Original Article

In an era of economic growth, is inequity holding back reductions in child malnutrition in Vietnam?

Nguyen Minh Thang PhD[1] and Barry M Popkin PhD[2]

[1] *Senior researcher, Population Research Consultants (POPCON), Hanoi, Vietnam, Carolina Population Center, University of North Carolina at Chapel Hill, USA*
[2] *Professor in Nutrition, Carolina Population Centre, University of North Carolina at Chapel Hill, USA*

In the past decade of economic growth, Vietnam has achieved an impressive rate of socioeconomic development. However, the rate of improvement in child malnutrition lags far behind that of most other health indicators. This study examines factors other than income that might affect this inability to reduce rapidly child malnutrition by exploring the socioeconomic factors that explain the high rates of stunting and underweight status of many Vietnamese children. A nationally representative survey of Vietnamese households, the 1997-98 Vietnam Living Standards Survey (VLSS) is used. Multivariate logit is used for regression analysis. The key parameters are household poverty status, total expenditure level, rural residence, and minority status with controls for many key socio-demographic measures. Children from rural households, poor households, and ethnic minority backgrounds are significantly more likely to be malnourished (with a 17.6%, 10.9%, and 14.1%, respectively, greater prevalence of malnutrition) than are urban residents, non-poor households, and the majority Kinh population. These results suggest that economic improvements in Vietnam have, for the most part, bypassed the rural poor and minorities and that targeting economic resources towards these groups will be most critical for reducing undernutrition in Vietnam.

Introduction

Over the past decade, Vietnam has experienced a dramatic economic reform, termed *Doi Moi*, that has led to considerable poverty reduction.[1] These reforms included the privatisation of the economy and have led to growth in all sectors, including improvements in the health status of many Vietnamese. However, these changes have not been uniformly beneficial; they have been found to have largely favoured those with higher incomes, so that health inequality has significantly increased.[2] Indeed, child nutritional improvements have lagged behind, and studies by a number of agencies and scholars have noted the large gap between economic improvements and child malnutrition.[1,3,4] While the reduction of overall malnutrition in Vietnam is important, there is little data or research on the specific impact of individual, household, and community factors on the rate of Vietnamese child malnutrition. This study, therefore, examines child malnutrition in Vietnam using the 1997-98 living standard survey and its determinants.

The economic reform process was focused first on the agriculture sector, which experienced a marked increase in rice and other agricultural production. Rice and rice equivalents in 1999 was 31,394 tons, an increase of 200% over 15 years.[5] During this period of economic expansion, the food supply has diversified and many key products experienced marked declines in price, while real household income increased and the rate of inflation decreased considerably. Rice, which is a staple in Vietnam, accounts for 85% of food grain outputs. The production of milk and meat, which remain important sources of protein, have reached 1.6 million tons and 79 thousand tons in 1998 respectively.[6] In the 1990s, the annual average growth rates of live weight pork, poultry and cattle were 6.9%, 6.3%, and 5.5% respectively. The growth rate of fruit and vegetable production has been 5% annually. Vegetable output increased from 4.8 million tons in 1990 to 6 million tons in 1999 and fruit output in 1999 was over 4.4 million tons.[7]

Despite the impressive achievements in economic growth in recent years, Vietnam still has one of the highest rates of child malnutrition in the region. While the data show that in the period 1990-1999, the proportion of underweight children under the age of five years was 28% (world), 29% (low- and middle-income countries), 49% (South Asia), and 19% (East Asia and the Pacific), respectively,[8] the 46% rate for Vietnam showed the country lags considerably behind other developing countries, including its neighbours. This is shown most clearly in a comparison of low weight-for-age measurements of undernutrition for a range of countries.

Correspondence address: Nguyen Minh Thang, Carolina Population Center, University of North Carolina at Chapel Hill, CB # 8120 University Square, 123 West Franklin St, Chapel Hill, NC 27516-3997, USA
Tel: (919) 843-4128; Fax: (919)-966-6638
Email: nmthang@netnam.org.vn; nmthang@email.unc.edu
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Figure 1 presents the relationship of underweight status with per capita income. In the 1990s, Vietnam had a rate of malnutrition that was about 30% higher than would be expected based on the correlation between income and nutrition. Recent studies of child nutrition in Vietnam based on both the 1992-93 and 1997-98 Living Standard Survey also suggest a weak relationship between household income and child nutrition.[3,4,9] These results are surprising since the observed patterns for other infant and child health indicators, such as infant and child mortality, are exactly the reverse. In other words, Vietnam's infant and child mortality and reproductive health are better than would be expected given its per capita income level, yet childhood malnutrition rates are worse.

