MORBIDITY DIFFERENTIALS AMONG THE ADULT POPULATION IN RURAL KANCHANABURI DSS

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF ARTS
(POPULATION AND REPRODUCTIVE HEALTH RESEARCH)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2004

Thesis
Entitled

MORBIDITY DIFFERENTIALS AMONG THE ADULT POPULATION IN RURAL KANCHANABURI DSS

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Was submitted to the Faculty of Graduate Studies, Mahidol University
for the Degree of Master of Arts
(Population and Reproductive Health Research)

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ACKNOWLEDGEMENTS

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M.A (POPULATION AND REPRODUCTIVE HEALTH RESEARCH)

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ABSTRACT

        Morbidity differences are often used to identify the onset of ill health of the society and also to develop a proper health service system appropriate to specific groups in a population. One approach to identify morbidity differences is to associate population morbidity with demographic, socioeconomic, and environment affecting factors. This study investigates morbidity differentials by individual demographic, socioeconomic and household environment characteristics and examines the influence of the related determinants on morbidity patterns in four rural strata, Kanchanaburi province. Data from the 2001 Kanchanaburi Demographic Surveillance Survey is analyzed. Morbidity status is measured by reported sickness. The study area was divided into four rural strata which were categorized according to the main occupation of the population and land use patterns. Descriptive analysis with chi-square statistics was used to check the morbidity differentials by strata, demographic, socioeconomic, and household environment characteristics. While binary logistic regression analysis was used to investigate the determinant factors affecting on morbidity status. Results show the morbidity differentials among some socio-demographic groups. Consistent with past researches, analysis indicates that morbidity status is influenced by sex, age, education and sanitation status in rural Kanchanaburi. Contrary to expectation, economic factors and some household environment factors are not associated with morbidity status in rural Kanchanaburi. The results also show that people in different rural strata vary greatly in terms of their morbidity status. The research recommends that health policy and program should be flexible taking into the consideration the distinctiveness of different social groups in rural areas. Greater attention needs to be paid to issue of health status of women and older people, and people continue to need to improve education, sanitary facilities in order to reduce morbidity in rural areas. Information on regional differentials on morbidity is necessary, and prevention program should be made according to morbidity pattern and health situation in different rural regions.

KEY WORDS: MORBIDITY DIFFERENTIALS / RURAL STRATA /
                ADULT POPULATION / KANCHANABURI DSS

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CHAPTER 1

INTRODUCTION

1.1 Rationale

Over 68% of the global population lives in rural areas. The target of "Health for all people in the 21st century" (WHO, 1998) is most difficult to achieve in the rural areas where the majority of the poor people live. The advancement of health of the people living in rural areas, both developed and developing countries, require a multidimensional approach, cooperative activity aiming at promotion of health.

The health of the people living in rural areas can be understood directly from their "health status" and "health outcomes" (Kumar, 1993). In general, the health status is measured by mortality and morbidity prevalence rates. For decades, since life expectancy increases and mortality declines to very low levels in many developing countries, morbidity has become more important concern as for individuals as for public health (Riley,1992). A lot of planning, effort and public expenditure has been devoted to improving the health of the people both in rural and urban areas of many developing countries. Further, the spread and accessibility of modern medicines has also improved substantially across these countries. However, in spite of these efforts, many developing countries still have high levels of morbidity, especially in rural areas. In the developing countries of Africa, Asia and Latin America many of the conditions that affect health are more favourable in urban areas than in rural areas. It was also reported by WHO that while some diseases are no longer problems in urban of developing countries, they are still serious problems in certain rural areas (WHO, 1998). It is only recently that mass campaigns for the control and elimination of parasitic diseases have been extended to rural areas of the developing countries, while the urban populations, especially in major cities, have had the benefits of such measures for a considerable number of years (Somasundaram, 2000).

Actually, morbidity differentials not only exist between the urban areas and rural areas but also in the different population groups of rural areas in many developing countries. The different demographic and socio-economic characteristics of the population determinate the morbidity differentials in rural areas (Phananiramai,1990). For example, in all age and gender groups, children and women often have the higher morbidity rate than the other groups. Morbidity is greater in groups with lower socio-economic status. The morbidity of different population groups may have different implications on the national population. For example, morbidity among adults may affect national income while the growth and development of children depends on the incidence and type of illness that they may be subjected to. Further, the morbidity pattern among the aged is now of special interest especially in developing countries where their proportion has been increasing due to declines in fertility and mortality levels (Deshpande, 1998).

Although knowing morbidity patterns at a small-area level would be useful for morbidity analyses and prevention program planning, morbidity data are generally not available for geographic units smaller than a state or province and so are not very useful for the many diseases that vary across communities, especially among rural areas in many countries (Deboosere, 2001). The studies about morbidity in a small-area level of rural areas should prove more useful to local health officials and public health researchers than very broad patterns of country data.

Understanding the patterns of morbidity by different strata, demographic, socio-economic, and household environment characteristics in rural area thus assumes importance as they can help planners and policy makers to plan and implement appropriate health programmes so as to reduce morbidity.

In Thailand, about three quarters of the population live in rural areas (Phananiramai, 1990). The Thai government has done some programmes in improving the health status and limiting morbidity in rural area. Some surveys of Thai health status and morbidity also had been done and showed that there were differences in morbidity rate by region, age, sex, urbanization, education, household wealth and other factors. The importance of accurate information on morbidity differences is necessary to reveal and understand the intricate relationship between morbidity differentials and demographic, socio-economic characteristics of the Thai population

(IPSR, 1985). However, there are still few available data and studies about morbidity differentials, especially in small-area level of rural areas. More work is needed in analyzing the morbidity differentials in rural areas. The creation of the Demographic Surveillance Survey (DSS) 2001 conducted in selected areas of Kanchanaburi province, Thailand by Institute for Population and Social Research, Mahidol University offered the opportunity for study of morbidity in several rural strata based on individual data. The study area was divided into five strata, which were categorized according to the main occupation of the population and land use patterns. We choose four rural strata to study their morbidity. This paper attempts to investigate morbidity differentials by strata, demographic, socio-economic and household environment characteristics and examine the influence of the related determinants on morbidity patterns in these rural strata.

1.2 Research Questions

- What are the patterns of morbidity by demographic, socio-economic and household environment characteristics in rural Kanchanaburi ?
- What are the level of morbidity by strata in rural Kanchanaburi ?
- What are the determinate factors affecting strata morbidity in rural Kanchanaburi ?

