25.1% and 30.2% respectively.

The characteristics of the analysis sample and those attrited

To determine if there is selectivity bias in the analysis sample, a one-way ANOVA over-all F-tests and post hoc Bonferroni comparisons were used for continuous sociodemographic variables and a Pearson's chi square tests of percentiles for categorical variables. Values of $P<0.05$ were considered to be significant (Table 2).

Table 2. Baseline sociodemographic characteristics of young adults, CLHNS 2005

Characteristic	In 2005 survey (n=1,888) Mean SD	Attrited (n=1,192) Mean SD	P value*
Mother's years of formal schooling	7.0	7.0	0.0318
Mother's age in years	3.3	3.3	0.5645
Mother's height (cm.)	26.0	26.0	0.7190
Father's years of formal schooling	6.0	6.0	0.0000
Father's age in years	150.6	150.5	0.7570
Household size	5.0	5.0	0.4439
HAZ score at age 2 years	7.1	7.7	0.2251
	3.4	3.6	
	29.0	29.0	
	6.7	6.8	
Male child	6.5	6.4	
Urban resident	2.5	2.2	
With piped water	-2.13	-2.46	
	1.0	0.9	
	% n	% n	P value**
	52.6	53.6	0.584
	993	639	0.000
	73.8	80.7	0.000
	1,393	962	
	5.9	9.7	
	111	116	

* Values of *P* correspond to one-way ANOVA overall F-test statistics
* * Values of *P* based on Pearson's chi-square test

Generally, young adults had mothers and fathers who were in their late teens, maternal height was relatively short, the average size of household was 6.5 and with lower HAZ at age two years. On the other hand, young adults who were attrited had better socioeconomic status in comparison with the analysis sample. These characteristics include: higher parental educational attainment - parents attained high school or more than high school of education, bigger proportion of urban residents (24 rural residents for every 100 urban), and a greater percentage had piped water connections in their houses.

Table 3 further describes the characteristics of young adults by work status. Young adults who landed in formal jobs were not married, not enrolled in school, and the household location was in urban. For every female young adult, there were two male young adults who worked in informal job. Results show that there was a wider gap in job opportunities for rural and urban areas.
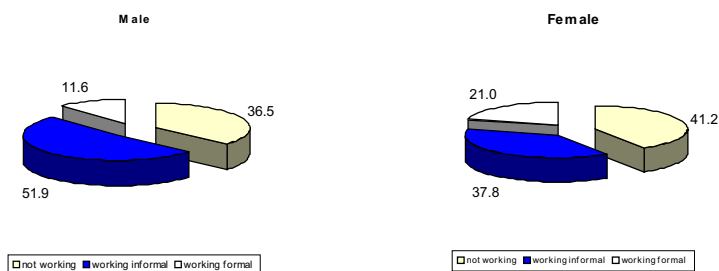
The percent distribution of young adults working in both jobs – whether informal or formal, was higher whose household location was in urban areas compared to those who resided in rural. Moreover, urban young adults were twice as many to be working in formal jobs compared to their rural counterparts.

Table 3. Background characteristics of male and female young adults by work status, CLHNS 2005

Characteristic	Male (%)			Female (%)			Both sexes (%)
	Not working	Working informal	Working formal	Not working	Working informal	Working formal	
Age							
20	10.2	7.6	3.5	10.3	10.1	6.9	8.8
21	87.0	88.5	93.0	87.3	86.1	90.4	88.0
22	2.8	3.9	3.5	2.4	3.8	2.7	3.2
Marital status							
Never married	89.0	72.4	80.0	61.2	57.1	86.7	72.6
Ever married	11.0	27.6	20.0	38.8	42.9	13.3	27.4
Schooling status							
Not enrolled	67.8	93.0	97.4	74.0	91.7	98.4	85.0
Enrolled	32.2	7.0	2.6	26.0	8.3	1.6	15.0
Educational level							
Elementary	14.6	28.6	6.9	10.0	11.5	1.6	15.2
High school	47.9	58.6	63.5	50.2	65.1	63.3	56.8
College	37.5	12.8	29.6	39.8	23.4	35.1	28.0
Household location							
Rural	19.3	30.5	26.1	25.5	22.8	35.6	26.2
Urban	80.7	69.5	73.9	74.5	77.2	64.4	73.8
N cases	363	515	115	369	338	188	1,888

As shown in Figure 1, there are more males than females working but more females were working in a formal job.