The disjunction between GNP per capita and malnutrition in Vietnam led us to this proposed analysis of the correlates of malnutrition in Vietnam. The databases to explore dietary and morbidity determinants do not exist, but we utilized a nationally representative survey to examine the role of socio-demographic factors on child malnutrition rates. There is a large literature that has examined many biological, social, cultural, and economic determinants of child malnutrition. Among the key factors found to generally affect the likelihood of malnutrition are gender,[10-13] female household-headship,[14-17] the occupational status of the mother,[18-19] maternal education, family income, area of residence, and other socio-demographic factors as key determinants of child wasting and stunting.[20-27] These key socio-demographic factors noted above are examined in our study for their potential association with child stunting and underweight status in Vietnam.

Methods

Data

Central to our analysis is the Living Standard Surveys (VLSS) conducted in 1997-98. This survey of comprehensive household living standards was conducted within the framework of the World Bank's Living Standard Measurement Surveys (LSMS). The survey was conducted by the General Statistical Office (GSO) and is nationally representative in both the urban and rural sectors. The 1997–1998 survey was a follow-up to the original survey conducted in 1992-1993. A total of 6,002 households was included in the survey.[28]

This analysis uses the 1997-1998 survey as an independent cross-section. 5309 children aged from 2-11 are included in the analysis. Weights are used to make each survey nationally representative. Both of the VLSS surveys were multipurpose household and community surveys. The household component includes questions on household composition, characteristics of the dwelling, education levels, health, labour force participation, fertility, agriculture and fishery output, household enterprises, income, credit, and household expenditures. The community survey provides information on the characteristics of the community, with detailed information on the operation of social services (particularly health and education providers), along with more general information about services available in the community, the community's physical and economic infrastructure, and a complete set of prices.

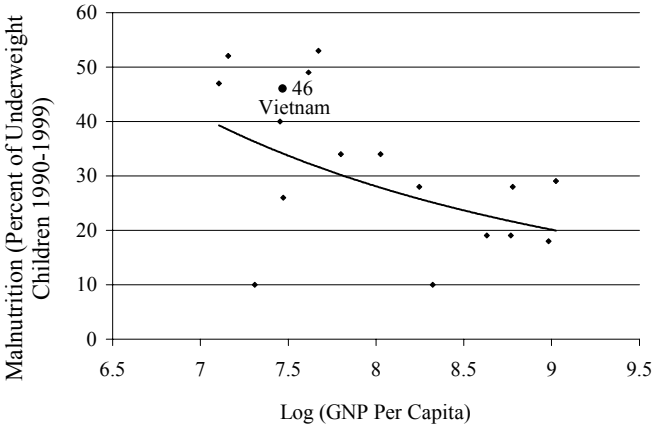
Measurement of key parameters

Our focus is on long-term exposure to malnourishment, resulting in stunting or low height-for-age. Weight-for-age is a measure commonly used that can reflect either long-term energy deficiency linked with stunting or current shorter term declines in weight. In this analysis children's height and weight were presented in Z-scores, which expresses the variable in terms of standard deviations from the mean value of the healthy population. Z-scores were calculated with the following formula:

$$Z = \frac{(X/M)^L - 1}{L * S}$$

where X is the value of the individual (for example, the weight or the height), M is the value of the mean for the healthy population, L is a transformation factor calculated from the raw data, and S is the standard deviation of the healthy population.

Children who are more than two standard deviation units (Z-score) below the median value of a reference population of healthy children in terms of each of these two indices (as compiled by the National Centre for Health Statistics of the United States[29]) are considered stunted or undernourished and fits our definition of being undernourished.[30] Our analysis excludes children aged 0-2 as their nutrition status often relates to current infant feeding practices. During infancy, analysis must focus on small age groupings [e.g. age 0-2, etc] and longitudinal analysis is needed to understand the role of socio-economic status (SES) factors more clearly. Thus, we will focus on three measures of inequality in Vietnam: poverty status, rural status, and minority status.



Source: Asian Development Bank, 2001

Figure 1. Malnutrition in Vietnam – an international comparison

We would expect these three selected measures to reflect longer term status of economic welfare[31] and be sensitive to a series of determinants of socio-economic status. Independent variables were classified into two groups: 1) variables related to poverty and inequality; and 2) other socio-demographic and economic measures.