1.3 Research Objectives

- To investigate the morbidity differentials by strata, demographic, socio-economic characteristic and household environment in rural Kanchanaburi ;
- To examine determinant factors affecting morbidity status in rural Kanchanaburi.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

For decades, investigators have attempted to ascertain health status by measuring, quantifying, and comparing illness and disease in individuals and populations. These attempts at assessing morbidity have grown in importance as life expectancy increases and mortality declines to very low levels in many populations (Murray and Chen, 1992). The morbidity situation is considered as part of both the quality of development and health status. Morbidity differences are often used to identify the onset of ill health of the society and also to locate a proper health service system appropriate to specific groups of the population (IPSR, 1985).

Although researchers still debate the determinants in morbidity, it has been often hypothesized that morbidity rates are determined by demographic factor and socioeconomic status, and researcher are often cautioned of the interlinkages between morbidity with individual demographic and socioeconomic characteristic (Phananiramai, 1990). Researchers and public health officials are frequently interested in analyzing differences in morbidity for small geographic areas. The existence of "gaps" in health status is often the basis for further research on small-area variations in health services utilization, socioeconomic variables, and environmental exposures (Boisier, 2001). One approach for identifying morbidity differences in these areas is to associate population morbidity with demographic, socioeconomic, and environment affecting factors. These major demographic, socioeconomic dimensions and environment characteristics are relevant to the variation of the morbidity in these areas.

2.2 Morbidity Definition

Both the concept of morbidity and its measurement are plagued by conceptual and methodological difficulties. In general, morbidity is defined as relative incidence

of disease and accidents in a population (Glossary, 2000). Berg (1973) pointed out that morbidity has "social and emotional as well as biophysical antecedents in that the rate of disability they (morbidity and impairment) engender is filtered through social and emotional determinants and perceptions". In much research morbidity is often used as equivalent of the health status (Gerdtham U.G. et al, 1999).

Murray and Chen (1992) reviewed and developed methods and approaches in measuring morbidity. They identified two fundamental types of morbidity measures namely, self-perceived and observed morbidity. Self-perceived or self-reported morbidity depend upon an individual's perception of illness. Typically, respondents are asked about the occurrence of illness or specific symptoms over a defined time period. Particularly in social sciences, self-reported morbidity is commonly used and recent studies in developing countries have found that self-reported morbidity is reliable and it is a good measure of health. In this study will focus on self-reported measures of morbidity.

2.3 The factors affecting morbidity

Developing countries are usually found to have very different levels of development between urban and rural areas. An unequal development within countries is expected to affect adult health and diseases in a way that parallels cross-country development and it suggests that ill health is negatively associated with the degree of socio-economic development of a nation or region. To examine this relationship more closely on the individual level, this section attempts to review the literatures about the factors linking individual characteristics to morbidity status.

2.3.1 Residence (Strata) and morbidity

Many research evidences on health inequalities has demonstrated the existence of important disparities in morbidity for different population groups. One manifestation of these inequalities is the persistent geographical inequalities in health (Townsend et al., 1988).

There are two potential sources of spatial contrasts in morbidity: compositional effects and contextual effects. Compositional effects operate because of the varying distribution of types of people whose individual characteristics influence their health.

Contextual effects operate where the health experience of a particular type of individual depends not only on their own characteristics, but also on the area where they live (Shouls, 1996).

Most studies distinguish the imbalance in morbidity between rural and urban area, actually rural situations also differ from each other. Elman and Myers studied the geographic morbidity differentials in the late nineteenth-century United States, and they found the morbidity differences by region in rural areas. The high levels of chronic disease and impairment were found in the rural of southern and western regions (Elman and Myers, 1999). A study investigated morbidity in rural Mauritius, and it suggested that the rural geography of island was transformed with the appearance of major plantation economy districts and the prevalence of reported illness was different among these districts, and environmental factors affect diseases outcomes (Kalla, 1993). The regional differentials in morbidity might be attributed to differentials in economic opportunities. A paper examined the determinants of self-reported health status in rural Malawi and it suggested poor health in the Southern region where is characterized by small-scale subsistence farming with low productivity (Doctor, 2002).

In Kanchanaburi DSS, the study area was divided into five strata, which were categorized according to the main occupation of the population and land use patterns. There are one urban/semi-urban strata and four rural strata: rice producing, plantations, uplands areas, and mixed economy. We will investigate morbidity status in four rural strata and compared the level of morbidity among these strata.

2.3.2 Demographic factors

Among the demographic characteristics of the population, sex, age and marital status are the main determinants of morbidity differentials (Phananiramai, 1990).

Age and sex: Morbidity is often studied in different age and sex groups. A survey about Thai Morbidity conducted in 1985 showed morbidity was strongly dependent on age, with the highest incidence for adults over 60 and for infants and children under 5 (IPSR, 1985). The result of a study in rural Karnataka, India also shows that children below four years of age and the elderly over 60 have higher levels of morbidity as

compared to other age groups. The analysis also revealed higher more morbidity among females than males. Higher morbidity levels among younger individuals, low among adults and an increase in morbidity as age advances revealed a J-shaped relationship between age and morbidity. A desegregated analysis by sex showed females to have experienced higher morbidity (12.5 percent) than males (11.8 percent). This was observed among infants and in the 15-49 age groups pointing to high reproductive morbidity among females (Deshpande, 1998). This pattern also suggests that biased reporting associated with gender is not the dominant factor in older age groups and become irrelevant for those over age 60. There is a real impact on female morbidity associated with childbearing and feeding and care of infants and small children. However, gender has no effect on the differentials in morbidity in over age 60 or under age 15 groups. A paper investigated gender differences in morbidity whilst controlling participation in paid employment and it also showed that the similar relationships between experience of work and occupational grade and morbidity for men and women. Particularly in comparison with working conditions, gender explained only a small proportion of variance (Emslie, 1999). However, the gendered nature of much of adult life continues to shape the experiences and health of men and women at the end of the twentieth century, especially in many developing countries.

   Marital status: It has frequently been shown that the never married, divorced and widowed have higher rates of morbidity than married people. The research findings in Europe and U.S reveal that married people have better health than the single, divorce ones (Arber, 1997). In a study about difference in morbidity by marital status and by living arrangement, researcher controlled for other socio-demographic variables and analyses showed that people who live with a partner have lower morbidity rates than those who live alone. They further showed that excess risks of the never married, widowed and divorced decreased by 40-70% for all health measures after controlling for living arrangement (Joung, 2000). Changes in marriage patterns may impact the health of people. They may experience longer periods of living alone, increase in divorce, separation and remarriage and many of them becoming lone mothers and fathers (Graham, 1993).

