SOCIO-ECONOMIC FACTORS AFFECTING NUTRITIONAL STATUS AMONG CHILDREN UNDER FIVE YEARS OLD IN VUTHU DISTRICT, THAI BINH PROVINCE, VIETNAM IN 2004

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วัตถุประสงค์หลักของการศึกษานี้คือ การบ่งชี้ปัจจัยต่าง ๆ ทางเศรษฐสังคมที่มีผลต่อภาวะโภชนาการในปี 2004 ของเด็ก ๆ ในอำเภอวูธู จังหวัดไทบินห์ ซึ่งเป็นจังหวัดหนึ่งของประเทศเวียตนาม เด็กอายุต่ำกว่า 5 ปี จำนวน 310 คนถูกประเมินภาวะโภชนาการ ครอบครัวของพวกเขาถูกสัมภาษณ์เกี่ยวกับขนาดของครอบครัว จำนวนเด็กใน แต่ละครัวเรือน ระดับการศึกษาของผู้ปกครอง จำนวนชั่วโมงทำงานของผู้ปกครอง หัวหน้าของครอบครัว รายได้และแหล่งรายได้ของครอบครัว และค่าใช้จ่ายและราคาต่าง ๆ ที่เกี่ยวกับอาหารประเภทต่าง ๆ วิธีกำลังสอง น้อยที่สุด (Ordinary Least Square หรือ OLS) ถูกนำมาใช้ในการประมาณค่าของตัวแปร Semi Log-linear เพื่อบ่ง ชี้ปัจจัยต่าง ๆ ที่มีผลต่อภาวะโภชนาการของเด็ก ๆ การวิเคราะห์แบบ Additional Cluster Analysis ถูกใช้เพื่อ อธิบายความสัมพันธ์ระหว่างปัจจัยต่าง ๆ และภาวะโภชนาการของเด็ก ๆ

จำนวนเด็กที่มีน้ำหนักต่ำกว่ามาตรฐานในจังหวัดดังกล่าวมีมากถึงร้อยละ 24.8 ซึ่งอยู่ในเกณฑ์สูงเมื่อ อ้างอิงกับเกณฑ์ที่องค์การอนามัยโลกกำหนด และเด็กที่มีน้ำหนักเกินกว่ามาตรฐานคิดเป็นสัดส่วนร้อยละ 3.5 รายได้เป็นปัจจัยสำคัญที่มีผลต่อภาวะโภชนาการของเด็ก ๆ ครัวเรือนที่มีระดับรายได้สูง จะมีเด็กที่มีภาวะทาง โภชนาการที่ดีกว่าครัวเรือนที่มีระดับรายได้ต่ำ ณ ระดับรายได้ต่อหัวน้อยกว่า 236,092 VND และตัวแปรอื่น ๆ มีค่าอยู่ที่ค่าเฉลี่ย เด็กในครัวเรือนนั้นอาจมีน้ำหนักต่ำกว่ามาตรฐาน อย่างไรก็ตาม การเพิ่มขึ้นของรายได้จะทำให้ เด็กเผชิญกับภาวะมีน้ำหนักเกินกว่ามาตรฐานได้ ระดับการศึกษาของมารดาและเวลาในการทำงานของบิดามีผล กระทบทางบวกต่อภาวะโภชนาการของเด็ก อย่างไรก็ตาม ได้มีสัญญาณเตือนซึ่งบ่งบอกว่ามีเด็กที่มีน้ำหนักเกินกว่า มาตรฐานจำนวนมากพอสมควร โดยเด็กเหล่านี้จะอยู่ในครัวเรือนที่บิดาและ/หรือมารดามีระดับการศึกษาสูง ระดับ รายได้ต่อเดือนที่สูง หรือเวลาในการทำงานของมารดามีน้อย

การเพิ่มระดับรายได้ของบุคคล และลดครัวเรือนที่ยากจนอาจจะช่วยลดจำนวนเด็กที่มีน้ำหนักต่ำกว่า มาตรฐานได้ การเพิ่มระดับการศึกษา ความรู้และความเอาใจใส่ของมารดาในการดูแลเด็ก อาจช่วยให้ภาวะ โภชนาการของเด็กดีขึ้น การให้การศึกษาควรเป็นนโยบายหลักที่รัฐบาลต้องเอาใจใส่เพื่อส่งเสริมประชาชนให้ความ ใส่ใจต่อการศึกษาเรื่องสุขภาพของเด็ก การให้ข้อมูลและการสื่อสารต่าง ๆ ไม่ควรมุ่งเป้าไปที่การพยายามลดจำนวน เด็กที่มีน้ำหนักต่ำกว่ามาตรฐานเพียงอย่างเดียว แต่ควรจะรวมถึงการลดจำนวนเด็กที่มีน้ำหนักเกินกว่ามาตรฐาน อย่างเหมาะสมด้วย การมีครัวเรือนที่มีขนาดเล็กลงอาจจะช่วยลดจำนวนของเด็กที่มีน้ำหนักต่ำกว่ามาตรฐานได้

สาขาวิชา	เศรษฐศาสตร์สาธารณสุข	ลายมือชื่อนิสิต	
ปีการศึกษา	2004	ลายมือชื่ออาจารย์ที่ปรึกษา	
		ลายมือชื่ออาจารย์ที่ปรึกษาร่วม	

The main objective of this study is to determine socio-economic factors affecting nutritional status of children in Vu thu district, Thai binh province of Vietnam in 2004. Three hundred and ten children under five years old were evaluated about nutritional status and their families were interviewed based on questionnaire to collect the information about household size, number of children in each household, parent education, parent work load, head of households, income and sources of income, food expenditure and price for representative food products. Ordinary Least Square (OLS) method was applied to estimate the semi log-linear regression to identify factors affecting nutritional status of children. Additional cluster analysis was also used to clarify relationship between individual factors with the nutritional status of children.

Prevalence of underweight children in the district was 24.8%. It is still in high level according to WHO categorizes. There were 3.5% of children overweight. Income was the important factor affecting nutritional status of the children. The higher income the households the better nourished the children were. At monthly income per capita less than 236,092 VND, keeping other characteristics in average, the child in that household could be underweight. However, increasing in income also leaded children facing to overweight situation, at monthly income per capita greater than 267,429 VND, keeping other characteristics in average, the child in that household could be overweight. Mother education level and father working time had positive impact to nutritional status of children but mother working time and household size had negative impact to nutritional status of children. There was alarming that overweight children were often in the households with high education level of mothers or/and fathers, high monthly income per capita, or few working time of the mothers per day.

Increasing income of people and eliminating poor households may reduce underweight prevalence of children. Increasing education level, knowledge and awareness of mothers in child health care may help increase the nutritional status of children better. Social mobilization in education participation should become strong local government policies in order to encourage people attending to school. Content of child health education, information and communication should not only focus on preventing underweight children but also proper feeding to prevent overweight children. Small family model may contribute in reducing underweight prevalence of children.

Field of study: Health economics   Student's signature: ………..……………

Academic Year   2004   Advisor's signature: ……………………….

                                       Co-advisor's signature: ……………………

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ABBREVIATION

GDP	**Gross Domestic Product**
GSO	**General Statistical Office**
MCH/FP	**Maternal and Child Health /Family Palnning**
MOH	**Ministry of Health**
MOLISA	**Ministry of Labour, Invalids and Social Affair**
NCHS	**National Center Health Survey**
NER	**Net Enrolment Rate**
NIN	**National Institute of Nutrition**
NNS	**National Nutrition Strategy**
NPAN	**National Plan of Action for Nutrition**
OLS	**Ordinary Least Square**
PEM	**Protein – Energy - Malnutrition**
UNICEF	**United Nation International Children's Emergency Fund**
VND	**Vietnam Dong (Vietnamese currency)**
WB	**World Bank**
WHO	**World Health Organization**

CHAPTER I
INTRODUCTION

1.1 Problem and its significance

Malnutrition is a serious global issue. According to estimate of World Health Organization, each year, some 24 million babies are born too small to lead healthy lives because their mothers were either ill or malnourished. Among children under five years of age in the developing world, 206 million are stunted (low height for age), 50 million are wasted (low weight for height), and 167 million are underweight (low weight for age).

The malnutrition is not only related to many diseases in the world but also it can reduce the productivity of the labour forces in the future. The consequences of malnutrition are strongly affected to the children in capacity to prevent various diseases especially the infected disease. In 1995, 6.3 million of the 11.6 million deaths among children aged under five years were associated with malnutrition, mainly because of the potential effect of mild-to-moderate malnutrition (World Health Organization; 1997). For children with low birth weight, they are also affected by the non communicable diseases like hypertension, obesity, cardio-vascular, or diabetes in the future. Some calculation estimated that the lost of GDP annual growth due to malnutrition might be 2.4% (World Bank).

Ultimately, malnutrition results from inadequate intake of nutrients and/or from disease factors that affect digestion, absorption, transport, and utilization of nutrients. However, there are also economic, social, political, and cultural causes of malnutrition. They directly or indirectly affect to the access of people, in general, and children, in particular, in nutrient intake and health care services. Because of the link between malnutrition and social factors, the nutritional status of a population is a sensitive indicator of the quality of life in the community.

Poor families, confronted with the permanent stress of the struggle for survival, do not have either the awareness or the opportunity to provide these stimuli. The results of the inadequate nutrition for the mother in pregnant period lead to the low birth weight babies. Additionally, because of not having enough money to survive, the mothers also have to participate in earning money for the family early when their children are not mature enough. Poor children have higher rates of infections and less access to adequate nutrition and are more exposed to the consequences of carelessness and lack of information that are common in their family settings. The impact of poverty upon health is largely mediated by nutrition and is expressed throughout the whole life course. When income distribution is unequal, economic growth usually does not reach the undernourished, and nutrition may stagnate or even deteriorate.

Poverty, low levels of education, and poor access to health services are major contributors to childhood malnutrition, a complex issue that requires tackling on a wide number of fronts. Childhood malnutrition is often caused by improper feeding and caring practices, making the knowledge and values of caregivers are very important. Women with a higher education tend to have the knowledge and skills to provide them with better nutritional care. Lower education mothers cannot translate knowledge about nutrition into optimal child-care practices to understand the special nutritional needs of young children, suitable complementary foods at the right age. Women's education levels therefore influence nutritional status.

Work load of the main caregiver for the children in family is very important. Maternal work, either part-time or full-time, is affect to the time for taking care of the children. For the ones who often work hard, they do not have enough time staying with their children or spend time to study or participate the class for learning the method to look after the children properly. This kept them away from home and children, particularly during the working time. However, with the good occupation, the mothers have more chance to access information or communication about child health care or they can spend more time for taking care of their children. A trend is evident for the children of mothers with a heavy workload, despite a greater family income, to have lower energy intake and a higher prevalence of diseases.

Large household size is also widely regarded as a risk factor for malnutrition in developing countries, particularly for infants and young children. Children from larger households are significantly shorter and consume diets of poorer quality, as assessed by intake of foods from animal sources. Often, the poor families have more children than the richer. They have to share food in limited sources food in their families, and care from their parent when the parents also have to work hard for their families.

1.2 Background and nutrition situation in Vietnam

From 1986, with the renovation strategy from a centrally-planned to a market-oriented economy, Vietnam has made remarkable progress across a broad range of socio-economic development measures. In according to the Vietnam's GSO, the rate of poverty fell from 58% in 1993 to around 37% in 1998 and 29% of population in 2002 according to the National poverty line. The annual growth rate in 1990s was 8-9% and it is quite stable around 7-8% in recent years. Adult literacy has been maintained at over 90%. The net enrolment rate in primary education has steadily improved from 1990 to 2000. In 1999, the net enrolment rate (NER) in primary education stood at 94.8%, a significant improvement from 1990 (86%) and 1995 (91%) *("Education for All in Viet Nam 1990-2000")*

The prevalence of underweight children (under 5) was reduced gradually from 36.7% in 1999 to 33.8% in 2000, 31.9% in 2001, 30.1% in 2002 and 28.4% in 2003.

However, we realize that we still face with many challenges:

National poverty reduction rates in the 1990s conceal significant disparities. In urban areas, poverty decreased by two-thirds from 1993-1998, while the reduction was less than half in rural areas. The growing gap between urban and rural areas constitutes the core of the increasing differentiation between rich and poor in Viet Nam. In 1993, the richest fifth of the population spent 4.6 times as much as the poorest fifth, and by 1998 this ratio had increased to 5.5, with 43.7% of all spending coming from the rich and 8% from the poor. The increasing gap among population groups and regions leaves a larger number of people in poverty than if growth had been distributed evenly. Nearly 90% of

the poor live in rural areas in Viet Nam. Poor people are often farmers with low levels of education, and limited access to factors of production such as land, capital, technology, information, and basic social services. They are also particularly vulnerable to natural disasters, which frequently occur in Viet Nam.

The country still faces geographical, gender and ethnic disparities in primary net enrolment rates. In 1999, while the NER of the Red River Delta (in northern Viet Nam) was 98%, that of the Mekong River Delta (in southern Viet Nam) was only 90%.

Malnutrition in the Central Highlands, Northwest region, and North Central region, is still over 33%. These areas are also those where household and community food production is not stable.

Government targets under the ten year socio-economic development strategy 2001-2010

- ❖ Doubling of GDP, which implies a growth rate of 7.2% per annum
- ❖ Substantial rise in the country's Human Development Index (HDI)
- ❖ Eradication of hunger and rapid reduction of the number of poor households
- ❖ Reduction of urban unemployment to 5%, and of rural underemployment to 15-20%
- ❖ Universalization of lower secondary education (education for all)
- ❖ Malnutrition rate of children to be reduced from around one-third to around 20%

The report of United Nation (Vietnam development context) shows that there are many other social factors related to health care needed to solve to improve the health of the Vietnamese in general and children in particular.

* The low capacity of the women is one of the main factors, besides food security, that affects children's nutritional status. The heavy workload women shoulder to provide additional productivity and income, their double burden during pregnancy and men's lack of involvement in childcare, leads to nutritional problems for both women and children, including problems of low birth weight, complications with deliveries, breastfeeding and the provision of adequate childcare.