Variables related to inequality:

- *Poor household with total expenditure below the poverty line*. Vietnam General Statistical Office and World Bank calculated food poverty line and overall poverty line on the basis of a minimum requirement of 2,100 calories per person per day for an adequate diet. The poverty line was converted into monetary value – in VN Dong (Vietnamese currency: 15,000 VND is equivalent with one USD). For Vietnam, the food poverty line was approximately 1,287,000 VND in 1998. The overall poverty line was set at 1,790,000 in 1998.[1] In this article, *poor* and *non-poor* indicate households with total expenditures per capita below and above the overall poverty lines, respectively.
- *Minorities*. Lowland ethnic Vietnamese, known as Kinh represent about 85 percent of the general population, domination socioeconomic affairs in Vietnam. There are officially 53 ethnic groups within the nation who constitute the category of "ethnic minority". In this analysis, ethnicity was categorized as "ethnic minority" or Kinh.
- *Type of residence* was categorized as urban or rural.

We also examined the interactions of these measures. Additional measures of inequality that we explored reflected the isolation regions of the upper highlands - northern upland and central highland. We found that regional isolation was not as predictive of undernutrition as were our poverty, rural residence, and minority status measures, so we do not present these results here.

Other socio-demographic and economic control variables include:

- *Protected water.* The household questionnaire of 1997-1998 survey has a question related to the sources of water for cooking and drinking that were presented in 11 different type. In this study, all tap water, wells, raining water, and filtered water were treated as protected water. Other waters taken directly from ponds, lakes, streams, rivers, etc. were considered as unprotected water.
- *Prices of three main foods* of Vietnamese households; rice, pork, and vegetable (water morning glory) in Vietnam Dong are included in analysis. The price of each food was collected at three sites per community during the survey fieldwork. The community mean price of each food was treated as a continuous variable to examine the impact of food price on nutritional status.
- *Age* of children was categorized as 2-5 years old or 6-11 years old.
- *Sex* of children was categorized as boy or girl.
- *Head of household* was categorized as female-headed or male-headed
- *Mother's education*. For descriptive analysis, education was categorized as illiterate, primary, lower secondary school, upper secondary school, or above. For logistic regression, the number of years in school and college of the mother was treated as a continuous variable.
- *Hours worked* was the average number of hours per day that a mother worked during the previous 12 months. For descriptive analysis, hours worked was recalculated as the mean number of hours per week. It was categorized as fewer than 20 hours a week or more than 20 hours a week for the previous 12 months. For logistic regression, the number of hours worked was treated as a continuous variable, measured in hours.

Results

Descriptive

Table 1 presents descriptive figures of the nutritional status of children 2–11 years old from the 1997–1998 VLSS. Households with total expenditure below the poverty line (hereafter referred to as *poor households*) had more stunted and underweight children than did those at or above the poverty line. The differences between poor and non-poor were 17.6 and 12.8 percentage points,

Table 1. Percentage of physically stunted and underweight children who were 2-11 years old, Vietnam Living Standard Survey 1997-98

	Stunted	Under-weight	N		Stunted	Under-weight	N
Poverty				*Meat price*			
Not poor	39.76	53.45	2634	Cheap	51.43	63.26	3324
Poor	57.34	66.26	2675	Expensive	42.41	53.84	1888
P	*.0001*	*.0001*		*P*	*.0001*	*.0001*	
Minority				*Veg. Price*			
No	46.54	59.12	4295	Cheap	49.59	62.74	3149
Yes	57.41	63.24	1014	Expensive	43.51	54.30	1904
P	*.0001*	*.016*		*P*	*.0001*	*.0001*	
Type of residence				*Age of children*			
Rural	28.57	41.35	872	2-5 yrs	41.91	50.45	1411
Urban	52.55	63.55	4437	6-11 yrs	51.04	63.33	3898
P	*.0001*	*.0001*		*P*	*.0001*	*.0001*	
Rural & Minority				*Sex of children*			
No	46.09	58.80	4359	Girl	47.51	60.55	2601
Yes	60.19	64.98	950	Boy	49.68	59.29	2708
P	*.0001*	*.0001*		*P*	*.115*	*.347*	
Rural and Poor				*Sex of head of household*			
No	40.45	53.88	2774	Female	40.38	53.75	868
Yes	57.55	66.50	2535	Male	50.23	61.11	4441
P	*.0001*	*.0001*		*P*	*.0001*	*.0001*	
Clean water				*Mother's Education*			
Not clean	53.38	63.15	1422	Illiterate	51.04	60.55	1721
Clean water	46.87	58.72	3887	Primary	48.23	61.09	1300
P	*.0001*	*.003*		Lower secondary	50.66	61.26	1654
				Upper secondary and above	37.56	52.29	633
				P	*.0001*	*.007*	
Rice price				Work hours of mother			
Cheap	*49.40*	*60.76*	2609	≤ 20 hrs a week	41.46	55.92	684
Expensive	47.70	58.97	2663	> 20 hrs a week	49.57	60.67	4443
P	*.216*	*.184*		*P*	*.0001*	*.018*	
				Total	48.49	60.04	5127

respectively, for the rates of stunted and underweight. The differences were statistically significant, with $P < 0.0001$. Similar results are shown for minority status, rural residents, and our variables to reflect rural minorities and rural poor. For example, the percentage of physically stunted children of rural areas was 52.55% – about 24 percentage points higher than for urban children. The difference in underweight between rural and urban areas was also quite high: 22.2 percentage points. These were significant differences, with $P < 0.0001$.