2.3.3 Socio-economic factors

Socio-economic status of people creates significant and consistent differentials in their morbidity. The association between people's socio- economic status and morbidity has been observed for a long time. People in lower socio-economic positions have higher morbidity than those with higher status. This finding has been observed in different populations by using different indicators of socio-economic position (Antonovsky, 1967; Feinstein, 1993). Link and Phelan (1995) contend that socio-economic status is a "fundamental cause of disease". Socio-economic status generally refers to three characteristics of an individual or household, such as educational attainment, income, and occupation. The main traditional socio-economic indicators in morbidity commonly used were educational attainment, income, and occupation (Phananiramai,1990). Martelin (1994) suggested that no single measure proves comprehensive enough to investigate the relationship between socioeconomic status and morbidity.

Education and household income: Two commonly reported measures of social and economic hierarchy are: the level of attained education for each individual and total household income. As education is typically completed by early adulthood, it is viewed as a stable, long-term marker of socio-economic status. For most adults over the age of 25, education is temporally prior to any subsequent change in health. (House et al, 1990). Many researchers think that one of the most important factors governing the health status of a population is its educational level. The positive association between education and health level is widely acknowledged. Education has a positive influence on both the chances of getting ill and the nature of victims' response to the illness (Panikar, 1999). Gullifoud and Baksh studied the social environment and morbidity in Trinidad and Tobago, and they develop nine variables according to educational attainment. They found the highest prevalence of morbidity in those with lowest educational attainment (Gullifoud and Baksh, 1997). Studies also showed education has strong effects in the aggregate estimates for two age groups - negative for adults 15-44 and positive for adults over age 60 (Phananiramai,1995). A rise in the level of education contributes to a rise in health consciousness of the person or group of persons concerned, promoting personal hygiene, and stimulating prompt

response to a morbidity episode, however, minor. The level of female education is particularly relevant since, it is the female members of a household who are, in general, more concerned with the health of its members, especially health of children (Panikar, 1999). Household income, on the other hand, being more variable over the life course, is an indicator of socioeconomic status over the short term. The association between income and health is obvious. The level of income is a determinant of several factors that have a proximate connection with health such as standard of living including food intake, education, housing, electricity, water supply, and sanitation. On the other hand, poverty and ill-health are closely associated. The level of knowledge on matters related to health and responses to morbidity episodes, recovery, and rehabilitation of a person are all affected by his/her level of income. The economic and social origins of ill health are a part of the received doctrine widely covered in the literature. The relationship between income and health may be bi-directional (Lerner, 1973). The overall morbidity estimates suggest that there is an inverse effect of wealth for the youngest and the oldest groups, however, it imply little relationship between the distribution of wealth and morbidity for the middle age groups (Martelin, 1994).

Occupation: Some studies have shown that there is a relationship between the type of occupation and morbidity. A higher occupational categories, namely professional and administration tend to have lower morbidity prevalence. A lower occupation had higher morbidity (IPSR, 1988).

Farming has been considered a high-risk occupation for some diseases. In rural areas, farmers appear to still carry a high risk of infectious, parasitic, and zoonosis diseases and often involve particular hazards such as insect, tick, or snakebite. Despite mechanization, farming is still a physically demanding job. A high workload, especially associated with lifting, carrying loads, bending and twisting, and exposure to vibrations, has been found to be associated with an increased risk of acquiring low back pain. Accidental injuries from falls or from cutting tools or machinery are always a danger. Long working days, poor nutrition, boredom, and fatigue are closely associated with accidents. In several reports, it has been proposed that farmers might have a higher prevalence rate of osteoarthritis of the hip and perhaps the knee than other occupational groups (Holmberg, 2002). More, recently, as farmer adopt new

methods, the risk of poisoning from fertilizers, herbicides, and pesticides has become significant and may contribute to cancer (Basch, 1990).

2.3.4 Household environment

People's health is intricately linked with the household environment they live in (Panikar, 1999). The factors underlying diseases of these people living in rural areas have been identified in some studies include environment status comprising the type of house,   water supplies, and sanitary facility.

The type of dwelling in which the person lives also has a bearing on the incidence of morbidity: poor quality of housing is an indication of less hygienic living conditions and hence greater chances of falling sick (Deshpande, 1998). In addition, low quality of household equipment and ventilation all may contribute to risk through accident, fire, or environmental degradation (Mechanic, 1989). Water supplies and sanitation have great effect on the morbidity. Diseases related to unsafe water supplies and poor sanitation are among the greatest causes of morbidity and mortality in the developing countries at the present time. Over 1,800 million people lack adequate sanitation facilities in the developing countries (except China). In 1988, residents in the developing countries accessed sanitation facilities at approximately 66 percent in urban area and only 17 percent in rural areas (WHO, 1990). Over 1.2 billion people lack safe drinking water in developing countries (excluding China). Properly-directed water and sanitation interventions, however, can reduce the incidence of many illnesses by 20% to 80% (WHO, 2000). The shortage of pure drinking water constituted a serious menace to health in rural areas of the developing countries. However, the statistics on and water supplies and quality of water are seldom available in the rural areas (IAEA, 2002). The existence of a comparatively high proportion of the households, especially in the rural areas of the developing countries where the vast majority live, without the benefit of safe water should be a matter of great concern. Safe water is a critical component of health status; without this facility reaching all households, whatever advances are made in other sectors, would fail to bring in commensurate progress in health (Panikar, 1999).

2.4 Morbidity and health in rural Thailand

Thailand is one of the fastest growing economies among Southeast Asian countries. Compared to many developing countries, Thailand has better health status and health system. However, there are still about three quarters of the Thai population living in rural areas. Morbidity is still higher in some rural and poverty-stricken areas than in urban areas and cities (Phananiramai, 1990). The last national health and welfare survey was conducted in 2003 and the morbidity status in this study is measured by number of population who ill or not feeling well during one month before interview's date. The results showed the rural population generally tends to have higher illness incident than those of the urban population in Thailand. The prevalence of illness reached 204.5 per 1000 population aged 15 and over in rural area, and there is a lower the prevalence of illness for the same age population living in urban area: 173.5 per 1000 population (National Statistical office, 2003).