Figure 1. Distribution of male and female young adults by work status in 2005

Results in Tables 6a and 6b reveal that HAZ at age two years and work status of young adults are associated. Without adjustment, higher HAZ at age two years decreases the likelihood of young males and females working in an informal job, but it increases the likelihood of working in a formal job. Controlling for covariates including young adults' formal years of education, the effect of HAZ on informal work is no longer significant at $P=0.05$. For males, however, it increases the likelihood of formal work relative to not working; for females, it increases the likelihood of working in a formal job relative to an informal one. With these, we might say that part of the effect of HAZ on work status is mediated by education.

Conclusion and Discussion

The results of the study support previous studies on the long-term deterrent consequences of lower HAZ in early childhood on the child's physical and cognitive development. Most studies in the context of developing countries examined the associations of early childhood HAZ on human productivity as reflected in schooling success. This study delved further and considered what happens when the children become young adults and have for the most part completed their schooling. Specifically, it examined if height-for-age at age two years affects work status in early adulthood and whether there are differences between males and females. The availability of longitudinal data of the CLHNS allows us to examine this relationship. Longitudinal studies are powerful in addressing key scientific questions of central importance to individual and societal well-being and might be a major aid in the government's policy decision making. They are the only means for studying processes of individual life course development and dynamics, and for studying the effects of earlier characteristics on later outcomes (Martin, et. al, 2006).

Estimates showed a positive relationship between HAZ at age two years and formal work in young adulthood. Young adults who were taller at age two are more likely to be working in formal jobs. For males, it increases the likelihood of formal work relative to not working and for females; it increases the likelihood of working in a formal job relative to an informal one.

The years of formal education of the young adults was considered as potential pathway between HAZ at age two years and work status of the young adults in 2005 (Daniels and Adair, Kristensen, et. al., 2004, Baron and Kenny, 1986, McClanahan, et. al, 1999). 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 HAZ and work status among young adults especially if the mediating effect of education is taken into account. In the Philippines, formal jobs usually require higher educational attainment on top of long stature.

Table 6b. Result of multinomial logistic regression: females

Work status	Model 1		Model 2		Model 3	
	RRR	CI	RRR	CI	RRR	CI
Informal vs. not working	0.7947*	0.68-0.93	0.8933	0.75-1.06	0.9043	0.76-
HAZ score			1.0000	0.99-1.00	1.0000	1.08
Birth weight			0.9873	0.96-1.02	0.9876	0.99-
Mother's height			0.8666*	0.82-0.92	0.8744*	1.00
Mother's educational attainment						0.96-
					1.1202	1.02
Ownership of asset®			1.0983	0.78-1.54	0.9403	0.82-
			0.9219	0.56-1.51	1.5334*	0.93
Owns house or TV			1.5276*	1.06-2.21	0.9728	
Owns house & TV						0.80-
Parental household location©						1.58
						0.57-
Young adult's years of education						1.54
						1.06-
						2.22
						0.92-
						1.03
Formal vs. not working						
HAZ score	1.0620	0.88-1.28	1.1108	0.90-1.36	1.0285	0.83-
Birth weight			1.0003	0.99-1.00	1.0003	1.27
Mother's height			0.9795	0.94-1.02	0.9793	0.99-
Mother's educational attainment			0.9448@	0.89-1.00	0.8981*	1.00
						0.94-
Ownership of asset®					1.0658	1.02
			1.1982	0.80-1.79	0.9549	0.84-
Owns house or TV			1.0626	0.60-1.88	0.6293*	0.96
Owns house & TV			0.6571*	0.44-0.98	1.2001*	
Parental household location©						0.71-
						1.60
Young adult's years of education						0.54-
						1.70
						0.42-
						0.95
						1.10-
						1.31
Formal vs. informal						
HAZ score	1.3364*	1.11-1.61	1.2434*	1.01-1.53	1.1373	0.92-
Birth weight			1.0003	0.99-1.00	1.0003	1.41
Mother's height			0.9921	0.95-1.03	0.9916	0.99-
Mother's educational attainment			1.0902*	1.02-1.16	1.0271	1.00
						0.95-
Ownership of asset®					0.9515	1.03
			1.0910	0.73-1.63	1.0155	0.96-
Owns house or TV			1.1527	0.63-2.12	0.4104*	1.10
Owns house & TV			0.4301*	0.28-0.65	1.2336*	
Parental household location©						0.63-
						1.44
Young adult's years of education						0.55-
						1.88
						0.27-
						0.63
						1.13-