The descriptive results also show that clean water supply and many of the key economic and demographic measures are important. The price of meat and vegetables, for instance, contributed significant differences in percentage of physically stunted and underweight children. Children of less educated women were more likely to be malnourished. The rate of stunted children of highly educated (upper secondary or higher) women was 13.5 percentage points less than that of children of illiterate women. The difference was statistically significant, with $P < 0.0001$. Households headed by females had fewer stunted and underweight children than did households headed by males. The differences in percentage of physically stunted and underweight children between households headed by females and males were 9.9 and 7.4 percentage points, respectively, with significant statistics. The rate of stunted children of mothers who worked less than 20 hours a week was 8.1 percentage points less than that of mothers who worked more than 20 hours a week. The rate of stunted and underweight for groups of older children was 9.1 and 12.9 percentage points higher, respectively, than that for younger children, with significant statistics.

Multivariate: The role of these same equity-related variables was further explored in the logistic regressions, shown in Table 2. The logistic procedure of STATA package version 7 was used for this analysis. Table 2 presents the odds ratio for stunted and underweight children in two models. Model 1 was controlled by variables related to inequality. Model 2 included both variables related to inequality and other socio-demographic controls.

In general, our measures of inequity – household poverty status, total per capita expenditure level of the household, minority status, and area of residence – all significantly influenced stunting and low weight for age. Children from rural areas, poor households, or an ethnic minority group are more likely to be stunted than are those from urban areas, well-off households, or the Kinh group. For example, in Model 1, the likelihood of stunted children in poor households was two times higher than in non-poor households. The impact of poor household was significant at $P<0.001$. The probability of stunted children in rural areas was about 1.8 times higher than in urban areas, with a significant value of $P<0.01$. Although minority itself did not show a significant influence on stunted children, an interaction variable of rural and minority showed significant influence on stunting. The probability of stunting was 2.34 times higher in children from a minority group and a rural area than for the rest of the groups. The impact and its significant statistic of inequality measures remained when other socio-demographic controls were added (Model 2). The results for underweight status are comparable, except that the minority effect was not significant.

Other factors: For both outcomes, the price of rice and the age of each child were consistently significant. Increases in the price of rice were linked with increased undernutrition: Odds ratios were 1.27 and 1.28, respectively, for likelihood of stunted and underweight – a result readily interpreted in this rice-eating population, where rice constitutes a major component of the diet. Older children were more likely to be stunted and underweight – odds ratios of 1.53 and 1.73, respectively – reflecting the cumulative nature of each of these measures. Surprisingly, boys were more likely to be stunted. Other variables – such as female-headed household, mother's education, and number of hours that the mother worked – did not show a significant influence on either stunted or underweight children.

To facilitate the interpretation of these results as they relate to the probability that a child was malnourished, we simulated the effects of changes in our key inequality measures on the likelihood of being stunted. We varied the effects of the key parameters noted and used each child's values for the other parameters. In Figure 2 we present the effects of changes in the key poverty, minority status, and rural residence parameters. These results are based on the fully specified equation from Table 2. Children whose families are from a rural, poor, minority group present the greatest likelihood of being stunted: 62.4% – approximately 2.6 times higher than for urban, non-poor non-minority children. The net effect of the minority factor is 8.9% (62.4% vs. 55.5%); poor is 10.4% (62.4% vs. 52%); and the combination of poor and minority status factors is 17.4% (62.4% vs. 45%). The urban–rural effect is by far the largest, as 45% of rural, non-poor non-minority children would be stunted – compared with 24.5% of urban children of similar background: a 21.6% difference.

Discussion

Vietnam is in an interesting situation. It is experiencing rapid economic growth, infant mortality is declining rapidly and for many measures of health status, Vietnam is far better than would be expected for its national income level. However, with respect to child malnutrition, this is not the case. Clearly factors other than income must explain the reasons for this below average level of achievement in reducing malnutrition. This article highlights the role of critical socio-demographic background factors as delineating the high risk population groups that must be targeted for more intensive assistance. These groups — the rural poor and minority sub-populations — have clearly not benefited from the improvements in the economy. It appears that improvements in the general population have not included the poor – non economic issues appears to be most responsible for this disparity.