From the socio-economic perspective, it is speculated that the regional and population group differences revealed may reflect differences in the quality of the development. Socio-economic characteristics of the study population emphasize mainly on education and occupation and improvement in the conditions of life of certain broad occupational groups and education may have help result in morbidity reduction. Ranging between 80 and 121 per 1,000 populations, highest illness incidence is found among farmers (87), miners (87) and labourers (73). People living in rural areas also have the lower educational level comparing with those of urban areas (IPSR, 1985). The rural population, comprising the majority of the country's population, seems to be the most disadvantaged group relative to other groups.

Several morbidity surveys were conducted in Thailand since 1970 and the morbidity differentials also were studied. However, there are still very limited reliable sources of data to study the morbidity among rural Thai population, especially in a small area level. The data about demographic, socio-economic and environment characteristics should be collected and analyzed in order to examine the morbidity differentials and understand the morbidity pattern among different groups and regions of rural Thailand.

2.5 Conceptual framework

Based on the literature review above, the study uses the conceptual framework shown in Figure 2.1. Morbidity in this study is measured by self- reported illness. Four strata are selected from rural Kanchanaburi: the rice strata, the plantation strata, the upland strata and the mixed economy strata. The focus of the research is to understand the demographic, social-economic, and household environment differentials in morbidity in these strata and also investigate the determinant factors on morbidity in these strata. Demographic, socioeconomic, and household environment characteristics serve as independent variables in the study and morbidity is dependent variable. I argue that demographic, social-economic, and household environment factors are the morbidity determinants, therefore, there are different percentage distributions of reported illness as well as morbidity patterns among different demographic, social-economic, and household environment characteristics population groups in rural area.

Figure 2.1 Conceptual Framework
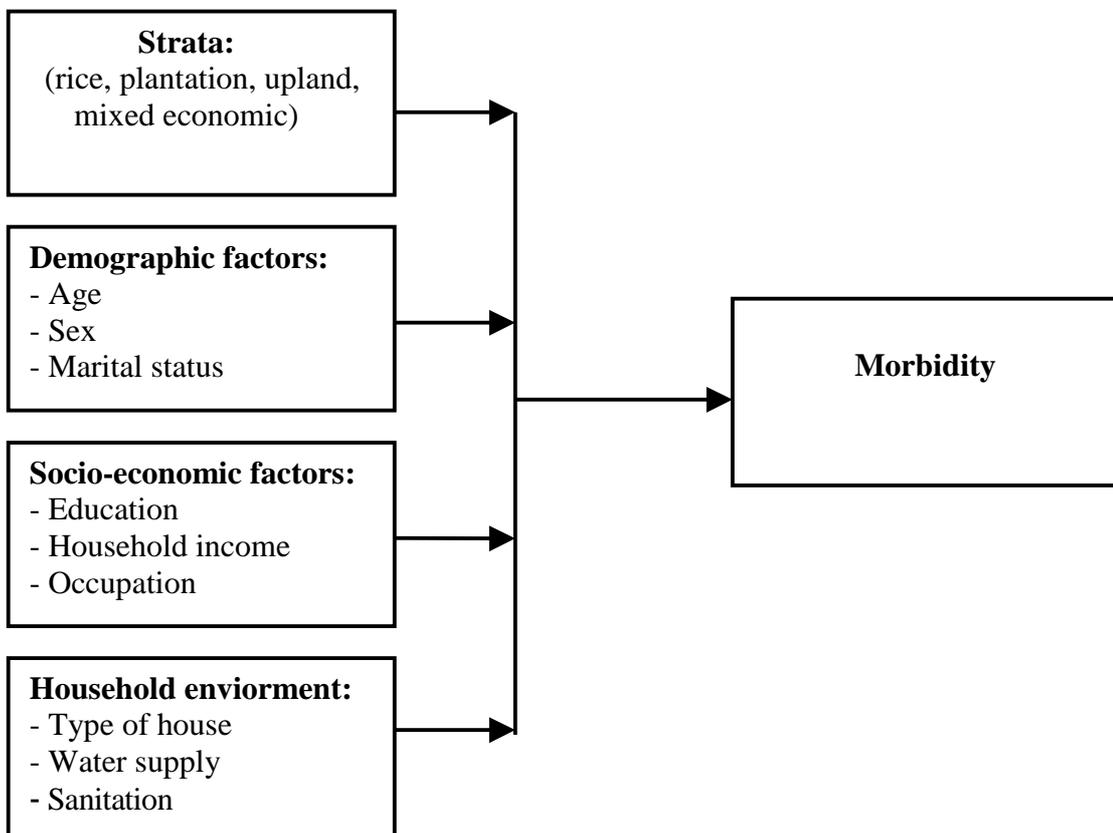
2.6 Hypotheses

Several hypotheses concerning the differentials and factors affecting the morbidity of adult population are evaluated.

- Morbidity differentials exist among different rural strata, net of demographic, socio-economic, and household environment factors.

- Morbidity differentials are related to demographic, socio-economic, and household environmental factors.

- Adults with higher socioeconomic and better household environment status have lower self-reported morbidity level than those with lower socioeconomic and worse household environmental status.

CHAPTER 3

DATA AND METHODS

3.1 Data

The study is designed to study demographic, socioeconomic and household environment differences in morbidity in rural areas. The data employed for this thesis is obtained from the 2nd Demographic Surveillance Survey (DSS) 2001 conducted in selected areas of Kanchanaburi province, Thailand by Institute for Population and Social Research, Mahidol University.

The Kanchanaburi DSS covers 100 villages/census blocks selected from five strata: urban/semi-urban, rice, plantation, uplands, and mixed economy. Data has been collected at three levels: community, household and individual. Totally, 12,657 households and 29,022 individuals aged 15 and above were interviewed in July and August 2001. The focus of the present research is on rural adult population and the data were selected from four rural strata: rice, plantation, uplands, and mixed economy. In this study, the sample includes 20,586 individuals (7,596 males and 8,722 females) aged 20 and over living in four rural strata. The demographic and socio-economic factors included in the study will be drawn from individual and household questionnaires. This sample is used to examine morbidity variations and determinates.

3.2 Methods of analysis

To meet the objectives of the study, first descriptive statistics will be examined in relation to differentials in morbidity. The focus of the descriptive analysis (cross tabulations, means and frequencies) is to check the morbidity differentials by strata, demographic, socioeconomic, and household environment characteristics. Appropriate significance test will be estimated. Second, the analysis of factors determining morbidity differentials also will be undertaken by using logistic regression techniques.