* Lack of knowledge of child health and nutrition care**.** Often, families and caretakers are not able to support pregnant women and mothers in caring for their children primarily as a result of lack of knowledge and essential resources. Caretakers and mothers are unable to assess the nutritional status of their children and do not have adequate information on maintaining a hygienic environment, good weaning and nutrition practices and the basic management of childhood illnesses. If they do have such knowledge, caretakers and families are often unable to put it into practice as they lack essential resources.

In Vietnamese households, basic hygiene, health and nutrition practices crucial to child survival, growth and development are ineffectively applied. Knowledge of childcare and particularly of child feeding among mothers and families is inadequate and this results in poor feeding habits.

While the reduction of overall malnutrition in Vietnam is important and it seems to be not achieved the expectation of the plan, there has been little research on the trends and the specific impacts of individual and household factors on changes of child malnutrition. So it appears one question: What is needed to accelerate reductions in malnutrition to meet the reducing malnutrition targets?

On the one hand many would argue that greater economic growth and increases in income of poor people are necessary and sufficient to meet these goals. On the other hand, there are some evidences that the other socio factors also affect to the nutrition status of children such as education, workload of the heads of family, household size, etc.

This study looks at anthropometric measures (weight for age following the standard of WHO) of child nutritional status as an outcome of household in health and child care.

1.3 Research questions

1.3.1 Primary questions

- What is prevalence of underweight among children under five years old?
- Can the socio-economic factors of households affect nutritional status of children?

1.3.2 Secondary question

What is the association between the poverty incidence and nutritional status of children?

1.4 Research objectives

1.4.1 General objective:

To determine the prevalence of malnutrition and the relationship between socio-economic factors affecting and nutritional status of children under five years old.

1.4.2 Specific objectives

1. To identify socio-economic factors affecting nutritional status of children.

2. To determine the relationship between socio-economic factors and nutritional status.

3. To analyze the association of poverty to nutritional status of children.

4. To identify the malnutrition prevalence of children under five years old.

1.5 Hypothesis

The income per capita, relative food price and other social factors in household level can affect nutritional status of children.

1.6 Scope of the study:

Although there are many socio-economic factors that influence nutritional status of children, this study is only focused on some factors from micro level in individual child and household in Vu thu district, Thai binh province, Vietnam.

1.7 Usefulness of the study

- To identify detail of socio-economic factors affecting nutritional status of children and to make the recommendation for the resolution.
- To describe the association between the poverty and nutritional status of children to identify the impact of poverty to nutritional status of children.
- The information will help policy makers to develop appropriate interventions to improve the nutritional status of children.

CHAPTER II
LITERATURE REVIEW

Nutritional status of children reflects their overall health. When children are provided an adequate, proper food and not exposed to repeated illness, they can reach their growth potential and are considered well nourished. There is a standard distribution of height and weight for children under the age of five years. Nutritional status of children can be identified by comparing children to standard distribution.

2.1 Concept of malnutrition

2.1.1 Underweight and overweight:

In the World Summit for Children Technical Guidelines for the Statistical Appendix, UNICEF defined that underweight is a composite measure of stunting and wasting, it is useful for describing the overall level of malnutrition in a population and for assessing changes over time.

Weight- for-age is reference to determine underweight and overweight. It is influenced by both the height of the child (height-for-age) and his/her weight (weight-for-height).

Generally, a low' weight-for-age is considered underweight and over weight-for-age is considered overweight.

The weight-for-age indicator reflects body mass relative to chronological age and is influenced by both the height of the child (height for age) and weight-for-height.

Prevalence of underweight children:

Prevalence of underweight children is the percentage of children under five years old whose weight for age is less than minus two standard deviations from the median for the international reference population ages 0–59 months. The international reference

population was formulated by the National Center for Health Statistics as a reference for the United States and later adopted by the World Health Organization (WHO) for international use (often referred to as the NCHS/WHO reference population).

The under-five underweight prevalence is an internationally recognized public health indicator for monitoring nutritional status and health in populations Children's body measurements are particularly sensitive to changes in the intake of   proteins and calories as well as to the onset of disease. Because of this, the most commonly used measures of childhood nutritional status are anthropometric, and relate to the child's height, weight and age. The three most commonly used anthropometric indices to assess children's growth status are weight-for-height, height-for-age and weight-for-age.

To calculate the prevalence of underweight (indicating both acute and chronic malnutrition) count all of the children in your sample with a weight-for-age Z-score less than -2. Report the result as a % of the total sample. For example, if you measured 400 children, of whom 100 had a weight-for-age Z-score less than -2, the prevalence of wasting would be $100/400 * 100\% = 25\%$.

2.1.2 Stunting:

A low, height-for-age indicates stunting (stunted growth), and reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions. Low height for age or stunting, (below minus two standard deviations from the median height for age of the reference population) measures the cumulative deficient growth associated with long-term factors, including chronic insufficient daily protein intake.

2.1.3 Wasting:

A low' weight-for-height indicates wasting or thinness, and reflects in most cases a recent and severe process of weight loss, which is often associated with acute starvation and/or severe disease.

Low weight for height, or wasting, (below minus two standard deviations from the median weight for height of the reference population) indicates in most cases a recent and severe process of weight loss, often associated with acute starvation or severe disease. (Agencies Ministries of health. UNICEF. WHO)

2.1.4 Z-score:

Z-score is cut off point for determining the nutrition situation of each child. A Z-score tells you how far the child deviates from the average.

WAZ (Z-score of weight for age):

If the figure of measurement was less than the standard weight for relative age (standard cut off point is -2 Z-score), we can say:

* WAZ less than -2 indicates that the child is underweight:

+ If the WAZ is greater than -3 and less than -2, it indicates that the child is slightly underweight.

+ If the WAZ is greater than -4 and less than -3, it indicates that the child is moderate underweight.

+ If the WAZ is less than -4, it indicates that the child is severe underweight.

* WAZ greater than -2 or equal -2 and less than 2 or equal 2 indicates that the child is normal.

* WAZ greater than 2 indicates that the child is overweight

2.2 Identifying determinants of malnutrition

The population determinants of malnutrition were analyzed within a framework adapted from the United Nations Children's Fund (UNICEF). According to this

framework, the prevalence of malnutrition in a population is determined by immediate, underlying, and basic causes.

* Immediate causes are inadequate dietary intake and disease. Inadequate dietary intake related to improperly ingredient and/or not enough food so they can not digest and absorb food effectively. Diseases make a lot of disorder in term of digestive system and out expose is malnutrition status.

* Underlying causes lead to inadequate dietary intake and disease. Underlying causes are usually interrelated and mainly concern the unmet basic needs of children and women. There are three main groups of underlying causes: inadequate health services and an unhealthy environment; inadequate household food security; and inadequate mother- and child-caring practices. Most underlying causes are themselves the result of basic (or structural) causes related to the unequal distribution of resources in a society, the historical background, and external factors.

* Basic causes include political, legal, and cultural factors that could counteract the best efforts of households to attain good nutrition for all members.

2.3 Consequences of malnutrition

Malnutrition is a condition leading to death and disability on a vast scale, particularly among children and women of child-bearing age. It destroys lives by compromising health, learning, productivity, curiosity, incentive and hope. Malnutrition engenders social and economic costs that cripple the development of individuals, communities and nations.

Malnutrition readily crosses generations. The low birth weight children often were born from malnourished women, and face increased risk of early death, childhood disease and life-long impairments. Underweight or very thin children are susceptible to much higher risk for developing chronic diseases in mid-life, including cardiovascular diseases, hypertension, and diabetes.

2.3.1 Consequences for children

According to estimate of WHO, nearly 12 million children under five die each year in developing countries mainly from preventable causes and over half of these deaths are either directly or indirectly attributable to malnutrition.

A third of children under five years of age suffer from chronic malnutrition; fully half of South Asia's children are malnourished. Worldwide about 183 million children weigh less than they should for their age. Some regions' children are particularly vulnerable. Half of all children in South Asia are underweight. In Subsaharan Africa, where one of every three children is underweight, the nutritional status of children is worsening.

2.3.2 Consequences for people and development

In children, calorie/protein deficient diets result in underweight, wasting, lowered resistance to infection, stunted growth, and impaired cognitive development and learning. The body compensates for lack of food by retarded physical and intellectual growth.

Malnourished children face diminished futures as adults with compromised abilities, productivity and health. This loss of human potential affects their economy development.

2.4 Introduction about National Nutrition Strategy of Vietnam 2001–2010

Main orientation of the National Nutrition Strategy (NNS) 2001–2010

The target is to reduce prevalence of underweight children to 25% in 2005 and 20% in 2010. These are stated as follows.

(1) Solving nutrition-related health problems will be a key issue of this NNS for 2001–2010.

(2) Improved nutrition activities should be implemented in every household in all communities, based on transferring nutrition understanding and desirable practices to every family member.

(3) Improved nutrition activities should be highly socialized and long-term. There is a need for further developments in the training of nutritionists and in fostering more effective multi-sectoral activities from the central to the community level.

(4) Interventions need to be planned and carried out carefully with attention to contents and practical/specific measures (processes) tailored to the needs of each region/ locality.

(5) Increases in international cooperation in the implementation of this NNS are desirable.

Policies supporting the National Nutrition Strategy

Incorporation of nutritional objectives into local socio-economic development plan:

The integration of nutrition objectives in national socioeconomic development plans at the local level should call for the components of this nutrition strategy to be adopted by all authorities, so that they are introduced into pertinent regulations and are implemented. Nutrition indicators proven to be representative of socioeconomic development should be used to measure the attainment of these objectives set by the Party and the authorities. Every commune, district and province should integrate these activities into their annual plans to reduce maternal and child malnutrition, to alleviate food shortages and to ensure food safety. Each locality should have its specific plans and their implementation should be monitored.

Policies to support better nutrition outcome:

The National Plan of Action for Nutrition (NPAN) 2001–2005 that will complement this Strategy must be officially implemented by the Government and be integrated into national development plans at all levels. Regulations will be needed to support pre- and postnatal maternal leave, as well as pregnant and lactating mothers in an

effort to promote better breast-feeding and infant care. Laws and regulations will be needed to enforce food fortification to control micronutrient deficiencies and to enforce food quality and safety. Efforts will continue to implement, amend and complete the policies on care and protection of children and women, on health and nutrition care for the poor and on social welfare. A policy will be needed to explicitly support nutrition collaborators at a grassroots level.

2.5 Nutrition organisation and multisectoral collaboration in Vietnam

2.5.1 Organisation

- The Minister of health (MOH) is the executive institution for the NNS in co-operation with other ministries, government branches, mass organization, and international agencies. They will develop, implement and evaluate the Strategy's progress.

- The National Institute of Nutrition (NIN) is appointed as national focal point of the NNS and as the institution in charge of assisting Ministry of Health in all technical aspects of the NNS. The NIN will be responsible for regular evaluating, monitoring and supervision of the NNS.

- The steering committees for nutrition strategy will be established at different administrative levels. The Minister will chair the central steering committees, while in locality, it will be headed by the vice chairperson of the people's committee in charge of socio-cultural services with the members from difference sector such as the health representative (as the secretary of the committee), the planning investment, finance, education and agriculture, Committee of Population-Family and Children, Women's Union and other related sectors and social agencies.

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│     GOVERMENT        │   │  MINISTRY OF     │◄──────►│      MASS        │
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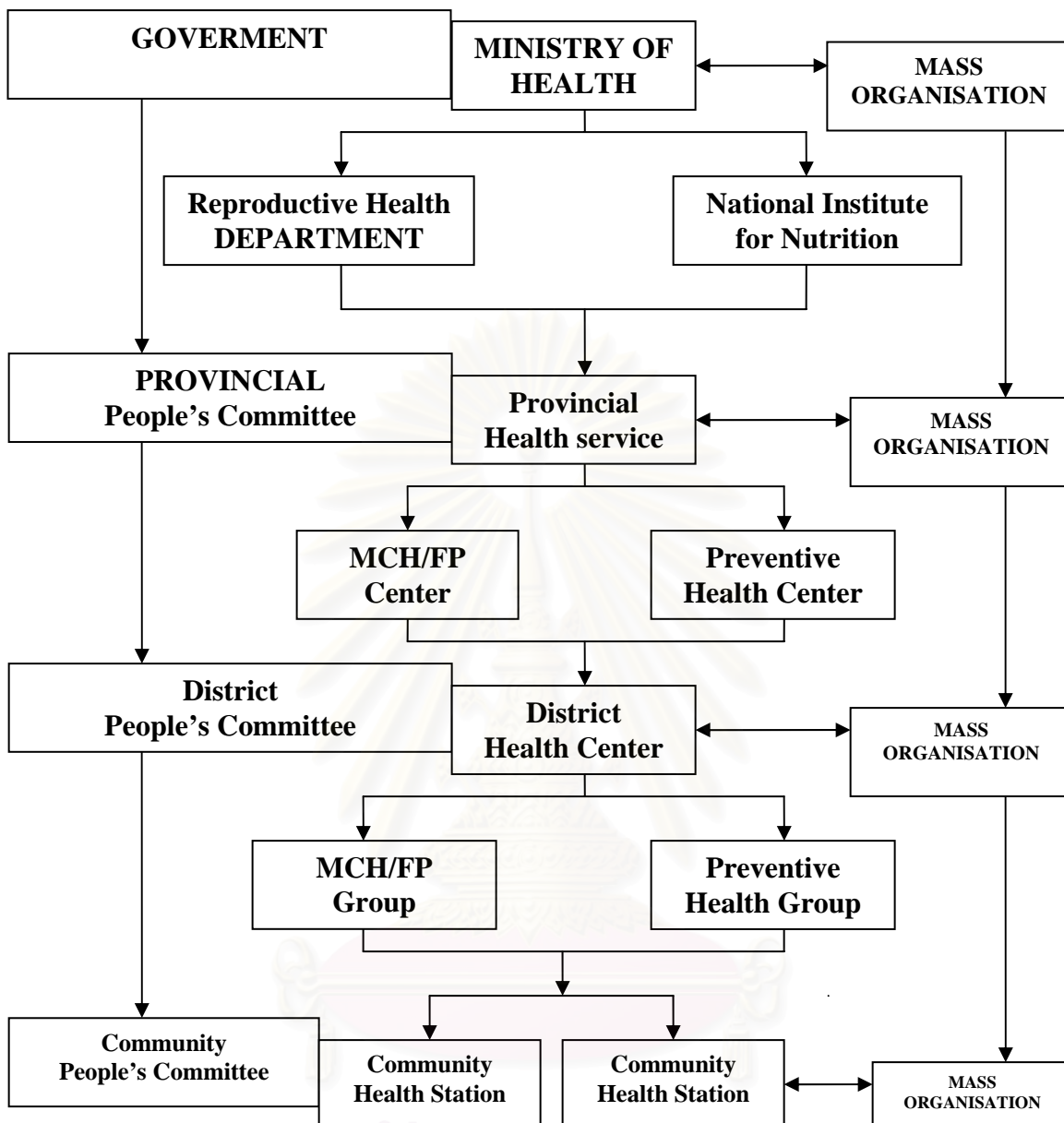
Figure 2.1: Nutrition Institution System in Vietnam

2.5.2 Socialization of strengthened nutrition activities.

Social mobilization for nutrition needs to be considered a priority. It is to be a strategic multi-sectoral policy that mobilizes all the related sectors and social groups. Nutrition activities must be supported by the local authorities. Multi-sectoral collaboration is the key to nutrition socialization. In order to have an effective

collaboration, the government needs to assign specific responsibility to each sector, whereas each sector should take into consideration the objectives of improving the nutritional status in their plans. Local authorities at different levels must consistently support plans and the mobilization of all social groups involved. Each family and each citizen should be aware of nutrition actions and become involved.