Obviously poverty status is one of several critical factors in determining malnutrition rates. Our previous analysis shows that, in 1997, the prevalence of stunting among children from 0-5 years old from the poorest quintile was about 250 percent higher than among those

from the richest quintile. The rate of decline between 1992 and 1997 in stunting has been the greatest among households in the richest quintile, and amounts to more than double of that observed in households in the poorest quintile (decline of 39.5% vs. 16.6%).[2,32] The tendency is about the same for other malnutrition indices. The strong positive relationship between poverty and prevalence of children's malnutrition holds not only at the household level, but at the provincial level as well.[3]

Our results go further and point out that even among the poor, the rural poor are far more likely to be malnourished than the urban poor. Similarity, the ethnic minority sub-populations face a greater likelihood of being undernourished. These results indicate that the population most at risk are those children from lower income, rural minority families, hence our focus on interpreting this as an equity issue. According to our analysis the 1997-1998 Vietnam Living Standards Survey, rural residence, poor households, and ethnic minority groups have about 17.6, 10.9 and 14.1 percent greater prevalence of malnutrition than urban residents, non-poor households, and the majority Kinh populations. These rural-urban residence and ethnic differentials are critical non-economic factors. In addition, these results also indicate that the price of rice can play an important role in affecting child nutrition, but that the major factors affecting nutritional status are these demographic and economic ones noted above.

The analysis clearly confirms that poverty status, as well as the total amount of household money expended (a proxy for income), and food prices do affect child malnutrition, but do not play the sole or central role at this time of Vietnamese economic development. At an earlier stage of *Doi Moi* when poverty was common, the household budget for food might have been more constraining. Surprisingly we did not find that education levels, particularly variations in maternal education, impacted significantly on child malnutrition. These results indicate some of the challenges the government of Vietnam will face as it attempts to reduce child malnutrition in the future.

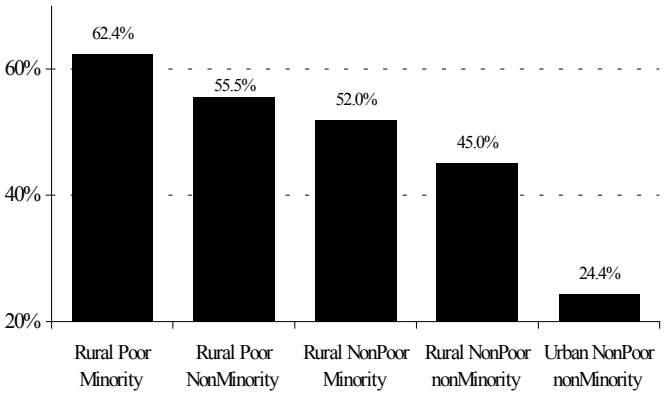


Figure 2. Prediction of the net effect of poverty, minority, and rural settings on probability of stunting children, Vietnam Living Standard Survey 1997-98

Table 2. Logit regression for impact of selected individual, household, and community variables on the underweight status of children 2-11 years old, Vietnam Living Standard Survey 1997-98

	Stunted				Underweight			
	Model 1		Model 2		Model 1		Model 2	
	Odd	*P*	Odd	*P*	Odd	*P*	Odd	*P*
Measures of inequality								
Poor household	2.00	0.001	2.01	0.001	1.65	0.014	1.66	0.016
Total expenditure per capita	0.82	0.0001	0.82	0.0001	0.82	0.0001	0.82	0.0001
Minority	0.54	0.053	0.55	0.076	0.94	0.805	1.08	0.746
Rural areas	1.80	0.0001	1.88	0.0001	1.83	0.0001	1.75	0.0001
Rural and minority	2.34	0.010	2.17	0.026	1.02	0.951	0.91	0.720
Rural and poor	0.58	0.007	0.60	0.015	0.66	0.039	0.68	0.068
Other socio-demographic controls								
Protected water			0.92	0.277			0.86	0.055
Price of rice			1.27	0.001			1.28	0.001
Price of meat			0.96	0.001			0.96	0.0001
Price of vegetables			1.18	0.012			0.99	0.839
Age of child (6-11)			1.53	0.0001			1.73	0.0001
Sex of child (male)			1.12	0.068			0.95	0.418
Male-headed household			1.10	0.285			1.03	0.742
Mother's education			1.00	0.887			1.01	0.116
Mother's work hours			1.01	0.245			0.98	0.119

Note: Logit procedure from STATA version 7 was used for this analysis

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