3.3 Definition of variables

In this study the morbidity of the population will be defined based on self-reported illness. It means any self-reported illness that occurred in the year prior to the Kanchanaburi DSS (July 1st, 2000-June 30th, 2001). The respondents were asked to report any illness that was serious enough that they could not work as usual. Data from the survey revealed that two-thirds of the population reported that they were ill according to this definition. The percentages reporting illness by strata are showed.

In Kanchanaburi DSS, the villages were selected using a stratified systematic design. The primary selection units for rural areas were villages. The study rural area was divided into four strata, which were categorized according to the main occupation of the population and land use pattern. These strata are: 1) rice producing, 2) plantations, 3) uplands areas, and 4) mixed economy. The characteristics of each of these strata include the following:

The rice strata villages are those located in lowland areas where the main occupation is rice cultivation.

The plantation strata comprises villages that are also located in lowland areas, and where the major occupation of the local people is cultivating cassava or sugar cane.

The uplands strata contains villages located in the three uplands districts, which are Saiyoke, Thongpapham and Sakhaburi districts.

The mixed economy strata contains villages that could not be classified into the other categories as mentioned above.

Age, sex and marital are indicators of demographic characteristics of the respondents. As mentioned earlier, the adult population aged 20 and over will comprise the study population. There are five age groups with a ten-year interval (Table3.1).Sex also is important independent variable of the study and age-sex differentials in morbidity also will be analyzed. Marital status of the respondents indicates the current status reported at the time of data collection (Table3.1).

An individual's socioeconomic characteristics will include education, household income, occupation. Education is computed from the question on the completed level of education and divided into the five categories as shown in Table3.1. Household income shows reported household income in Baht and categories are shown in the

Table3.1. Occupation is divided into three categories: agriculture, non-agriculture and other who are not in labor force.

Household environment includes the type of house, water supplies and sanitation. The type of house is defined according to the materials from which houses are built. There are two categories, modern materials and traditional materials. Original categories of concrete/brick/stone, tile, zinc plate, wood and half cement are classified as "modern materials", lamparat cylindrical/elephant grass/nipa palm leaf/teak leaf, bamboo and used materials are considered as "traditional materials". Water supplies are obtained from the question "does this household have pipe water system?" and categorized as pipe water system and no pipe water system. Sanitation are obtained from the question "does this household have it's own toilet?".

The brief definition of variables used in the analysis and measurement are given in Table 3.1 below.

Table 3.1 Operational definition of variables

Variable name	Description	Measurement scale
Dependent Variables		Nominal
Morbidity	Self-reported sickness within the year prior to data collection—sick or not sick	1. Sick 2. Not sick
Independent Variables		
Demographic characteristics		
Sex	Sex of the respondent	Nominal 1. Male 2. Female
Age	Reported complete age	Ordinal 1. 20-29 2. 30-39 3. 40-49 4. 50-59 5. 60-69 6. 70+
Marital status	Marital status	Nominal 1. Married 2. Divorced 3. Separated 4. Widowed 5. Single

Table 3.1 Operational definition of variables (Continued).

Variable name	Description	Measurement scale
Socio-economic characteristics		
Education	Completed educational level	Nominal 1. No education 2. Primary 3. Secondary 4. High school 5. Higher education
Household income	Annual household income	Ordinal 1. No income 2. 1-29999 3. 30000-59999 4. 60000-11999 5. 120000-249999 6. 250000+
Occupation	Main occupation at the time of data collection	Nominal 1. Agriculture 2. Non-agriculture 3. Other
Household environment characteristics		
Type of house	Type of the materials used in construction of house walls	Nominal 1. Modern materials 2. Traditional materials
Water supply	Pipe water system	Nominal 1. Pipe water system 2. No pipe water system
Sanitation	own toilet	Nominal 1. Own toilet 2. No own toilet

3.4 Limitations of the research

    This study focus on morbidity differentials by socio-demographic, household environment factors, but there are still some determinants that have been found to correlate with morbidity status among individuals as health risk behaviors, health-seeking behaviors, and the more general functional limitations. In this study, the data about economic factors might be not accurate because of their measurements and it is also little unclear to check the morbidity differentials among different strata because of their confused concept. A further problem is related to self-reported morbidity. There is considerable uncertainty about difference between perceived illness and actual illness. It is also necessary to check the categorized diseases by demographic and socio-economic factors in order to predict morbidity pattern accurately.

CHAPTER 4

RESULTS

In this chapter the results of the analysis are described. First a description of morbidity differentials among adult population by their demographic, socio-economic and household environmental characteristic will be shown. Then descriptive and logistic regression analyses of the determinant factor on morbidity differentials will be presented in the following section.

4.1 Characteristics of the adult population

Demographic, socio-economic and household environmental characteristics of adult population are shown in Table 4.1. Percentage distribution of demographic, socioeconomic characteristics are presented in four rural strata, Kanchanaburi DSS, 2001.

There are limited differences in demographic characteristics among four rural strata. The similar sex rate are shown, and there are higher proportion of female population than male population in all four rural strata. More than 70 percent of adult population are 20-49 years in all four rural strata. Plantation and upland strata show the younger population compared to other strata. More than 78 percent of adult population are married, and the proportion of divorced and separated are very low in all four rural strata.

The differences in socio-economic characteristics of population are more marked than differences in demographic characteristics among four rural strata. To most of population, their education attainments reach the level of primary schooling. The highest proportion of illiterate population is found in upland strata (43.5 percent) and only 46.8 percent of population gets the primary schooling level of in this strata. Other three strata have the similar level of education. There is very high proportion of population who has no household income in four strata. This might be explained by these reasons that there are not available methods to measure household income

accurately in rural area. Among those who have household income, most of them whose annual household income is less than 60,000 Baht. Regarding occupation, there is the highest proportion of population who are employed in agriculture in plantation strata (70.9 percent). The lowest proportion of this population group is found in mixed economic stratum (52.6 percent).

Most of people living in houses built from the modern materials in three strata and upland strata have the lowest proportion of this population (52.2 percent). About 62.2 percent of population whose house have pipe water system in four rural strata. People have similar sanitation status in four strata, and most of population who own toilet in their household. The data indicate that most of adult population live in a better household environment in rural Kanchanaburi.