®Did not own house or TV is the referent
©Rural is the referent
*significant at *P*<=0.05 level
@ significant at *P*<0.10 level but >0.05

Table 4. Mean HAZ by work status and sex

Work status	N cases	Mean HAZ		P > |t|
		Male	Female	
Not working	732	-2.08	-2.07	0.03
Working in an informal job	853	-2.20	-2.29@	0.00
Working in a formal job	303	-1.93*	-2.02*	0.02
Prob > F		0.012	0.002	

*Bonferroni p<0.05, comparison between working in a formal job and an informal job
@ Bonferroni p<0.05, comparison between working in an informal job and not working

Table 4 above shows that higher HAZ at age two is associated with working in formal jobs for both males and females. Among females, low HAZ is associated with work in informal jobs. Furthermore, regardless of work status, females had significantly lower HAZ at age two than males.

b) Association between main exposure variable and other covariates

Bivariate measurements of the associations of young adults' HAZ at age two years showed significant results for almost all of the covariates with the exclusion of the household location of females wherein there was no significant association observed (Table 5). For females, HAZ at age two years is not dependent on where they resided during baseline.

Table 5. Pairwise associations of HAZ and other covariates

Characteristic	Male		Female	
	Coefficients (SE)	P>|t|	Coefficients (SE)	P>|t|
Birth weight	0.05 0.0005	0.000	0.0007 (0.0008)	0.000
Mother's height	(0.0001)	0.000	0.0547 (0.0063)	0.000
Mother's educational attainment	0.0623 (0.0057)	0.000	0.0766 (0.0097)	0.000
Ownership of asset	0.0883 (0.0085)			
®		0.007	0.1896 (0.0707)	0.007
Owns house or TV	0.1728 (0.0644)	0.000	0.4652 (0.0952)	0.000
Owns house & TV	0.6228 (0.0897)	0.009	0.0918 (0.0734)	0.211
Parental household location©	0.1801 (0.0686)	0.000	0.0982 (0.0112)	0.000
	0.0813 (0.0087)			
Young adult's years of education				

®Did not own house or TV is the referent
©Rural is the referent

c) Multiple logistic regression models

In Table 6a Model 1, the estimates of HAZ at age two years unadjusted for any covariates show that male young adults who had HAZ at age two years that was one unit higher had 0.36 probability of participating in formal jobs compared to males working in informal jobs.

Table 6a. Result of multinomial logistic regression: males

Formal vs. informal						
HAZ score	1.3583*	1.09-1.69	1.2359@	0.96-1.58	1.1058	0. 86-1.43
Birth weight			0.9999	0.99-1.00	0.9999	0.99-1.00
Mother's height			0.9942	0.95-1.04	0.9923	0.95-1.04
Mother's educational attainment			1.1473*	1.07-1.23	1.0614	0.98-1.15
Ownership of asset®						
Owns house or TV			0.8104	0.51-1.28	0.7612	0.48-1.21
Owns house & TV			0.7692	0.37-1.58	0.7427	0.36-1.54
Parental household location©			0.9365	0.58-1.52	0.8893	0.54-1.46
					1.2758*	1.17-1.39
Young adult's years of education						

®Did not own house or TV is the referent
©Rural is the referent
*significant at *P*<=0.05 level
@ significant at *P*<0.10 level but >0.05

The effect of HAZ at age two years alone was strongly associated with the work status of female young adults (Table 6b, Model 1). In comparison with male young adults, the same positive relationship holds through - higher HAZ at age two years relates to working in a formal job with reference to working in an informal job. Female young adults who had HAZ that was one unit higher at age two years were about 0.34 higher probability of working in formal jobs compared to those female young adults who were working in the informal jobs.