Responsibilities of local authorities:

The chair person of the People's Committees of provinces/cities is responsible for implementing this Nutrition Strategy in their own localities.

Mechanism of coordination

Based on the national objectives of this Strategy, each of the different sectors, social agencies and mass organizations needs to develop practical and specific implementation plans to achieve both their own specific objectives as well as the objectives of this Nutrition Strategy.

Quarterly review meetings will be called by the MOH to review the implementation of this Strategy with the participation of related ministries/branches.

Semi-annual reports from all provinces/major cities must be sent to the MOH, who will be responsible for reporting the progress to the Prime Minister.

A multidisciplinary approach should be strengthened at all levels. Local and central steering committees need to closely communicate.

2.6 Concept about impact of income to nutritional status

2.6.1 The changes in price and food consumption:

According to the law of demand that consumers demand more of a good the lower its price, holding constant tastes, the price of other goods, and other factors that influence

the amount they consume so we can imply that if the price for food is higher, people can consume less food.

2.6.2 The changes in income and food consumption:

As an individual's purchasing power rises, it is natural to expect that the quantity of each good purchased will also increase there for we can suppose that when the income of the household increases, the food consumption of that household also increases.

2.6.3 The food basic need for individual:

Based on the definition of the international standard about the basic energy needed of the people per day is 2100 calories/person/day it means that people need to purchase the typical basket food items that provide 2100 calories/person/day. If people do not consume enough basic need food, it means that the body is not provided enough nutrients and it can reduce nutritional status of people.

2.6.4 The impact of income to nutritional status

At the Q^* is the basic need food for people, at that point, people is provide enough nutrition and at which the nutritional status of people is in the standard.

In the level of income Y_o, if price of food is P_1, people can buy enough food to satisfy the basic need so the nutritional status could be good. However, they can not buy enough food if the price is greater than P_1, in this case people could be in malnutrition.

When income rises from Y_o to Y_1, people can pay for higher price so people can afford to buy enough nutrients with price of food greater than P_1, the price that people can not afford to buy food goes up to P_2. Therefore, higher income can contribute to reduce malnutrition. So we can assume that the higher income, the less people could be in malnutrition.
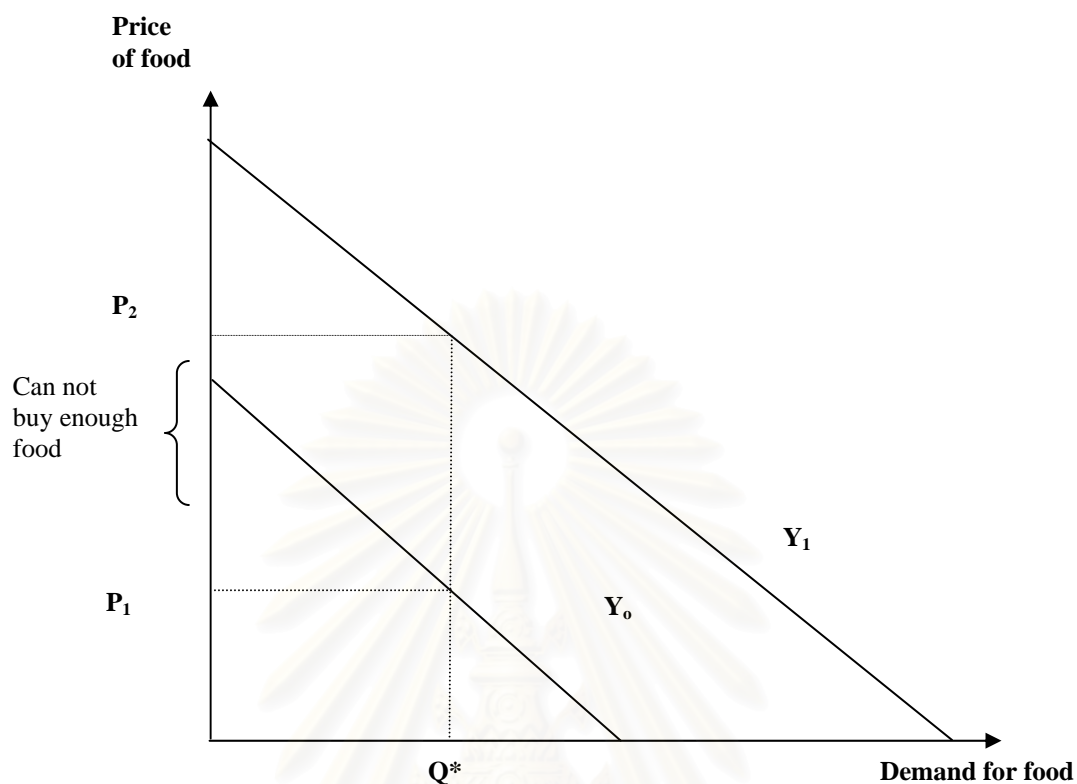
Figure 2.2: Relationship between income, food, price and malnutrition

We can see that from 1993 to 2002, the GDP of Vietnam increased every year and the Malnutrition Prevalence reduced gradually.

Table 2.1: GDP growth rate and Malnutrition prevalence if Vietnam 1993 to 2002

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP Growth Rate (%)	8.0	8.8	9.54	9.34	8.8	5.8	4.8	6.75	7.1	7.0
Malnutrition prevalence (%)	55.6	53.9	52.5	47.5	43.0	40.5	36.7	33.8	31.9	30.1

Sources: Vietnam General Statistical Office and National Institution of Nutrition

2.7 National poverty line in Vietnam

Poverty refers to the state of a part of the population which is not provided with the basic Human Needs that in accordance with the socioeconomic development level and local habits in each nation.

In Vietnam, there are three poverty lines used to determine the poverty state as follow:

- The poverty line of the General Statistical Office (GSO).

- The poverty line of the Ministry of Labour, Invalids and Social Affairs (MOLISA).

- The poverty line of the World Bank (WB).

Advantages and disadvantages of three poverty lines:

2.7.1 General Statistical Office (GSO):

* *Advantages:*

- Based on *Vietnam Survey on Wealth and Poverty* so it is more suitable with Vietnam.
- It is used to determine the number of poor household and poor communes for the programme Hunger Eradication and Poverty Reduction in Vietnam.
- It deals with all the food and non food items.
- It is also internationally comparable.

* *Disadvantages:*

- Based on the price of food and non-food in 1993, so it should be adjusted every year.

2.7.2 World Bank(WB):

* Advantages:

- It deals with all the food and non food items.
- It is also internationally comparable.

* Disadvantages

- Based on Global Living Standard Survey while Vietnam is one of the poorest countries in the world.
- It is not used to determine the number of poor household and poor communes for the programme Hunger Eradication and Poverty Reduction in Vietnam.

2.7.3 Ministry of labour, invalids and social affairs (MOLISA)

* Advantages

- It is easy to calculate
- It is used to determine the number of poor household and poor communes for the programme Hunger Eradication and Poverty Reduction in Vietnam.

* Disadvantages:

- It does not take into account the consumption of other food items except for rice
- It can not be used as a standard in comparison with the international standards

From the concept of the poverty line and the advantages and disadvantages of each method, the GSO poverty line is chosen to measure the poverty in Vietnam because it is based on the Vietnam Survey on Wealth and Poverty of the basic Human Needs, both food and non-food; it is internationally comparable and applied in calculating the poor

household and poor communes in the programme Hunger Eradication and Poverty Reduction in Vietnam as well.

The general poverty line of the GSO

Basing on the experiences of the WB and research in regional countries, the Vietnamese GSO calculated the National poverty line for the 1992-1993 Vietnam Survey on Wealth and Poverty by expenditure for food and non-food basic need. Expenditure for food basic need is money to purchase a basket of food items that conforms to Vietnamese food consumption patterns and provides 2100 calories per day. Assuming that household balance their food and non-food need, household that are just at the point of meeting their food basic need are also at the point of meeting their non-food basic need. So non-food basic needs are defined as non-food expenditures of households whose food expenditure is equal to the food poverty line.
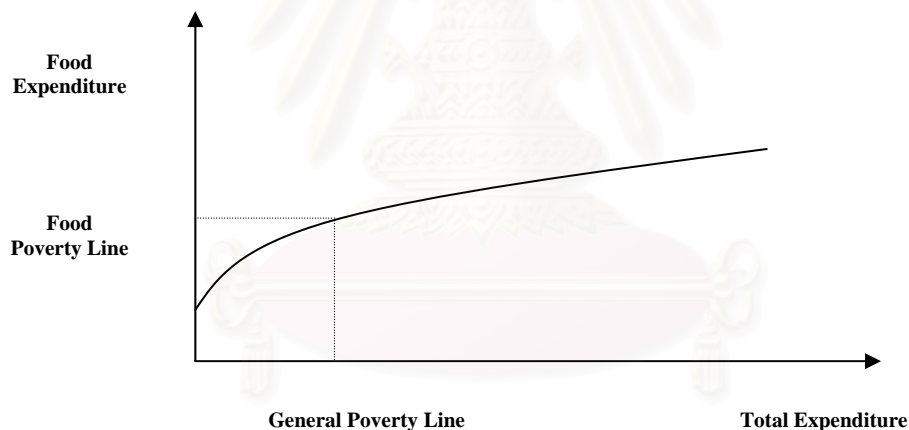
Figure 2.3: Relationship between food expenditure and total expenditure

The non-food cost calculated for 2002 is simply defined by multiply the non-food cost of poverty line in 1993 with the non-food price deflator from January 1993 to January 2002. The general poverty line for 2002 is 1,915,000 VND per person per year (160,000 VND per person per month).

The incidence of poverty in Vietnam:

The percentage of poor households is decreasing parallel to the reduction of prevalence of underweight among under-5 children. According to the GSO poverty line and the results of Vietnam Living Standard Survey in 1993, 1998 and 2002; the percentage of poor household in Vietnam is: 1993: 58 percent, 1998: 37 percent and 2002: 29 percent and at the same time, the malnutrition prevalence is 55.6%, 40.5% and 30.1% respectively.

Figure 2.4: Trends of malnutrition prevalence and percentage of poor household in Vietnam
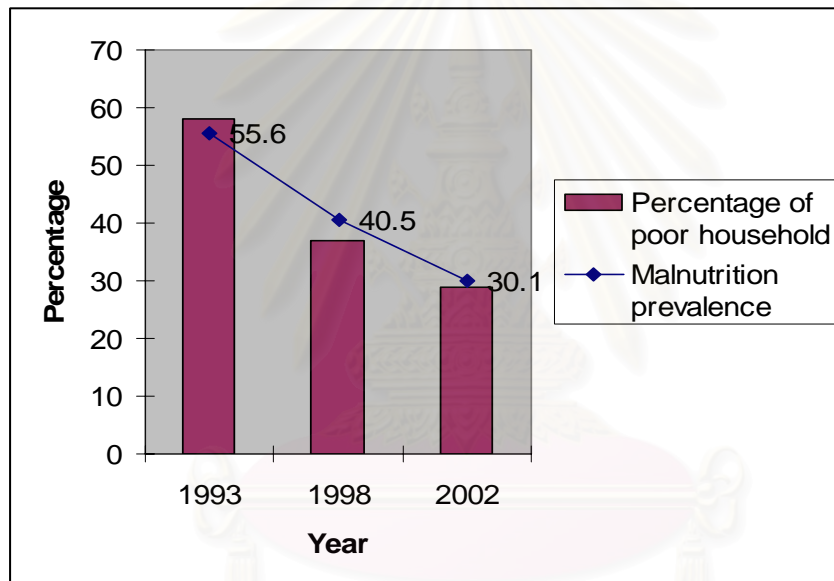
Source: Vietnam General Statistical Office

2.8 Previous research related to nutrition in Vietnam

Vietnam has been successful in reducing malnutrition prevalence in recent years, the malnutrition prevalence was reduced quite stably, from 36.7% in 1999 to 28.4% in 2003 but it is still high compared with the standard of the WHO. It shows that Vietnam is hard to achieve the goal of the National Nutrition Strategy 2001-2010.

Table 2.2: Malnutrition of children under 5 by years of Vietnam

Year	Under weight (%)	Stunting (%)	Wasting (%)
1999	36.7	38.7	9.8
2000	33.8	36.5	8.6
2001	31.9	34.8	9.0
2002	30.1	33.0	7.9
2003	28.4	32.0	7.2

(Sources: Health Statistic Profile 1999-2003)

However, there is big different among regions in Vietnam. In the North east south region, Mekong river delta region and Red river delta region, the three central economy of Vietnam, the malnutrition prevalence is much lower than other regions. In the Central highlands region and North central coast region, where the living standard is still very difficult, the malnutrition prevalence is much higher.