Table 4.1 Percentage distribution of demographic, socioeconomic and household environment characteristics by strata, Kanchanaburi DSS, 2001

Characteristic	Strata				
	Rice	Plantation	Upland	Mixed economy	Total
Demographic characteristics					
Sex					
Male	43.7	45.7	48.6	44.7	46.0
Female	56.3	54.3	51.4	55.3	54.0
Total	100	100	100	100	100
N	4268	4086	6643	5589	20586
Age groups					
20-29	20.4	22.2	23.6	22.2	22.3
30-39	25.1	27.7	27.8	24.7	26.4
40-49	21	22.1	23.3	21.9	22.2
50-59	14.7	13.8	12.3	15.3	13.9
60-69	10.7	9.3	8.3	9.7	9.4
70+	8.2	4.9	4.7	6	5.8
Total	100	100	100	100	100
N	4268	4086	6643	5589	20586
Marital Status					
Married	75.5	78.4	83.2	75.5	78.6
Divorced	0.4	0.2	0.4	0.4	0.4
Separated	3.7	4.4	3.1	4.3	3.8
Widowed	8.1	7.1	6.5	8	7.3
Single	12.3	9.9	6.8	11.8	9.9
Total	100	100	100	100	100
N	4268	4086	6643	5589	20586

Table 4.1 Percentage distribution of demographic, socioeconomic and household environment characteristics by strata, Kanchanaburi DSS, 2001 (Continued).

Characteristic	Rice	Plantation	Upland	Mixed economy	Total
			Strata		
Socioeconomic characteristics					
Education level					
No education	12.3	18.3	43.5	12.6	23.7
Primary	76.2	72.4	46.8	67.1	63.4
Secondary	5.1	4.3	4.2	8.5	5.6
High school	3.2	2.6	2.5	6.5	3.8
Higher education	3.2	2.4	3	5.3	3.6
Total	100	100	100	100	100
N	4005	3854	6365	5365	19589
Household Income					
No income	56.6	68.6	62.8	74.1	65.7
1-29999	13.7	7.5	18.7	6.5	12.1
30000-59999	12.6	11.2	10.2	8.1	10.3
60000-119999	9.7	7.3	5.8	6.4	7.1
120000-249999	5.2	3.2	1.9	2.8	3.1
250000+	2.8	2.4	0.9	2.1	1.9
Total	100	100	100	100	100
N	4257	4079	6619	5581	20536
Occupation					
Agriculture	61.2	70.9	66.1	52.6	62.4
Non-agriculture	21	15.2	16.1	28.8	20.6
Other	17.8	13.9	17.8	18.6	17
Total	100	100	100	100	100
N	4268	4086	6643	5589	20586
Household environment					
Type of house					
Modern	91.5	80.6	52.2	86.4	74.7
Traditional	8.5	19.4	47.8	13.6	25.3
Total	100	100	100	100	100
N	4268	4086	6643	5589	20586
Water supply					
Pipe water system	69.8	53.5	62.7	62.4	62.2
No pipe water system	30.2	46.5	37.3	37.6	37.8
Total	100	100.0	100	100	100
N	4268	4086	6643	5589	20586
Sanitation					
Own toilet	88.4	81.8	81.1	88.1	84.6
No own toilet	11.6	18.2	18.9	11.9	15.4
Total	100	100	100	100	100
N	4268	4086	6643	5589	20586

4.2 Prevalence of reported illness

With reference to the period prevalence rate as shown in Table4.2, the prevalence of reported illness occurred in the year prior to the census (July 1st, 2000-June 30th, 2001) was 67.9 persons per 100 population in the four rural strata, Kanchanaburi. Morbidity differences among four rural strata, indicated the highest rate in the rice strata (80.3 percent) and the lowest recorded in uplands strata (58.1 percent). Adult population who living in plantation and mixed economy strata have the similar level of morbidity.

Table 4.2 Percentage distribution of reported illness by strata, Kanchanaburi DSS, 2001

Strata	Illness	Number of persons reporting illness
Rice	80.3	4,268
Plantation	70.4	4,086
Uplands	58.1	6,643
Mixed Economy	68.0	5,589
Total	67.9	20,586

4.3 Morbidity differentials

Morbidity differentials are presented in Table 4.3. Cross tabulations of variables summarize the data and statistically significant relationships between independent and dependent variables are established at the 0.001 and 0.05 levels by using chi-square. As predicated, there are significant morbidity differentials by demographic, social factors and household environment characteristics in rural Kanchanaburi. However, household income does not show the relationship with morbidity and there are not significant morbidity differentials in household income groups.

Table 4.3 Percentage distribution of reported illness by strata, demographic, socioeconomic and household environment characteristics , Kanchanaburi DSS, 2001

Characteristic	Rice	Plantation	Upland	Mixed economy	Total
Demographic characteristics					
Sex****					
Male	72.9	63.0	53.9	59.4	60.9
Female	86.1	76.7	62.2	74.9	73.8

Table 4.3 Percentage distribution of reported illness by strata, demographic, socioeconomic and household environment characteristics , Kanchanaburi DSS, 2001 (Continued).

Characteristic	Rice	Plantation	Upland	Strata Mixed economy	Total
Age groups					
20-29	70.7	58.2	48.9	55.8	56.7
30-39	77.6	65.6	55.3	62.0	63.5
40-49	79.9	72.5	57.5	68.9	67.9
50-59	84.8	80.6	66.1	77.5	76.5
60-69	91.4	82.4	72.5	80.9	81.3
70+	91.1	92.5	78.4	89.3	87.6
Marital Status***					
Married	80.2	70.6	57.7	67.3	67.2
Divorced	77.8	57.1	45.8	72.0	63.5
Separated	85.4	73.5	60.6	72.6	72.1
Widowed	92.2	88.3	75.9	85.3	84.8
Single	68.9	53.2	46.1	54.2	55.5
Socioeconomic characteristics					
Education level***					
No education	91.5	84.0	59.4	77.1	69.1
Primary	80.9	70.1	59.4	70.5	70.3
Secondary	72.5	60.5	48.3	55.9	57.9
High school	58.1	44.4	49.1	59.1	54.8
Higher education	72.1	53.2	47.1	49.6	53.6
Household Income					
1-29999	87.8	77.4	58.1	67.2	68.7
30000-59999	80.0	76.4	55.5	69.9	69.3
60000-119999	77.5	71.9	58.6	69.6	69.4
120000-249999	80.3	77.5	55.2	66.5	71.3
250000+	78.8	62.9	58.3	58.5	65.6
Occupation**					
Agriculture	74.1	66.4	55.8	61.6	64.0
Non-agriculture	81.1	68.8	57.3	67.2	67.0
Other	79.2	60.0	44.6	66.7	57.9
Household environment					
Type of house***					
Modern	81.3	72.3	61.5	69.3	71.1
Traditional	80.6	66.6	55.8	64.8	67.0
Water supply*					
Pipe water system	79.6	70.4	61.1	70.5	69.3
No pipe water system	85.2	72.2	54.7	65.7	66.7
Sanitation*					
Own toilet	80.8	72.0	58.6	69.3	68.8
No own toilet	84.9	67.8	59.1	64.3	66.0

Note: χ^2 is significant at p≤0.001(***), p≤0.01(**) and p≤0.05(*).