However, adjusting for birth weight, mother's height, mother's educational attainment, parental household location and parental ownership of assets (Table 6b, Model 2), female young adults who had HAZ that was one unit higher at age two years were 0.24 higher probability of working in formal jobs compared with female young adults who engaged in informal jobs. Likewise, higher maternal educational attainment is positively associated on the work status of female young adults. An increase in maternal education also increases the probability of engaging in formal jobs compared with working in informal jobs. An inverse relationship between parental household location and work status of female young adults was observed. Female young adults whose parental residence during baseline was in urban areas lowered the probability of engaging in formal jobs compared to those female young adults who were in the informal jobs. This might be an indication that the type of work engaged in by female young adult is not necessarily linked to her natal residence. As usually is the case, in adult years, she moves out from rural to urban to look for a job. By including the years of formal education of female young adults in 2005 (Tables 6b, Model 3), the effect of HAZ at age two years on the work status diminished. The relative risk for HAZ reduced to as low as 20 per cent. Female young adults who attained more years of formal education are more likely to work in formal jobs. This implies a mediating effect of education in the relationship between HAZ in early childhood and work status in early adulthood.

When adjusted for birth weight, maternal height, maternal education, household ownership of assets, and, household location (Table 6a, Model 2), males who had HAZ at age two years that was one unit higher had 0.33 probability of participating in formal jobs compared to males who were not working. As shown in Table 6a, Model 3, this association, however, weakened when the years of formal schooling attained by young adults was accounted as potential pathway between HAZ and work status. The probability for male young adults to engage in formal jobs versus not working decreases from 0.33 to 0.27.

Several studies report the positive effect of higher educational attainment of the mothers on their children's health and well-being. This study attested that maternal education and work status of young adults have direct relationships as well. An increase in the educational attainment of a mother also increases the likelihood of working in formal job compared to joining in informal job.

Table 6a. Result of multinomial logistic regression: males

Work status	Model 1		Model 2		Model 3	
	RRR	CI	RRR	CI	RRR	CI
Informal vs. not working						
HAZ score	0.8730@	0.76 - 1.01	1.0774	0.91-1.27	1.1444	0.97-1.35
Birth weight			0.9997@	0.99-1.00	0.9997@	0.99-1.00
Mother's height			1.0150	0.98-1.05	1.0151	0.98-1.05
Mother's educational attainment			0.8579*	0.82-0.90	0.8940*	0.85-0.94
Ownership of asset®			0.9037	0.66-1.23	0.9355	0.68-1.28
Owns house or TV			0.6453@	0.40-1.03	0.6631@	0.41-1.06
Owns house & TV			0.7921	0.56-1.11	0.8092	0.57-1.14
Parental household location©					0.8906*	0.85-0.94
Young adult's years of education						
Formal vs. not working						
HAZ score	1.1858	0.95 - 1.49	1.3315*	1.03-1.72	1.2655@	0.98-1.64
Birth weight			0.9996	0.99-1.00	0.9996	0.99-1.00
Mother's height			1.0092	0.96-1.06	1.0073	0.96-1.05
Mother's educational attainment			0.9843	0.91-1.06	0.9488	0.88-1.03
Ownership of asset®			0.7323	0.45-1.18	0.7121	0.44-1.15
Owns house or TV			0.4964*	0.24-1.00	0.4925*	0.24-1.00
Owns house & TV			0.7418	0.44-1.25	0.7197	0.43-1.21
Parental household location©					1.1362*	1.04-1.24
Young adult's years of education						