Table 2.3: Malnutrition prevalence of children under five year of age by regions in 2003

Region	Underweight (%)	Stunting (%)	Wasting (%)
Whole country	28.4	32.0	7.2
Red river delta region	27.0	29.7	6.3
North east region	32.5	38.4	8.2
North west region	34.3	37.9	9.9
North central coast region	33.9	37.8	7.8
South central coast region	30.9	32.4	7.0
Central highlands region	34.4	40.4	7.3
North east south region	25.0	27.9	7.1
Mekong river delta region	26.8	30.3	7.4

Source: Statistical Report 2003, MOH

The study of N. M. Thang and B. Popkin(2003) about malnutrition of children in Vietnam in 1992-1993 and 1998 pointed out that the children of rural households, poor households, and ethnic minority backgrounds are significantly more likely to be malnourished than urban residents, children of non-poor households. These results suggested that economic improvements in Vietnam had, for the most part, bypassed the rural poor and minorities, and targeting economic resources towards these groups would be most critical to reduce malnutrition in Vietnam.

In this study, the result also said that the children of less educated women, children of mothers who worked more than 20 hours per week were more likely to be malnourished.

Wagstaff, Doorslaer, and Watanabe (2001) conducted a research analyzed Malnutrition Inequalities in Vietnam found that parents' education reduced malnutrition in both years (1993 and 1998) and the larger impact of mother's education that were evident in 1993 was no longer evident in 1998.

One more research conducted by Linh Nguyen (2002) about "Child Nutrition, Economics Growth, and the provision Care Services in Vietnam in the 1990s" realized that Vietnam's rapid economic growth in 1990s greatly increased the incomes of households, which led to a dramatic decline in poverty. This improvement in child nutrition during a time of high economic growth suggested that nutritional improvements were due to higher household income.

In the article written by Cong Khan and Le Thi Hop about "Malnutrition and poverty alleviation in Vietnam during the last period 1985–2000" showed that the percentage of poor households was decreasing parallel with the reduction of prevalence of underweight among under-5 children during the last period 1985–2000. It was illustrated by the observation about the malnutrition and poverty in Hanoi, Vietnam.

Figure 2.5: Trends of malnutrition prevalence and percentage of poor household in Hanoi, Vietnam
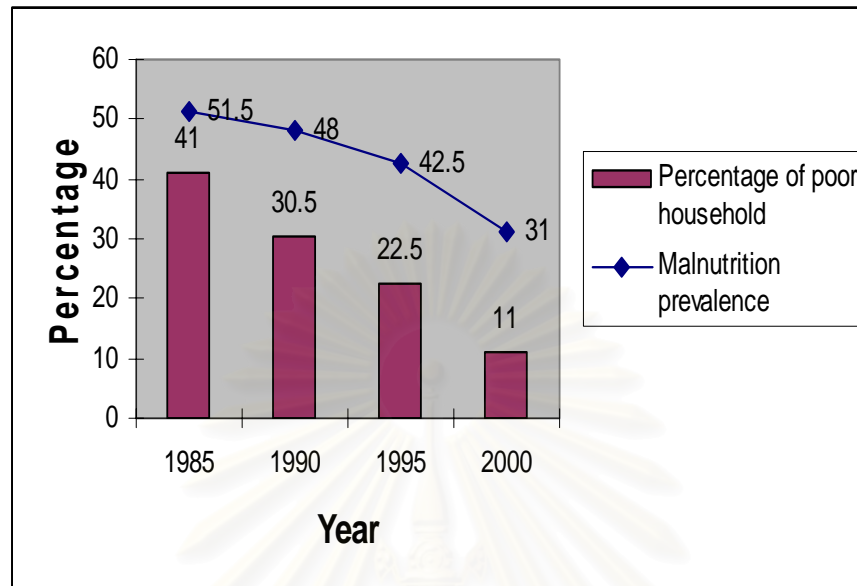
Source: Vietnam National Institution of Nutrition

2.9 Thai binh province profile

Thai Binh is a coastal province in the Red river delta region. It is one of the most density areas of Vietnam with population around 1,752,000 and natural land 1,542.24 km². Almost all people live on agriculture so the living condition is still very low; the GDP per capita was 336 USD (GSO, 2003) and percentage of poor household is 17% ranked 43rd among 64 provinces of the country where the first province with the lowest percentage poor household was Hanoi City (9%) and the last was Lao cai province (60%).

In 1990, Thai binh is one of the two first provinces across the country to acquire the national standard in illiteracy eradication and primary education universalization. The net enrolment rate in primary education was over 98% in 2003.

It has been carrying out the nutrition programme from 1986 and got some important result. The underweight children reduced from 54% in 1986 to 35.5% in 1998,

34% in 1999 and 32.4% in 2000. However, it did not achieve the desired result that was 30% of underweight children at the end of 2000 (Thai binh health report).

From the 2000 up to now, Thai Binh continues implementing the NPAN 2001-2005 with the goal is reduced the underweight children to 25% in 2005. The malnutrition prevalence is gradually reduced to 31.2% in 2001, 29.8% in 2002 and 28.2% in 2003 (Thai binh health report). Compared with the other provinces, in 2003, it was stood in the 18th across the country. The lowest malnutrition prevalence was Ho Chi Minh city (the biggest city in Vietnam) with 10% and the highest prevalence was Gialai Kontum (a province in the central highland region) with 48%.

Table 2.4: Malnutrition situation children under five year of age 2003 in Thai binh province

District	The number of children	Prevalence (%) of underweight children	Number of underweight children estimated
Thi xa	8,673	24.7	2,145
Quynh phu	15,676	29.9	4,685
Hung ha	17,783	29.6	5,258
Dong hung	17,508	27.5	4,808
Vu thu	14,939	27.7	4,145
Kien xuong	16,472	26.5	4,368
Tien hai	16,484	28.4	4,683
Thai thuy	17,845	29.7	5,293
Total	125,380	28.2	35,385

(Sources: Provincial Health Service, Annual report 2003)

We can see that the malnutrition prevalence is quite different among districts. While in Thi xa (township), Kien xuong and Vu thu districts where in the central of the province, the malnutrition prevalence is quite low, the prevalence of Tien hai and Thai thuy (two coastal districts where most of people live by fishery with low income) is quite high. This may illustrate that the malnutrition prevalence in different socio-economic conditions is different.

2.10 Nutrition situation in some other countries

Global data showed that no change in the overall prevalence of protein-energy malnutrition in children under five years of age from 1990 to 1995. However, the malnutrition prevalence was quite different among countries:

Table 2.5: Malnutrition prevalence of children under five year of age by countries

	Year	Under weight (%)	Stunting (%)
Bangladesh	1997	58	55
Bhutan	1986	38.3	54.9
	1988	37.8	57.2
India	1992	53.4	51.7
	1993	53.3	52.3
Indonesia	1995	34.4	43.0
Myanmar	1994	33.8	46.9
Sri Lanka	1993	34.8	22.7
Thailand	1987	25.4	21.1
	1995	19.2	-
Vietnam	**1999**	**36.7**	**38.7**
	2003	**28.4**	**32.0**

Source: World Health Organization

2.10.1 Average income of family and child malnutrition

Poverty and higher income are considered as the important determinant affecting to the malnutrition status of children.

Peña and Bacallao (2002) discussed about "Malnutrition and Poverty" that poverty used to be linked to those severe forms of under nutrition, particularly in children, that were frequently seen in times and places of famine and hunger. The children lacking nutrition during the first year often got important consequences and it is difficult to recovery and incomplete. Poor children had higher rates of infections, less access to adequate nutrition and were more exposed to the consequences of carelessness and lacked of information that were common in their family settings. Fifty-four percent of mortality in children under 5 in the whole world was attributed to small weight for age.

The discussion also considered that poverty was the reason that makes the men in rural areas abandoned home and migrated to peripheral urban areas in search of better economic opportunities. In urban areas of poor countries men often involved in illicit activities and were forced to indulge in a variety of social behaviors that tend to break family values and structure. This contributed to the lacking of caregiver for children.

One study about Nutritional Status of Children in Bangladesh from 1995 to 1997 of Pryer, Rogers, and Rahman (2004) found out that better nourished children were more likely to have taller mothers, and to be from families with higher income. The families with higher financial status likely had children with good nutritional status. Families with malnourished children reported a deficit financial situation, although no relationship was demonstrated with food expenditure or savings.

Alderman and *et al* (2001), the group researcher of University of Nottingham tried to answer the question *How far does the income take us?* By reviewing the data since 1970s from cross-sectional countries learnt that income growth could achieve a sizable reduction in malnutrition in the next two decades. Even holding community and household infrastructure constant, malnutrition rates (in terms of low weight-for-age) could be projected to decline by around 20% by 2010 and over 30% by 2020 if countries

that could achieve very strong per capita income growth (5% per annum). Additionally, some countries such as Sri Lanka, Peru in the data set had reduced malnutrition at rates that far exceed what would be expected based on income growth alone.

Ruel and *et al* (1999) in "Evidence from Accra" learnt that income might become more important as children grow older and have greater daily requirements of nutrients and other basic needs. Good care practices could compensate for low maternal education and insufficient income. However, good care practices provided no additional benefit to children from more educated mothers and wealthier households.

2.10.2 Education of the parent and child malnutrition

Beside the effect of income to the malnutrition of children, the education of the parent of family also is mentioned as the mediate factor affecting to child nutrition status.

According to the report of National Family Health Survey in India (1992 and 1993), the higher the education the mothers had the less malnutrition the children got. For mothers having some education but not completed middle school, children were much less likely to be stunted, wasted, or underweight than were children whose mothers were illiterate. Children whose mothers had completed middle school or higher education were even less likely to suffer malnutrition. However, the children whose mothers had completed middle school or higher education also suffer from chronic malnutrition. This suggests that efforts to improve women's education need to be combined with more specific programmes to improve child-feeding practices.

Ruel and *et al* (1992) studied about "maternal schooling and child nutritional status in Lesotho" showed that both the importance of maternal schooling and the mechanism by which it affected the child's weight-for-age are contingent upon the family's socioeconomic status. While maternal schooling was positively associated with weight-for-age for both wealthier and poorer households, the size of the effect was much larger for the latter group. The effect of maternal schooling on weight-for-age was mediated by the mother's nutrition knowledge only among wealthier households. These results imply that, in Lesotho, nutrition education for mothers could contribute to

improving children's growth, but only in households that have access to a minimum level of resources. For poorer households, nutrition education would not be sufficient.

"Evidence from Accra" of Ruel and *et al* (1999) show that literature was showing the importance of maternal schooling for child health, nutrition, and well-being was extensive. Maternal schooling might be the prim determinant of nutritional status among young children (less than 24 months).

This evidence also found that maternal work, either part-time or full-time, was not associated with children's nutritional status. Mothers appeared to adapt their work patterns to fit the specific needs of their young children.

2.10.3 Household size and child malnutrition

Pelto and *et al* (1991) when studied about anthropometric status of school-age children in a highland Mexican area found that large household size was widely regarded as a risk factor for malnutrition particularly for infants and young children. It was statistically significant with the malnutrition of children.

Children from larger households were significantly shorter and consume diets of poorer quality, as assessed by intake of foods from animal sources. In the areas with limited resources, it was difficult for people to maintain large families.

2.10.4 Workload of heads of family and child malnutrition

Work load of the parent, especially of the mothers, also effect to the nutrition status of children. In study of Rabiee and Geissler (1982) about "The impact of maternal workload on child nutrition in rural Iran", the data indicated that maternal work could have a negative effect on the nutrition status of young children through mechanisms affecting food consumption and health that were not directly financial.

The workload of mother was related factors of young children (under 2.5 years old). A trend was evident for the children of mothers with a heavy workload, despite a

greater family income, to have lower energy intake and a higher prevalence of diarrhea, to be thinner although not more stunted.

2.10.5 Malnutrition and poverty

Child malnutrition is considered as poverty indicator. Increasing health is seen as a dimension of poverty in its own right and child health is known to have important long-term effects on productivity during adulthood. Malnutrition has long been recognized as a consequence of poverty. It is widely accepted that higher rates of malnutrition will be found in areas with chronic widespread poverty (ADB, 2001).

Studies show that the relationship between child nutritional status and poverty is strong at the lower end of the income range. Increasing GNP per capita from $300 to $600 is associated with a decline in the prevalence of underweight children from about 34% to 17% or a reduction of about 50% (U.N. ACC/SCN, 1992).

With all of the above consideration, child malnutrition appears as a highly conceptually relevant candidate for a poverty indicator.

Explanation about odd ratio and risk ratio

Both the Odd Ratio and Risk Ratio compare the likelihood of an event between two groups.

Example we have the data about malnutrition of children below:

	Malnutrition	Normal	
Poor family	a	b	a+b
Non-poor	c	d	c+d

*Odd Ratio:

Odds are simply a ratio of the probability that an event will occur versus the probability that the event will not occur, or *probability / (1-probability).*

For example, children can get malnutrition (event occurred) or normal (event not occurred) so the Ood of getting malnutrition of children in poor family group is [a/(a+c)] / [c/(a+c)] = a/c

Odds ratios, therefore, are simply a ratio of odds; in general they refer to the ratio of the odds of an event occurring in the exposed group (poor family in example) versus the unexposed group (non-poor).

OR = (a/c)/(b/d) = a*d/b*c

O*dds ratio* can be used to give us an idea of how *strongly* a given variable may be associated with the outcome of interest compared to other variables. Odds ratios are simply a different way of expressing this association than relative risk since they compare *odds* rather than *risk* of an event; however, they are sometimes very close to each other, such as when the outcome of interest is rare or in this case the number of malnutrition children is rare.

Strength:

It can show how strongly the risk factor is associated with the outcome. It is not dependent on whether we focus on the event's occurrence or it failure to occur.

It is suitable for using in case-control study and cross-sectional descriptive study.

Weakness:

It has a reasonable interpretation in case control study as long as the outcome event (number of malnutrition children in this example) is rare. At that time a and c are very small so a/(a+b) is approximately a/b and c/(c+d) is approximately c/d.

* Risk Ratio:

Risk Ratio compares the probability of the event in each group. It measures the relative comparison of incidences between two groups and indicates that the risk in the exposed group (the children living in the poor families) with the non-exposed group (children living in the non-poor families).

$$RR = [a/(a+b)]/[c/(c+d)] = a*(c+d)/c*(a+b)$$

Strength:

The risk ratio measures event in a way that is interpretable and consistent with the way people really think. It is more natural interpretation.