4.3.1 Morbidity differences by demographic characteristics

Age-Sex differences

Age and sex have an important effect on morbidity. Table4.3 presents the morbidity differentials by age and sex. There are similar morbidity pattern among adult population in all four rural strata. It shows that females have experienced higher morbidity (73.8 percent) than males (60.9 percent) in all four rural strata. It also shows that the morbidity level increase with older age in adult age groups. The lowest morbidity level is presented in 20-29 age group (56.7 percent) and highest morbidity level in aged 70 and higher group (87.6 percent).

Table 4.4 presents the morbidity differentials by sex and age. In 20-29 age groups, the morbidity differentials between male and female is about 8 percent. In higher age groups, this number is over 12 percent. So it indicates that there are few morbidity differentials in early adult group, and there are wider morbidity differentials in higher adult groups. In all adult groups, female always have higher morbidity level than male. In 20-29 age groups, female morbidity level is about 60.2 percent, and 52.3 percent to males. In aged 70 and over group, the morbidity level reach 93.1 percent to female, and male still have lower morbidity level (81.1 percent).

The data show that the reported morbidity are strongly dependent on age and sex, with higher incidence for older adults, higher incidence for female. Therefore, this study will consider the morbidity differentials among age and sex groups.

Table 4.4 Percentage distribution of self-reported illness by age, sex, Kanchanaburi DSS, 2001

Characteristic	sex	
Age groups	Male	Female
20-29	52.3	60.2
30-39	56.9	69.3
40-49	59.0	75.6
50-59	67.5	84.2
60-69	73.4	88.6
70+	81.1	93.1

Marital differences

Patterns of self-reported morbidity differ significantly with respect to their marital status in rural Kanchanaburi. Some studies have shown that changes in marriage patterns may impact the health of people. Generally, divorced and widowed

have higher rates of morbidity than married people (Arber, 1997). Consistent with past studies, table 4.3 suggests that widowed people have the highest morbidity level (84.8 percent) and four rural strata have the similar pattern. The separated people also have the higher morbidity level (72.1percent). It seems that married and divorced people have similar morbidity level and their health status are better than separated and widowed people (married: 67.2 percent, divorced: 63.5 percent). Among all adult groups, single people have the lowest morbidity level (55.5 percent).

See Table 4.5, marital differences in prevalence of morbidity are showed in age and sex groups. Among younger age groups, people have the similar self-reported morbidity level with different marital status. In aged 60 and over groups, it shows that married and single groups have lower morbidity level. These results imply the clearer relationship between the marital status and self-reported morbidity for the older age groups.

Table 4.5 Percentage distribution of self-reported illness by age and sex, marital status, Kanchanaburi DSS, 2001

Characteristic		Marital status			
Age and sex groups	Married	Divorced	Separated	Widowed	Single
20-29 Male	55.9	53.0	51.5	55.0	46.5
Female	60.5	65.0	62.6	78.9	58.0
30-39 Male	57.7	44.4	62.8	53.8	47.9
Female	68.5	75.0	72.1	73.4	75.0
40-49 Male	59.1	53.0	67.7	50.0	54.5
Female	74.9	66.7	81.5	78.4	80.0
50-59 Male	68.3	66.7	57.1	47.5	82.4
Female	84.4	100.0	78.9	84.4	84.4
60-69 Male	73.5	100.0	73.5	72.3	72.2
Female	88.8	100.0	88.9	88.2	90.0
70+ Male	79.9	-	85.7	84.0	75.5
Female	88.7	-	96.6	95.1	85.7

4.3.2 Morbidity differentials by socio-economic differences

Educational differences

Education has statistically significant relationship with reported morbidity in four rural strata. In Table 4.3, among all educational attainment groups, people with no education and primary schooling have the highest morbidity level. The morbidity level decrease largely when people's education attainment reach secondary and the number

is about 57.9 percent. In higher educational attainment groups, people have the similar morbidity level and their morbidty level decrease a little with higher education, and thsoe with higher education have the lowest morbidity level (53.6 percent).

Table 4.6 presents eudcational differences in prevalence of morbidity among age and sex groups. Although both male and female reported illness level decrease with higher education level, compared with male, female always have the higher morbidity level in all education attainment groups. In 20-29 age and 50 over age groups, reported morbidity status have no much different among different educational attainment groups. In 30-49 age grops, people with higher education always have the lowest level of reported morbidity. Especially the reported morbidity decrease when educational attainment is more than primary schooling. Result indicate that educational attainments might have greater effect on morbidity level in middle audlt group than younger and older groups, and they have more clearer effect on morbidity level when they reach primary schooling or higher level.

Table 4.6 Percentage distribution of reported illness by age and sex, educational level, **Kanchanaburi DSS, 2001**

Characteristic		Educational level				
Age and sex groups		No education	Primary	Secondary	High school	Higher education
20-29	Male	53.9	53.6	48.2	45.4	46.0
	Female	56.5	62.2	50.8	50.3	51.0
30-39	Male	53.4	59.6	52.7	50.6	44.2
	Female	62.5	72.5	62.8	60.9	52.2
40-49	Male	51.3	61.8	54.5	58.5	50.7
	Female	73.8	77.8	68.1	68.0	59.7
50-59	Male	64.8	68.8	64.0	78.0	50.0
	Female	81.0	86.0	80.0	80.0	66.7
60-69	Male	70.6	76.3	41.4	60.9	83.3
	Female	87.7	89.7	60.0	100.0	100.0
70+	Male	78.7	81.6	88.9	100.0	100.0
	Female	91.8	94.7	100.0	100.0	100.0

Household income differences

It is not consistent with those studies shown in literature review and household income seem to have no much effect on the reported morbidity level in rural Kanchanaburi. We do not find the significat morbidity differences by household

income. The results clearly show that household income is not the primary cause of morbidity differentials in rural Kanchanaburi.