Weakness:

It is not good for case-control and cross-sectional study because in this case we can not collect the incidence of malnutrition.

It sometimes can lead to ambiguous and confusing situations. A small relative change in the probability of a common event's occurrence can be associated with a large relative change in the opposite probability (the probability of the event not occurring).

For example in this case if a (number of malnutrition children in the poor family group) increases it means that the ratio a/(a+b) getting malnutrition increases; beside, it also means that c (the number of malnutrition children in the non-poor group) is less and the ratio c/(c+d) decreases because both the total malnutrition (a+c) and normal children (b+d) of two groups are constant.

In this study, we use cross-sectional descriptive methodology so that we can not collect incidence of malnutrition to calculate Risk Ratio so Odd Ratio is chosen to calculate the likelihood of poverty favoring to malnutrition of children.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Conceptual framework

This study aims to analyze the effect of socio-economic factors on nutritional status of children in Vu thu district, Thai binh province, Vietnam. Many socio-economic factors can affect nutritional status of children. It could be: average household income, price index of food consumption for children, role of the head of the family, education of the parent, household size, and workload of the parent.

Most of these causes related to the unequal distribution of resources in a society, and external factors that could counteract the best efforts of households to attain good nutrition for all members.

Variables:

Dependent variable

* Nutritional status of children (Z-score)

Independent variables

* Average household income

* Female headed household

* Workload of the mother

* Workload of the father

* Education of the mother

* Education of the father

* Size of household

* Relative Price of food consumption for child of household

The reasons for choosing these independent variables

a. Household income:

Income of family can affect the family to access the health facilities, food, and free time to take care children. Poor families often do not have enough food so it is inadequate nutrition for the mothers in pregnant period that lead to low birth weight babies. They also can not afford to give their children good health care both from the health services and their care practice. Therefore, the children in the poorer family may get more risk in malnutrition.

b. Female headed household

Often the mother is the one who takes care her children especially when the child is in the breastfeeding period, so the mother and the child have close relationship together. If the mothers spend too much effort for earning money, it can affect to the consideration of the mothers to their children.

c. Education of the mother and father

Children not only need proper food, they also need proper caring practices. Women with a higher education tend to have more chance to get information or have better practices in child caring. Lower education mothers cannot translate knowledge about nutrition into optimal child-care practices to understand the special nutritional needs of young children, suitable complementary foods at the right age. Women's education levels therefore influence nutritional status.

In one family, education of the father may affect to the practices of the mother in taking care of their children.

d. Workload of the mother and father

Workload of the main caregivers for the children in family is very important. For the ones who often work hard, they do not have enough time to take care their children.

This kept them away from home and children, particularly during the working time. However, with the good occupation, the mothers have more chance to access information or communication about child health care or they can spend more time for taking care of their children. A trend is evident for the children of mothers with a heavy workload, despite a greater family income, to have lower energy intake and a higher prevalence of diseases.

If the father has more free time, he can use that time to help his wife to look after their children. However, if the father works hard, it may reduce the burden of the mother so she can spend more time to take care their children.

e. Size of household

Large household size is closely related to food sharing, especially in the poor families. Their parents may not have enough time to take care them carefully. Additionally, often the large size families are the poor so it also is difficult for them to access to good health or living facilities.

f. Price of food consumption for children of household

If the household buys food with higher price, they might afford to buy less food for the children so it will affect to nutritional status of children.

Socio-Economics Factors
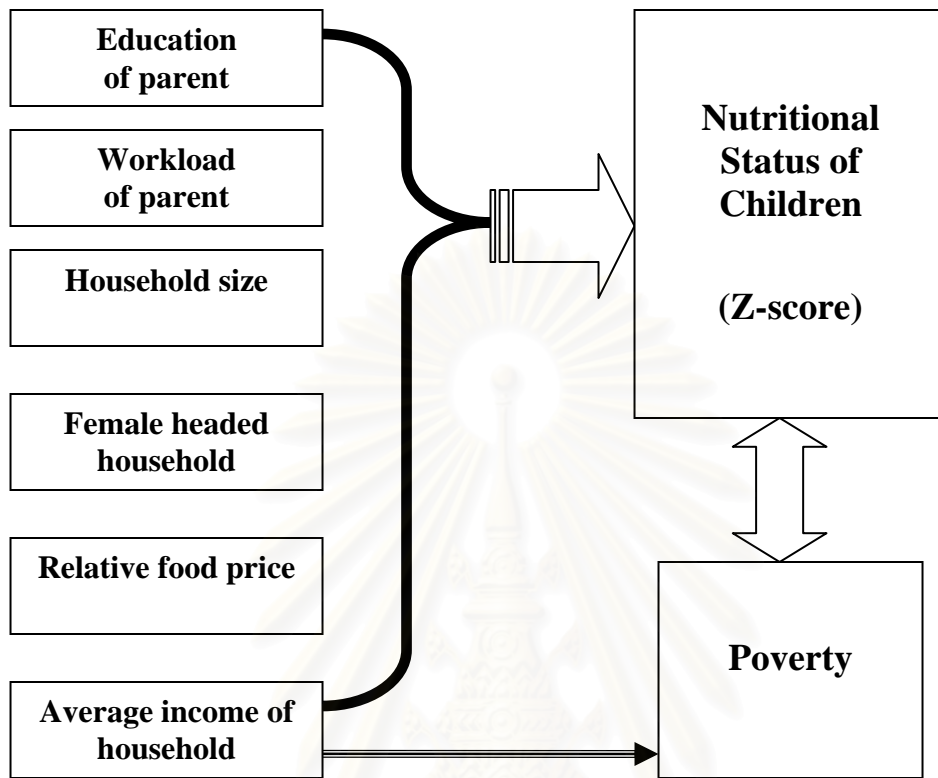
Figure 3.1 Conceptual framework

3.2 Research design

This study is a cross – sectional descriptive study.

It aims to identify the relationship between socio-economic factors and nutritional status of children, the study also to describe the impact of poverty to the nutritional status of children under five years old in Vu thu district, Thai binh province.

3.3 Research methodology

3.3.1 Population and sample

- Target population is children under five years old with the characteristics of their families in Vu thu district, Thai binh province, Vietnam.
- Study area: Vu thu district, Thai binh province, Vietnam

Vu thu is a small district of Thai binh province in the North of Vietnam, it is next to Thai binh city, Thai binh town. The population in 2003 is 228,604; all of them live in a lowland area with 31 communes and each commune has around 20 villages. The transportation is quite convenient. There is one township is the center of socio-culture and economy of the district.

Agriculture is the main economic activities. However, there are many craft villages such as Minh lang Embroidery Craft village, Bach Thuan Silkworm cocooning and fibre unrevaling craft village, Vu Hoi Mechanical Fabrication village, Nguyen xa Bamboo and Cane Craft village. Also, many people migrate to the city or other provinces to earn money by working in the factories or do business in markets. The annual GDP growth rate is around 7.2%.

There are 14,939 children under 5 years old with the malnutrition prevalence is 27.7% (health report in 2003). Children, here, are take care of quite well through the good health system. Every commune in Vu thu has one health station with one general practitioner, two or three other health workers and 10 voluntary health worker in the net grass-root to implement the community health programmes.

Figure 3.2 Vu Thu district on the map

- Time study: In February, 2005
- Data was collected based on questionnaires
- Weight of children was based on secondary data collected in December 2004.
- Sample size calculation:

$$N = \frac{Z^2_{1-\alpha/2} * P * (1 - P)}{d^2}$$

Of which:

N   : is the estimate sample size

$Z_{1-\alpha/2}$: is the standard normal deviation set at 1.96 corresponding 95% confidence interval (α equal to 0.05).

P   : is proportion of children under five years old having bad nutritional status (malnutrition), which is estimated equal to 0.28.

d   : is degree of accuracy set at 5%

Therefore:

$$N = \frac{1.96 * 0.28 * 0.72}{0.05^2} = 310 \,(\text{children})$$

- Sample selection:

In the first step, we randomly choose one village from each commune. Therefore, 31 villages are selected.

In the second step, based on the list of children under five years old in each village, ten children in each village are randomly selected. After that every parent of the selected children are interviewed and the children are evaluated the nutritional status.

Figure 3.3 Model of Sampling
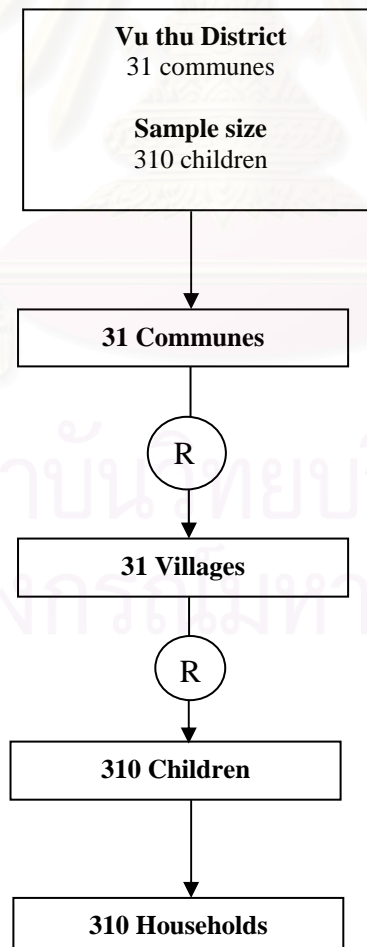
3.3.2 Research instruments:

Nutritional status of each child will be collected by weighting all the children in the sample population and compare with the cut off point of NCHS.

Every parent that has children under five in the sample population will be interviewed by using questionnaire to find out the socio-economic factor that related to the nutrition status of the children.

3.3.2.1 Indicators and determinations for description of nutrition status

* Indicator for measuring nutrition status of preschool children:

There are three main types of malnutrition: underweight (low weight-for-age), wasting (low weight-for-height), and stunting (low height-for-age).

In order to determine which children are malnourished, each child's weight and height needs to be *compared with data from a standard population*. The World Health Organization recommends that children be compared to the National Centre for Health Statistics (NCHS) dataset, which gives the heights and weights of well-nourished U.S. children.

Z-score is cut off point for determining the nutrition situation of each child. A Z-score tells you how far the child deviates from the average.

According to UNICEF, underweight is a composite measure of stunting and wasting. It is useful for describing the overall level of malnutrition in a population and for assessing changes over time. Generally, a low weight-for-age is considered to indicate underweight and reflects suboptimal long term health and nutritional conditions.

In this study, Weight for Age Z-score (WAZ) measurement is used to determine the nutritional status of children.

$$Z\text{-score} = \frac{\text{Measurement - reference standard (WHO)}}{\text{Standard deviation of reference standard}}$$

* Indicator for measuring income:

Household income is assessed based on income of households. Household income is summed up from major items: rice, cereal crops, industrial plants/ fruit tree, livestock, fish/ shrimp hatching, business, salary, hired-labor, supplementary benefit, and other resources.

$$\text{Monthly Income per Capita} = \frac{\text{Monthly Income of a Household}}{\text{Number of family's members}}$$

The unit of income per capita is 1000 VND.

In which: 1 USD equals 15,750 VND.

* Poverty line in the study:

The poverty line of GSO is chosen as indicator because it not only touches upon the food, based on the international methods so it is also internationally comparable. According to GSO, the general poverty line is ***160,000 VND/capita/month***.

* Indicator for measuring size of household:

Number of family members: it includes number of children and family members living and eating together in the same household.

* Indicator for measuring education:

Education is the number of years that mother/father got education in the school or in the higher level education.

* Indicator for measuring workload:

Workload is the number of hours the mother/father has to stay away from the family to earn money per day.

* The female headed house:

If the mother earns more money than the father, it means that ***female headed household*** and it is denoted 1, otherwise denoted 0.

* The relative price of food consumption for child of household:

The relative price of food consumption for each child is calculated in Appendix 1.

3.3.2.2 Data Analysis

* Describe the nutritional status with the characteristics of household.

Describe the characteristics of households: Income groups, education, household size, work load, female headed house and compare with the nutritional status of children and calculate the malnutrition prevalence of children under five years old. Mathematical analysis is simple descriptive; such as mean, frequency and tables in order to compare among characteristics.

* Multiple factors analysis

In order to point out the relationship between socio-economic factors and nutritional status of children, the multiple semi-log regression model will be estimated by the method of OLS (Ordinary Least Square):

$$\text{Z-score}_i = \beta_0 + \beta_1 Ln(INC)_i + \beta_2 D_1(FHEAD)_i + \beta_3 MEDU_i + \beta_4 FEDU_i + \beta_5 SIZE_i + \beta_6 FWL_i + \beta_7 MWL_i + \beta_8 Ln(PRI)_i + u_i$$

Of which: Z-score: Nutritional status of the children (Z-score unit)
  INC: Household income (Unit 1000 VND)
  FHEAD: The head of family is female
  MEDU: The education of the mother (year)
  FEDU: The education of the father (year)
  SIZE: Size of household
  MWL: Workload of the mother (average working hour/day)
  FWL: Workload of the father (average working hour/day)
  PRI: Relative price of food consumption for each child

Expected sign of coefficients of regression for each family characteristic:

Variables	Coefficient
INCOME	+
HEAD OF FAMILY IS FEMALE	-
EDUCATION OF THE FATHER	+
EDUCATION OF THE MOTHER	+
HOUSEHOLD SIZE	-
WORKLOAD OF THE MOTHER	-
WORKLOAD OF THE FATHER	-
RELATIVE FOOD PRICE	-

Example about prediction a change in dependent variable when an independent variable is changing

We have $\beta_1 = \dfrac{\partial Zscore}{\partial \ln(INC)}$

It means that if the income per capita of the family increases by 1%, the Z-score of the child can increase β_1 unit.

And $\beta_3 = \dfrac{\partial Zscore}{\partial MED}$

It means that if the years of education of the mother increases 1 year, the Z-score of the child can increase β_3 unit.

Test for significance of each factor.

For the model analysis, the hypothesis that a coefficient was different from zero by using t test and F test. The hypothesis was:

H_0: $\beta_i = 0$ i = 1, 2, 3, …

H_1: $\beta_i \neq 0$ i = 1, 2, 3, …

If the value of F test is less than critical value or p value greater than 0.05 that means we have to accept null-hypothesis or in other word all coefficients are equal to zero simultaneously. It means that the corresponding independent variable is not related with dependent variable.

If the value of F test is greater than critical value or p value less than 0.05 that means we reject null-hypothesis and accept alternative hypothesis, in this case all coefficients are not equal to zero simultaneously, then using t test and p value to check the significance of each coefficient. If coefficients are significant that means that independent variables can affect dependent.

$$F = \frac{ESS/(k-1)}{RSS/(n-k)}$$

In which: ESS: Error sum of square

RSS: Residual sum of square

K: number of variable

N: number of observation

If F > Fα(k-1, n-k), reject Ho,

Otherwise, do not reject it.

Describe the association between nutritional status with the poor and non-poor household.

Applying poverty line of GSO, we can classify families into the poor and non-poor and based on WHO standard, we divide children into two groups: normal and malnutrition. Then we describe the relationship between the poor and non-poor with the nutritional status of the children (normal and malnutrition). From that we can calculate the impact of the poverty to nutritional situation by Odd ratio of underweight children between to household group.

+ Odd Ratio is calculated to identify the risk to get malnutrition for the children living in the poor families.

$$OR = \frac{a/c}{b/d}$$

Confidence Interval at 95% certain is used to identify the association between the poverty and malnutrition.

We convert the Odd ratio estimate to a *natural log* (ln) scale before calculating the confidence interval. In this case, the natural log of the risk ratio = ln(OR)

The standard error of the natural log of the risk ratio is:

$$SE_{\ln OR} = \sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}$$

A 95% confidence interval for the $\ln_{OR}$ is:

$$Ln_{OR} \pm 1.96 * SE(ln_{OR})$$

Thus, the 95% CI for OR $= e^{(\ln OR \pm 1.96 * SE(\ln OR))}$

If the Confidence Interval includes value 1, it means that poverty do not have any impact to the malnutrition incidence.

If the Confidence Interval greater than 1, it means that poverty have positive impact to the malnutrition incidence. It means that if the the poverty prevalence increases the malnutrition prevalence also increases.

If the Confidence Interval less than 1, it means that poverty have negative impact to the malnutrition incidence. It means that if the the poverty prevalence increases the malnutrition prevalence decreases.

	Malnutrition	**Normal**
Poor	a	b
Non-poor	c	d

CHAPTER IV
RESULTS AND DISCUSSION

According to the methodology outlined in the previous chapter, 310 children were accessed about nutritional status and their parents were interviewed based on questionnaire to collect the information related to socio-economic factors related to nutritional status of the children. A research team including 10 health workers in the communes had been chosen to be interviewers. The data were collected from February, 15 to March, 14 2005 in Vu thu district. This chapter will show the results of the data and discuss about results with aim to study the current socio-economic factors in the household level that affect the nutritional status of children under five years old.

4.1 The characteristics of children and their households

4.1.1 Descriptive about the children

From tables 4.1 & 4.2, the proportion of female in the sample size was a little higher than the proportion of male (53.20% and 46.80%) with the mean of age was 32.24 months old (Range from 1 to 59). In which, the biggest group of children was from 49 to 60 months old (28.10%) and the smallest group of children was from 1 to 4 months old (9.40%). The other groups were around 11.30% to 19.40%. Mean of Z-score of the children is -0.914 (range from -3.68 to 2.86) with the prevalence of underweight children was 24.80%. However, most of the children were slightly underweight (22.90%) and moderate underweight (1.90%); none of them was severe underweight. There were 3.50% of the children overweight.

Table 4.1 Mean of age and Z-score of children

Characteristics	Min.	Max.	Mean	Standard Deviation
Age (months)	1	59	**32.24**	19.00
Z-score	-3.68	2.86	**-0.914**	1.35

Table 4.2 Percentage of male, female, age group and nutritional status of children

Characteristics	Number	Percentage *(%)*
Gender		
Male	145	*46.8*
Female	165	*53.2*
Age group		
1-4 months	29	*9.4*
5-12 months	35	*11.3*
13-24 months	55	*17.7*
25-36 months	44	*14.2*
37-48 months	60	*19.4*
49-60 months	87	*28.1*
Nutritional status		
Normal	222	*71.6*
Overweight	11	*3.5*
Slightly underweight	71	22.9
Moderate underweight	6	*1.9*
Severe underweight	0	*0.0*

4.1.2 Descriptive about the households

From tables 4.3, 4.4& 4.5, mean of household size was 4.19 with ranging from 3 to 7 members in each household. Most of them had one to two children; only 23.20% of them had more than two children.

Concerning about income per capita of household, the mean income per capita was 244.630 VND per month. When monthly income per capita were categorized to be five quintile groups, group 1 was household with income per capita that was lowest, then higher and highest is group 5, we can see that the percentage of people in each group were similar. However, the difference mean of income per capita between the poorest household group and the richest household group was 3.34 times.

In term of relative price, its mean is 0.993 and ranges from 0.821 to 1.482.

All of the respondent households had income source from the rice cultivation because this is a rural area so income from rice is one of the most important sources of the people with mean income per year was 3,091,970 VND. Following was from part time working with 81.90% and other sources 72.90% with mean income per year was 5,284,030 VND and 1,781,590 VND respectively. Small part of the households had income from salary, trading and garden. However, we can see that the mean of income from salary was very high (7,632,000 VND per household per year) so it was quite important source of income for these households.

In term of education of the mothers and fathers, tables 4.4& 4.5 showed that mean of schooling years of mothers was 8.81 and that of fathers was 8.98. In which, most of them were in the lower and upper secondary school; no one was illiterate.

In contrast with the education, the mean of working time between mothers and fathers were quite different with 6.58 hours/day for mothers and 9.28 hours/day for fathers. 62.60% of the fathers had working time more than 8 hours per day while there was 18.40% of the mother working more than 8 hours per day.

Table 4.3 Mean of year of schooling, working time of the parents, income per capita, household size and main income sources of respondent households

*Unit: `000 VND

Characteristics	Min.	Max.	Mean	S.D.
Household size	3	7	**4.19**	1.00
Income per capita*	66.67	505.56	**244.63**	98.94
Group 1	66.67	151.67	**118.40**	21.99
Group 2	152.78	202.38	**179.11**	13.30
Group 3	208.33	258.33	**233.59**	14.50
Group 4	259.17	340.00	**297.787**	26.46
Group 5	340.83	505.56	**395.46**	38.96
(categorized by quintile group)				
Relative Price	0.821	1.482	**0.993**	0.074
Main income sources of households*				
From rice	1,000	6,500	**3,091.97**	1,003.97
From garden	0	1,400	**305.74**	189.76
From trading	100	6,000	**1,440.22**	1,965.50
From salary	1,000	16,800	**7.632.00**	4,092.23
From part time working	0	15,500	**5,284.03**	4,380.47
From other sources	0	6,000	**1,781.59**	1,167.92
Schooling of the mother (year)	5	17	**8.81**	2.67
Schooling of the father (year)	5	17	**8.98**	2.51
Working time of the mother (hour/day)	3	10	**6.58**	1.92
Working time of the father (hour/day)	6	12	**9.28**	1.19

Table 4.4 Percentage of income per capita by group, household size, mother headed house and main income sources of respondent households

*Unit: `000 VND

Characteristics	Number	Percentage *(%)*
Children in the household		
One child	101	*32.6*
Two children	137	*44.2*
More than two children	72	*23.2*
Group of income per capita*		
Group 1	62	*20.0*
Group 2	61	*19.7*
Group 3	65	*21.0*
Group 4	60	*19.4*
Group 5	62	*20.0*
(categorized by quintile group)		
Main income sources of households		
From rice	310	*100.0*
From garden	58	*18.7*
From trading	46	*14.8*
From salary	75	*24.2*
From part time working	254	*81.9*
From other sources	226	*72.9*
Mother headed household	95	*30.6*

**Table 4.5 Percentage of year of schooling, working time of the parents of
respondent households**

Characteristics	Number	Percentage *(%)*
Education level of the mother		
Illiterate	0	*0.0*
Elementary school	13	*4.2*
Lower secondary school	207	*66.8*
Upper secondary school	57	*18.4*
Higher	33	*10.6*
Education level of the father		
Illiterate	0	*0.0*
Elementary school	17	*5.5*
Lower secondary school	186	*60.0*
Upper secondary school	82	*26.5*
Higher	25	*8.1*
Working time of the mother		
Unemployment	0	*0.0*
From 1-4 hours/day	57	*18.4*
From 5-8 hours/day	196	*63.2*
More than 8 hours/day	57	*18.4*
Working time of the father		
Unemployment	0	*0.0*
From 1-4 hours/day	0	*0.0*
From 5-8 hours/day	116	*37.4*
More than 8 hours/day	194	*62.6*

4.2 Descriptive about the malnutrition children and the characteristics of household.

4.2.1 Malnutrition and education level of the mothers and fathers

Data in tables 4.6& 4.7 show that most of children having education background of mothers and fathers in elementary level were underweight. For the children of whom their mothers had education in elementary level, 84.62% of them were underweight. In contrast, the children with the education level of their mothers in upper secondary or higher were not underweight. Underweight prevalence among children having education background of their fathers in elementary level was 58.83%, it was much reduced to be 22.04 % and 26.83% among children having education background of their fathers in lower secondary school, and upper secondary school respectively. For children having education level of their father in higher upper secondary school, it was 16.00%.

The data also show us that among children having education level of mother in higher upper secondary school the overweight prevalence was 24.25% while it was 3.50% and 0.48% among children with education level of mothers in upper secondary school and in lower secondary school respectively. Similarly, percentage of overweight children was 20.00%, 4.87% and 1.07% among children with education level of their fathers was higher upper secondary, upper secondary, and lower secondary school, respectively.

Table 4.6 Nutritional status of children and education level of the mother

Education level of the mother	Nutritional status of children			Total
	Underweight (Z-score<-2)	Normal (-2≤Z-score≤2)	Overweight (Z-score>2)	
Elementary	11	2	0	**13**
Percentage within group	*84.62*	*15.38*	*0.0*	*100.0*
Lower secondary	66	140	1	**207**
Percentage within group	*31.88*	*67.63*	*0.48*	*100.0*
Upper secondary	0	55	2	**57**
Percentage within group	*0.0*	*96.49*	*3.5*	*100.0*
Higher	0	25	8	**33**
Percentage within group	*0.0*	*75.75*	*24.25*	*100.0*
Total	**77**	**222**	**11**	**310**
Percentage	*24.84*	*71.61*	*3.54*	*100.0*

Table 4.7 Nutritional status of children and education level of the father

Education level of the father	Nutritional status of children			Total
	Underweight (Z-score<-2)	Normal (-2≤Z-score≤2)	Overweight (Z-score>2)	
Elementary	10	7	0	**17**
Percentage within group	*58.83*	*41.17*	*0.0*	*100.0*
Lower secondary	41	143	2	**186**
Percentage within group	*22.04*	*76.88*	*1.07*	*100.0*
Upper secondary	22	56	4	**82**
Percentage within group	*26.83*	*68.29*	*4.87*	*100.0*
Higher	4	16	5	**25**
Percentage within group	*16.00*	*64.00*	*20.00*	*100.0*
Total	**77**	**222**	**11**	**310**
Percentage	*24.84*	*71.61*	*3.54*	*100.0*

4.2.2 Malnutrition and working time level of the mothers and fathers

Tables 4.8 & 4.9 show that 87.71% of children having working time of their mothers more than 8 hours per day were under weight. The percentage of underweight was reduced to be 13.77% among children with working time of their mothers from 5-8 hours per day. However, all the overweight children had working time level of their mothers in 1-4 hours per day.

Working time of fathers was less affected to nutritional status of children. Among children having working time of their fathers 5-8 hours/day, the percentages of underweight was 23.19%, and it was 27.58% among children having working time of their fathers more than 8 hours/day.

Table 4.8 Nutritional status of children and working time of the mother

Working time of the mother	Nutritional status of children			Total
	Underweight (Z-score<-2)	Normal (-2≤Z-score≤2)	Overweight (Z-score>2)	
1-4 hours/day	0	46	11	**57**
Percentage within group	*0.0*	*80.70*	*19.29*	*100.0*
5-8 hours/day	27	169	0	**196**
Percentage within group	*13.77*	*86.22*	*0.0*	*100.0*
More than 8 hours/day	50	7	0	**57**
Percentage within group	*87.71*	*12.29*	*0.0*	*100.0*
Total	**77**	**222**	**11**	**310**
Percentage	*24.84*	*71.61*	*3.54*	*100.0*

Table 4.9 Nutritional status of children and working time of the father

Working time of the father	Nutritional status of children			Total
	Underweight (Z-score<-2)	**Normal** (-2≤Z-score≤2)	**Overweight** (Z-score>2)	
1-4 hours/day	0	0	0	**0**
Percentage within group				
5-8 hours/day	32	82	2	**116**
Percentage within group	*27.58*	*70.68*	*1.72*	*100.0*
More than 8 hours/day	45	140	9	**194**
Percentage within group	*23.19*	*72.16*	*4.63*	*100.0*
Total	**77**	**222**	**11**	**310**
Percentage	*24.84*	*71.61*	*3.54*	*100.0*

4.2.3 Malnutrition and number of children in each families

Results in table 4.10 point out that percentage of underweight children seem to be increased following the number of children in the family. Among children in the group of households having more than two children, the percentage of underweight was 54.17% which was much higher than that of underweight among children in other group: 19.71% in the group of households having two children and 10.89% in the group of households having only one child. It should be noted that all overweight cases were in the households having only one child.

Table 4.10 Nutritional status of children and number of children in each family

No. children of household	Nutritional status of children			Total
	Underweight (Z-score<-2)	Normal (-2≤Z-score≤2)	Overweight (Z-score>2)	
One child	11	79	11	**101**
Percentage within group	*10.89*	*78.22*	*10.89*	***100.0***
Two children	27	110	0	**137**
Percentage within group	*19.71*	*80.29*	*0.0*	***100.0***
More than 2 children	39	33	0	**72**
Percentage within group	*54.17*	*45.83*	*0.0*	***100.0***
Total	**77**	**222**	**11**	**310**
Percentage	***24.84***	***71.61***	***3.54***	***100.0***

4.2.4 Malnutrition and income per capita level of households

In table 4.11, we can see that in groups 3, 4 and 5, higher income per capita groups, there were a few children underweight (around less than 5% underweight children within each group). In groups 2 and 1, lower income per capita groups, the percentage of underweight among children in each group increased to 54.10%, and 61.29%, respectively. However, the higher income household groups also faced with the overweight situation of their children. All the overweight cases were in groups 4 and 5.

Table 4.11 Nutritional status of children and income per capita

Income per capita	Nutritional status of children			Total
	Underweight (Z-score<-2)	Normal (-2 ≤ Z-score ≤ 2)	Overweight (Z-score>2)	
Group 1	38	24	0	**62**
Percentage within group	*61.29*	*38.71*	*0.0*	*100.0*
Group 2	33	28	0	**61**
Percentage within group	*54.10*	*45.90*	*0.0*	*100.0*
Group 3	3	62	0	**65**
Percentage within group	*4.62*	*95.38*	*0.0*	*100.0*
Group 4	0	56	4	**60**
Percentage within group	*0.0*	*93.33*	*6.67*	*100.0*
Group 5	3	62	7	**72**
Percentage within group	*4.16*	*86.11*	*9.72*	*100.0*
Total	**77**	**222**	**11**	**310**
Percentage	*24.84*	*71.61*	*3.54*	*100.0*

Note:Income is categorized by quintile group, group 1 is poorest and group 5 is richest

4.2.5 Malnutrition and relative price of household

Result from table 4.12 shows that means of relative price in three groups of children (underweight, normal, and overweight) are not much different. However, means of relative price of overweight child group are slightly higher than that of normal child group and underweight child group.

Table 4.12 Relative price of household and nutritional status of children

Relative food price	Nutritional status of children		
	Underweight (Z-score<-2)	Normal (-2≤Z-score≤2)	Overweight (Z-score>2)
Min.	0.821	0.837	0.880
Max.	1.249	1.428	1.128
Mean	**0.994**	**0.992**	**1.010**
Standard deviation	0.078	0.074	0.068

4.2.6 Malnutrition and head of household status

Data in table 4.13 points out that in the households of which head was mother, percentage of underweight among children in this group was much higher than that among children in the households which the father was head, 41.06% and 17.67%, respectively. In contrast, all overweight children were in the households with their fathers were head of households.

Table 4.13 Nutritional status of children and head of household status

Head of household	Nutritional status of children			Total
	Underweight (Z-score<-2)	Normal (-2≤Z-score≤2)	Overweight (Z-score>2)	
Mother	39	56	0	**95**
Percentage within group	*41.06*	*58.94*	*0.0*	*100.0*
Father	38	166	11	**215**
Percentage within group	*17.67*	*77.20*	*5.11*	*100.0*
Total	**77**	**222**	**11**	**310**
Percentage	*24.84*	*71.61*	*3.54*	*100.0*

In this part we just discussed about the relationship between each factor with nutritional status of children. But we do not know the inter-correlation among these factors to nutritional status of children. So we analyze more deeply in the next part.

4.3   Factors affecting the nutritional status of children.

To understand relationship between nutritional statuses of children with other factors, Ordinary Least Square method (OLS) was used to estimate values of coefficients and other indicators. The results were listed below:

Table 4.14 Semi log linear regression for factors affecting nutritional status of children

	Coefficients	**Std. Error**	**t**	**Sig.**
(Constant)**	-4.316	.669	-7.744	.000
Education of the mother**	.277	.015	19.001	.000
Working time of the mother**	-.225	.021	-10.527	.000
Education of the father	.009	.011	.860	.390
Working time of the father**	.123	.023	5.318	.000
Head of household is female	-.042	.061	-.691	.493
Household size**	-.104	.030	-3.483	.000
Ln of income**	.306	.078	3.949	.000
Ln of relative price	-.076	.359	-.247	.836

Dependent Variable: ZSCORE
R square: 0.885
Adjusted R square: 0.882
F value: 289.13, P: 0.000
** p value less than 0.05

Table 4.14 shows that education of the father and sex of household head were insignificant so we step by step excluded one or two these variables (variable education of the father and head of household was female) to see change in regression, then we got the new result as the table below:

Table 4.15 Semi log linear regression for factors affecting nutritional status of children (after excluding)

	Coefficients	Std. Error	t	Sig
(Constant)**	-4.285	.661	-6.417	.000
Education of the mother**	.279	.014	19.328	.000
Working time of the mother**	-.228	.021	-10.703	.000
Working time of the father**	.125	.023	5.376	.000
Household size**	-.104	.030	-3.494	.001
Ln of income**	.312	.077	4.035	.000
Ln Relative food price	-.070	.366	-.080	.936

Dependent Variable: ZSCORE
R square: 0.884
Adjusted R square: 0.882
F value: 386.26, P: 0.000
** p value less than 0.05

In the Table 4.15, the value of R square was 0.884 that means 88.40% of independent variables can explain for dependent variable. Value of F test was 386.26 with $p<0,01$ this means all coefficients in above regression model were not equal to zero simultaneously or in other word dependent variable depended on some independent variables.

Additionally, table 4.16 shows that there is no coefficient of correlation of independent variables greater than 0.8. So we can say that among these independent variables, there is no inter-correlation between two variables.

Table 4.16 Correlation matrix of variables

	Z-score	MEDU	MWL	FEDU	FWL	FHEAD	SIZE	LnINC	lnRPI
Z-score		0.881	-0.830	0.190	0.333	-0.326	-0.442	0.620	0.005
MEDU	0.881		-0.713	0.167	0.210	-0.306	-0.339	0.515	0.005
MWL	-0.830	-0.713		-0.166	-0.250	0.304	0.408	-0.561	-0.010
FEDU	0.190	0.167	-0.166		0.108	-0.090	-0.049	0.127	0.058
FWL	0.333	0.210	-0.250	0.108		-0.071	-0.059	0.225	0.018
FHEAD	-0.326	-0.306	0.304	-0.090	-0.071		0.181	-0.246	-0.108
SIZE	-0.442	-0.339	0.408	-0.049	-0.059	0.181		-0.401	-0.005
LnINC	0.620	0.515	-0.561	0.127	0.225	-0.246	-0.401		-0.012
lnRPI	0.005	0.005	-0.010	0.058	0.018	-0.108	-0.005	-0.012	

The regression showed that, education of the mother was a factor that affected the nutritional status of children. The coefficient was 0.279 and significant ($p<0.01$), it means that if the mother get one more year of schooling, keeping other independent variables constant, Z-score of the child will get 0.279 more. In other word, the nutritional status of children will be better if their mothers get more education.

Working time of the mother had negative effect to nutritional status of children with coefficient -0.228 and $p<0.01$. It means that if the mother spends 1 hour more time in working, keeping other independent variables constant, the nutritional status of their children will be worse; Z-score of her child will reduce by 0.228 unit.

Relationship between income per capita and nutritional status of children was positive and significant ($p<0.01$). The coefficient equals to 0.312. It means that if the income per capita of household increases 1 percent, keeping other independent variables constant; the Z-score of children will increase 0.312 unit. In other word, it will improve the nutritional status of children.

Working time of father also was the factor that significantly affected nutritional status of children with positive sign (0.125). It means that if the father works one hour

more per day, keeping other independent variables constant, the nutritional status of his child will improve and the Z-score will increases by 0.125 unit.

Household size factor also had significant and negative relationship with nutritional status of children. With coefficient equaled -0.104 and p=0.001, it means that the larger the number of household the worse the nutritional status of children. If the family had one more member, keeping other independent variables constant, Z-score of the child in that family would reduce by 0.104 unit.

The relative food price also negatively affect the nutritional status of children although the effect was not significant with t value -0.080 (p=0.936). However, with coefficient equals -0.070 we can see the tendency that if the relative price increases 1 percent the Z-score of children will decrease by 0.07 unit.

Predict the change in Z-score when changing in monthly income per capita

Substitute mean of income (equal to 244.630), relative food price (equal to 0.990) and other independent variables on the regression, the value of Z-score is -0.91 that is in normal interval of nutritional status.

From the regression, if income increases 1%, keeping other independent variables constant, Z-score will increases 0.312 units or Δ Z-score = 0.312*Δ percentage of income, so we get the table:

Table 4.17a Change in Z-score when changing in monthly income per capita

*Unit '000 VND

Income*	232.399	**236.092**	242.183	256.862	**267.429**	269.093
Δ **percentage of income**	-5	**-3.49**	-1	5	**9.32**	10
Z-score	-2.47	**-2**	-1.222	0.65	**2**	2.21

From the result above, if we keep other independent variables constant at mean, at monthly income per capita greater than 267,429 VND the child in that household could

be overweight. In contrast, at monthly income per capita less than 236,092 VND the child in that household could be underweight.

Predict the change in Z-score when changing in relative food price.

From the regression, if relative price increases 1%, keeping other independent variables constant, Z-score will decreases 0.07 units or Δ Z-score = -0.07*Δ percentage of relative food price, so we get the table:

Table 4.17b Change in Z-score when changing in relative food price

RPI	1.19	**1.14**	1.09	0.69	**0.58**	0.49
Δ percentage of RPI	20	**15.57**	10	-30	**-41.57**	-50
Z-score	-2.13	**-2**	-1.61	1.19	**2**	2.59

It means that, if we keep other independent variables constant at mean, if the household buy food with relative price 15.57% higher, the child could be underweight and if the household buy food with relative price 41.57% lower, the child could be overweight.

These tables 4.17a & b are examples for prediction the change in Z-score when changing in income per capita and relative food price, for other variables we can also do similar predictions from the model.

4.4 Association of poor household to malnutrition of children.

From table 4.18, percentage of underweight children in the poor households was much higher then that of non-poor households, 68.87% compared with 14.52% respectively.

After excluding the overweight children, we calculated Odd Ratio (OR) to identify the association between the poor households and underweight children, the OR equaled 8.67 with Confident Interval from 4.45 to 16.60. This means that poor households had negative impact to the nutritional status of children and the children

living in the poor households had risk to get underweight 8.67 times compared with the children living in the non-poor households.

Table 4.18 Underweight children and household income status

Income status of household	Nutritional status of children		Total
	Normal	**Underweight**	
Poor	27	42	**69**
Percentage within group	*31.13*	*68.87*	*100.0*
Non-poor	195	35	**230**
Percentage within group	*84.78*	*15.22*	*100.0*
Total	**222**	**77**	**299**
Percentage	*74.24*	*25.76*	*100.0*

OR = 8.67
C.I. = 4.45-16.60

4.5 Discussion

In term of correlation between malnutrition of children and education level of parent, results in tables 4.6& 4.7 show that with the higher education level, both of mothers and fathers, the prevalence of underweight children would decrease. It implies that the education level of the mothers might play an important role to nutritional status of children. Taking care of children is not easy for every people; it also needs right understanding and right practice because in this period the children absolutely depend on the care givers. Result in table 4.14 showed that education level of father was not significant so we can understand that mother was major care giver for children and mother also needed higher education to get better understand in taking care of children. The results also show us that among children in families with higher education level of fathers and mothers the prevalence of underweight was low but the percentage of

overweight was much higher compared with that among children in families with lower level of education of fathers and mothers.

Considering about correlation between malnutrition of children and work load of parent, tables 4.8, 4.9 & 4.14 illustrate that if the mother works longer period of time the percentage of underweight children increases but the working time of the fathers was less affected nutritional status of children. It indicates that mothers might play a more important role in taking care of their children. It was different with that factor of mother so we can understand that even though fathers could not take care of their children as well as the mothers do but they could work hard to earn more money to increase the income of the families. Therefore, it indirectly increased the Z-score of children. However, the results also show that if the mothers had less working time, their children could be overweight. It means that they pay more attention in taking care of their children but they did know about proper feeding for their children.

In term of relationship between malnutrition of children and head of households, data in table 4.13 point out that in the households which head of household was mother, percentage of underweight children was much higher than that of the household which the father was head of household. It means that if mother pay more attention in earning money, it could affect to nutritional status of children but the result in table 4.14 shows that female headed household was not significant so it can be implied that the role of mother in earning money was less important compared with the role of father.

In term of correlation between malnutrition of children and household size, result in table 4.10 & 4.14, the percentage of underweight children seems to be increased following the number of children in the family. With the larger number of children, the nutritional status of children could be worse. So increasing the number of children in family can affect the nutritional status of children. However, we also are carefor that all overweight cases were in the household having only one child. May be all the members of families concentrated in feeding their babies and they were not conscious about overweight of their children.

Considering about effect of income per capita to malnutrition of children, from result in table 4.11, it can be implied that if households become richer the nutritional status children would be better but the higher income households also faced with the overweight situation of their children. It illustrates that income per capita of the people in this area was quite low, if their income increases a little, the nutritional status can increase so much. It is suitable with the general situation in Vietnam that all commodities in Vietnam are relatively cheaper compared with other countries in the area, especially food because most of the farmers can provide some part of food by themselves.

In term of effect of relative food price to malnutrition of children, results from table 4.12 show that means of relative price in three groups of children (underweight, normal, and overweight) were not much different, even if mean of relative price of overweight child group was slightly higher than that of other groups. It was supported by table 4.14 that coefficient of relative food price was not significant with p >0.05. The reason that can explain for the result is the study area is a agricultural area so some part of food are home produced food therefore relative food price may not affect so much to their food consumption.

CHAPTER V
SUMMARY AND CONCLUSION

5.1 Summary:

Reducing malnutrition prevalence of children under five years old are one of the big responsibilities of Vietnamese Government in order to achieve the goal underweight prevalence less than 25% in 2005 and 20% in 2010 nation wide. This is not only responsible for health sector but also for other supporting policies needed to reduce the burden of factors affecting to nutritional status of children. This study contributes in finding some policies to improve nutritional status of children in Vu thu district, Thai binh province, Vietnam.

Main objective of the study is to determine socio-economic factors affecting nutritional status of children, and the relationship between them and nutritional status of children. The results were based on primary data collected from 15th February to 14th March, 2005 and secondary data in December, 2004.

Three hundred and ten children under five years old were evaluated about nutritional status and their families were interviewed based on questionnaire to collect the information related to socio-economic factors related to nutritional status of the children. Characteristics of households about household size, number of children in each household, parent education, and parent work load, head of households, income and sources of income, food expenditure and price for representative food products were collected. Ordinary Least Square method was applied to estimate the semi log-linear regression to identify factors affecting to nutritional status of children. Additional cluster analysis was also applied to clarify relationship between individual factors with nutritional status of children.

5.2 Conclusion:

Prevalence of underweight children in Vu thu district, Thai binh province, Vietnam in 2004 was 24.8%, it is still in high level according to WHO categorizes. Most of them are slightly underweight and moderate underweight. Beside, there were 3.5% of children overweight. Although it is not big number but most of them were in the households with high income and high education level of mother.

Income per capita could affect nutritional status of children. The higher income the households were the better nourished the children were. At monthly income per capita less than 236,092 VND and other characteristics of household in average the child in that household could be underweight. However, increasing in income also leaded children facing to overweight situation, at monthly income per capita greater than 267,429 VND and other characteristics of household in average the child in that household could be overweight.

Relative food price could not affect nutritional status of children. Price for food expenditure could not affect food consumption of people in this area because the people in this area can spend some part of food from their own production. However, income per capita had significant affect so it could be that price for other expenditure also played an important part in health expenditure of children. An increase in non-food price will decrease real income.

Poverty was also a risk factor. It had association and positive impact to underweight situation of children, children living in the poor households had risk to get underweight 8.67 times compared with children living in non-poor households.

Mother education level had positive impact to nutritional status of children; children living with higher education level mothers had better nutritional status. However, these children also were facing with overweight problem. It could be caused by lacking of awareness about obesity (overweight situation of children). Father education level had insignificant impact to nutritional status of children; it means that mothers had a more important role in taking care of their children.

Mother working time had negative impact to nutritional status of children, if the mother spent less time in working out side the nutritional status of children would be better, while father working time had positive impact to nutritional status of children, the harder the father work out side, the better the nutritional status the child was. It meant that in family, the main career of children was the mother, the father did not pay much attention in taking care of his child, but he could earn more money to increase income of the household. It could be indirect affect to nutritional status of children.

Household size also had negative impact to nutritional status of children. With the larger household size, the nutritional status of children could be worse. Specially, if the households had more than two children, percentage of underweight children in these households was much higher than that of households having one or two children.

Besides, there was alarming that people did not consider about overweight situation of children, even if the households with education level of mothers or/and fathers, monthly income per capita were quite high, or working time of the mothers per day were a few.

5.3 Recommendation:

According to different situation of different households, the different nutrition intervention or socio-economic policies are needed to improve the nutritional status of children.

Increasing income of people is necessary to reduce underweight prevalence of children. Reducing poor household not only increases the income of people in general but also contributes in eliminating one important factor that has negative impact to nutritional status of children. There also should be specific policies to help the poor in term of increasing their income that will reduce the underweight prevalence of children.

The role of mothers in taking care of children are more than that of fathers so increasing education level, knowledge and awareness of mothers in child health care might help increase the nutritional status of children better. Mothers should spend more

time for their children when they are under 5 years old. However, fathers and other members in families should share the burden in taking care of children with their wives.

Social mobilization in education participation should become strong local government policies in order to encourage people attending to school. Financial support is need for the poor to help them continue learning and finishing their education as requirement of social development. The role of parents in school participation of their children also should be considered as important issue because they already know consequences of lacking education to their children.

Content of child health education, information and communication should not only focus on preventing underweight children but also proper feeding to prevent overweight children. Overweight is intangible enemy of child health because most of households specially the rich households and high education level parents are happy when their children become fatter and fatter but they do not care that it is risk to get overweight, a kind of malnutrition.

Small family model can contribute in reducing underweight prevalence of children so the local government should encourage people not having more than two children by using by family planning programme.

5.4 Limitation of the Study

This thesis attempted to study about affect of economic factors based on economics theory and social factors to nutritional status of children in household level of Vu thu district, Thai binh province, Vietnam. It appeared some limitation in conducting this study:

1. The study area is a plain and small area, and most of people living based on agriculture so it may affect to wide variation of the data such as price for food consumption, therefore some results we could not get as expected.

2. In this study, we just found out some factors affecting nutritional status of children but we did not know that what internal reason in each factor so we could

not get the optimal recommendation for different groups of household. Further investigation is needed to get qualitative data so we can explain properly the affect of each factor.

5.5 Further study of the thesis in the future

1. Considering about cost-effectiveness of different interventions, we can compare among different socio-economic interventions to identify which one is more cost-effectiveness to set priority programmes in order to reduce malnutrition prevalence of children.

2. In term of malnutrition, it is not only the consequence of socio-economic factors but also it is a cause of economic and social lag so it could be the idea for further study in the next time.

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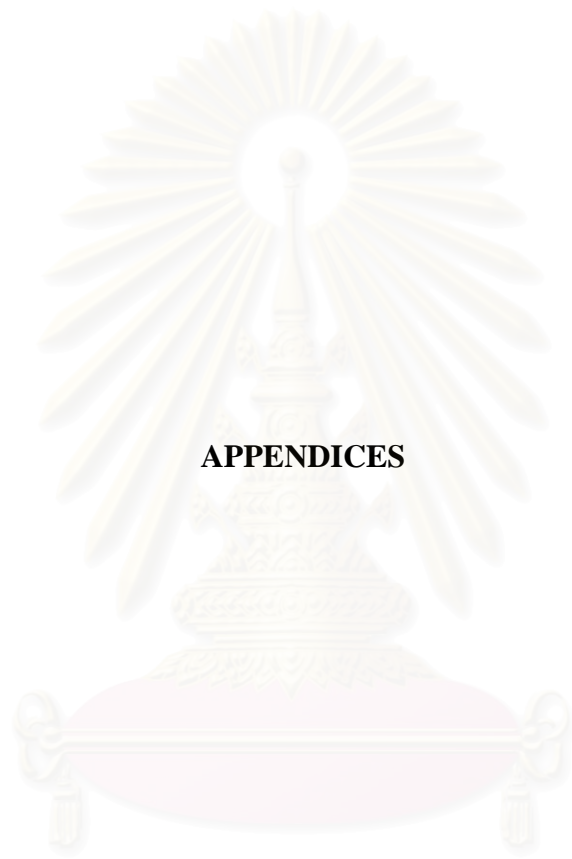
APPENDICES

Appendix A

Relative price of food consumption for each child of household.

According to the food culture in Vietnam, the most popular food products for children are five groups:

+ Cereal: such as rice and corn. Rice is representative because most of children spend it for the daily food.

+ Meat of animal: pork, egg and beef. Pork is chosen to be representative for this group because it is the most popular meat in this area.

+ Aquatic product: fish and prawn. Fish is representative because it is common in this area.

+ Vegetable: Cabbage is representative for vegetable because it is often used in the food for children.

+ Fruit: Orange is representative for this group because it is a favorite fruit of children and the mothers often buy it for children.

So to calculate the Relative Price of food consumption/month in each household we calculate the total expenditure for food of each household and price for the representative products.

Food products	Total expenditure (1000 VND)	Price (for the representative product) – 1000 VND
Cereal (rice, corn)	E_{f1}	P_{f1}
Meat of animal: pork, egg, beef	E_{f2}	P_{f2}
Aquatic products: fish, prawn	E_{f3}	P_{f3}
Vegetable	E_{f4}	P_{f4}
Fruit	E_{f5}	P_{f5}
Total expenditure for food	E_f	

And then we calculate the Relative Price of food consumption for each child (R_f):

$$R_f = \sum \left(\frac{E_{fi}}{E_f}\right) * \left(\frac{P_{fi}}{\overline{P_{fi}}}\right)$$

$\overline{P_{fi}}$: Average Price of food category i (average over all children)

Note: For children under 5 months old, the relative price is calculated based on the food bought for the mothers.

Appendix B

Reference value of weight for age for children (WHO recommended)

Age (months)	Male		Female	
	Median (kg)	S.D. (kg)	Median (kg)	S.D. (kg)
1	3.3	0.40	3.2	0.50
2	4.3	0.70	4.0	0.60
3	5.2	0.85	4.7	0.70
4	6.0	0.95	5.4	0.75
5	6.7	1.00	6.0	0.75
6	7.3	1.00	6.7	0.85
7	7.8	0.95	7.2	0.85
8	8.3	0.95	7.7	0.90
9	8.8	0.95	8.2	0.95
10	9.2	1.00	8.6	1.00
11	9.5	0.95	8.9	1.00
12	9.9	1.00	9.2	1.00
13	10.2	1.05	9.5	1.05
14	10.4	1.05	9.8	1.10
15	10.7	1.10	10.0	1.10
16	10.9	1.10	10.2	1.10
17	11.1	1.15	10.4	1.10
18	11.3	1.15	10.6	1.15
19	11.5	1.20	10.8	1.15
20	11.7	1.25	11.0	1.20
21	11.8	1.20	11.2	1.20
22	12.0	1.25	11.4	1.20
23	12.2	1.25	11.5	1.20
24	12.4	1.30	11.7	1.20
25	12.5	1.30	11.9	1.25
26	12.6	1.20	12.0	1.20
27	12.7	1.20	12.2	1.20
28	12.9	1.25	12.4	1.25
29	13.1	1.30	12.6	1.25

Appendix B (continue)

Age (months)	Male		Female	
	Median (kg)	**S.D. (kg)**	**Median (kg)**	**S.D. (kg)**
30	13.3	1.35	12.8	1.30
31	13.5	1.40	13.0	1.35
32	13.7	1.40	13.2	1.35
33	13.9	1.45	13.4	1.40
34	14.1	1.50	13.6	1.40
35	14.3	1.55	13.8	1.45
36	14.4	1.55	13.9	1.45
37	14.6	1.60	14.1	1.45
38	14.8	1.65	14.3	1.50
39	15.0	1.65	14.4	1.50
40	15.2	1.70	14.6	1.55
41	15.3	1.70	14.8	1.60
42	15.5	1.75	14.9	1.55
43	15.7	1.80	15.1	1.60
44	15.8	1.75	15.2	1.60
45	16.0	1.80	15.4	1.65
46	16.2	1.85	15.5	1.65
47	16.4	1.90	15.7	1.70
48	16.5	1.85	15.8	1.70
49	16.7	1.90	16.0	1.70
50	16.9	1.95	16.1	1.70
51	17.0	1.95	16.2	1.70
52	17.2	1.95	16.4	1.75
53	17.4	2.00	16.5	1.75
54	17.5	2.00	16.7	1.80
55	17.7	2.00	16.8	1.80
56	17.9	2.05	17.0	1.85
57	18.0	2.05	17.1	1.85
58	18.2	2.10	17.2	1.85
59	18.3	2.05	17.4	1.90
60	18.5	2.10	17.5	1.90

Appendix C

QUESTIONNAIRE

**Survey question form on the household information
related to child nutritional status in Vu thu district
Thaibinh province, Vietnam**

The aim of the research is to provide information to Provincial Health Service of Thaibinh and the Malnutrition Prevention Program. The survey will provide vital information to help improve the nutritional status of children in this area. We would like to ask you some questions about a variety of issues and ask you to be as honest as possible. Your personal information will be kept secretly and will not be revealed to other people. We expect to interview less than half hour. Are you available?

Child ID Code: ....

Village: ....; Commune: …...................; District: Vu Thu; Province: Thai Binh

PART I: NUTRITIONAL STATUS OF CHILDREN
(Use secondary data in the nutrition survey in December, 2004)

Full name of the child: …………………………… Sex: ……….

Date of birth: ………………….

Weighted on: ………………

Age in months at weighted day: ………..

Result: ……… kg (one digit after decimal)

PART II: HOUSEHOLD SURVEY
(Interview the head of household)

Could you please tell me some information about your family?

A. General information:

1. How many members are there in your family?   ………….

> Including: …………… children from 0 to 5 years old
>
> …………… children from 6 to 14 years old
>
> …………… persons from 15 to 60 years old
>
> …………… persons more than 60 years old

2. How many children do you have? ………………

B. The information about the mother of the child

1. What is your education level: ………….. (schooling years)

2. What is your occupation: …………………….

3. How many hours per day do you have to go away to earn money?………….. (hours)

4. Do you think that who can earn more money for family?

    1.   Your self

    2.   Your husband

C. The information about the father of the child

1. What is your education level: ………….. (schooling years)

2. What is your occupation: …………………….

3. How many hours per day do you have to go away to earn money?………….. (hours)

4. Do you think that who can earn more money for family?

    1.   Your wife

    2.   Your self

D. Household's income

Please list any sources of household income in the last 12 months.

Index	Sources of Income	Money(VND)	Non-money	
			Quantity	Value(VND)
1	Rice and/ or cereal			
2	Garden (vegetable, fruit)			
3	Fish, shrimp hatching			
4	Trading			
5	Salary			
6	Allowances			
7	Part-time working			
8	Supplement benefit			
9	Outside support			
10	Other sources			

        Total household's income per year: ……….............. **VND**

        Average income per capita per month: ……….............. **VND**

E. Information about the Price of food consumption for children:

1. Please tell me about food consumption for your child in the last seven days:

Food product	Total expenditure (1000 VND)
Cereal (rice, porn)	
Meat of animal: pork, egg, beef	
Aquatic production: fish, prawn	
Vegetable	
Fruit	

2. Please tell me about the price of major food products that you bought during the last seven days:

Food product	Price per kg (1000 VND)
Rice	
Pork	
Fish	
Cabbage	
Orange	
Total expenditure for food	

Thank you very much!

Date .... month .... year ....

Interviewer   **Supervisor**

(Checked)

BIOGRAPHY

NAME:	**VU NGOC LONG**
NATIONALITY:	**Vietnamese**
DATE OF BIRTH:	**May, 24, 1975**
PLACE OF BIRTH:	**Vietnam**

EDUCATION:

    1998   Graduated General Medical Doctor

                               Thai binh Medical University, Thai binh - Vietnam

WORKING EXPERIENCES

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