Occupational differences

Patterns of reported morbidity differ little with respect to their occupation in rural Kanchanaburi. However, it is not consistent with those studies shown in literature review. See Table 4.3, people who work in agriculture seem to have lower reported morbidity level than non-agriculture, but the morbidity differentials between agriculture and non-agriculture are not too great. In four rural strata, they all show the same morbidity pattern. For others, most of them are not in labor force, they have the lowest reported morbidity level in three strata.

In Table 4.7, it shows occupational differences in prevalence of morbidity among age and sex groups. In 20-39 age groups, different occupation groups have the similar morbidity level. In older age groups, people who work in agriclture have the lower morbidity level than non-agriculature and other groups. It is different with former analysis, and people who are not in labor force even have highest morbidity level in older groups.

Table 4.7 Percentage distribution of reported illness by age and sex, occupation, Kanchanaburi DSS, 2001

Characteristic	Occupation		
Age and sex groups	Agriculture	Non-agriculture	Other
20-29 Male	50.1	53.5	49.3
Female	61.6	61.2	53.3
30-39 Male	55.5	57.3	56.1
Female	70.6	69.4	61.4
40-49 Male	56.2	59.7	56.6
Female	73.5	76.8	54.2
50-59 Male	63.6	67.8	66.7
Female	84.9	86.5	90.0
60-69 Male	66.7	72.4	75.0
Female	89.2	92.3	94.0
70+ Male	67.9	77.6	82.0
Female	100.0	92.4	100.0

4.3.3 Morbidity differentials by household environment

In Table 4.3, it seems that there is a significant relationship between house type and reported morbidity level. However, the morbidity differentials among people living in houses built from the different materials are not great (Modern type of house: 71.1 percent, Traditional type of house: 67.0).

Four rural strata show the different morbidity patterns by water supplies. In rice and plantation strata, people whose household have pipe water system have lower illness level than those without pipe water system. In other two strata, they show contrary result. However, the morbidity keep the similar level between groups in four strata and the difference are very little.

Just like morbidity patterns by water supplies, in rice and upland strata, people, whose household have own toilet, have the lower level of illness than those without their own toilet. Other two strata show different result, but the morbidity differentials are not great.

Although there are significant relationship between household environment factor and morbidity, morbidity differentials by household environment factors are not great. It might suggest that household environment factors do not have strong effect on morbidity in rural Kanchanaburi.

4.4 Multivariate analysis

Logistic regression analysis is employed. The objectives are: (1) to see whether variables significant in the bivariate analyses still significant after controlling for other variables, (2) to determine the most important factors affecting the reported morbidity level in rural Kanchanaburi in order to recommend and provide strategies to administrators and implementers of the future programmes. The study examines the relationship between reported morbidity and ten independent variables. Table 4.8 presents the significance levels of results from applying logistic regression models to Kanchanaburi DSS sample data.

Three models were performed. Model1 analyzes only the effect of strata on the reported morbidity. In Model2, demographic factors are included, and analysis focus on the effect of sex and age on the reported morbidity. In Model3, soci-economic and

household enviroment factors are included. Table 4.8 also presents the odds ratio for the reported morbidity in rural Kanchanaburi.

The analysis show significant effect of strata, sex, age, education, house type and sanitation status on the level of reported morbidity. However, it is not consistent with descriptive analysis and marital status, occupation, and water supply are not significantly related to the reported morbidity in rural Kanchanaburi.

Table 4.8: Logistic Regression Odds Ratio for the reported illness by strata, demographic, socioeconomic and household environment characteristics , Kanchanaburi DSS, 2001

Variable	Model1	Model2	Model3
Strata			
Rice (RC)	-	-	-
Plantation	0.576*** (0.083)	0.606*** (0.085)	0.627*** (0.086)
Uplands	0.336*** (0.074)	0.375*** (0.076)	0.394*** (0.081)
Mixed Economy	0.485*** (0.078)	0.495*** (0.080)	0.528*** (0.081)
Demographic factors			
Sex			
Male (RC)		-	-
Female		2.104*** (0.065)	2.148*** (0.066)
Age groups			
20-29 (RC)		-	-
30-39		1.082 (0.083)	1.083 (0.084)
40-49		1.220* (0.084)	1.209* (0.086)
50-59		1.726*** (0.093)	1.673*** (0.096)
60-69		2.114*** (0.108)	2.030*** (0.111)
70+		2.812*** (0.170)	2.682*** (0.173)
Marital Status			
Married (RC)		-	-
Divorced		1.216 (0.398)	1.386 (0.400)
Separated		0.867 (0.120)	0.890 (0.121)
Widowed		1.017 (0.116)	1.039 (0.116)
Single		0.825 (0.130)	0.939 (0.135)
Socio-economic factors			
Education level			
No education (RC)			-
Primary			0.969 (0.068)
Secondary			0.769* (0.117)
High school			0.892 (0.152)
Higher education			0.652** (0.156)

Table 4.8: Logistic Regression Odds Ratio for the reported illness by strata, demographic, socioeconomic and household environment characteristics , Kanchanaburi DSS, 2001 (Continued)

Variable	Model1	Model2	Model3	
Household Income				
(0-∞)			0.951	(0.017)
Occupation				
Agriculture (RC)			-	
Non-agriculture			1.073	(0.066)
Other			1.325	(0.157)
Household environment factors				
Type of house				
Modern (RC)			-	
Traditional			0.849*	(0.065)
Water supply				
Pipe water system			-	
No pipe water system			1.007	(0.053)
Sanitation				
Own toilet (RC)			-	
No own toilet			1.174*	(0.073)
Constant	0.525***	0.305***	0.259***	

Note: *Note*: χ^2 is significant at p≤0.001(***), p≤0.01(**) and p≤0.05(*). The numbers in parentheses are Standard Error. RC=Reference category.

There are significant morbidity differences among four rural strata. In model1, the results show that people living in plantation (odds ratio=0.576), upland (0.336) and mixed economy (0.485) have relatively lower likelihood of reported sickness compared to rice strata. After controlling demographic factors, the odds ratio increase only slightly and it indicates that the differences in morbidity status among these rural strata are not results of differences in demographic factors. After controlling socio-economic and household environment factors, similar results remain. This indicates that the differences in morbidity status among these rural strata are also not results of differences in socio-economic, and household environment factors. However, as predicted, these strata were categorized according to the main occupation of the population and land use patterns, so the relationship between strata and reported morbidity is still difficult to define.

There are also no significant change in the reported sickness among demographic groups after controlling socio-economic and household environment factors. Although it is well know that sex and age play the important effect on the morbidity status, see

Model2, the results are still surprising that women (odds ratio=2.136) have the greatly higher likelihood of reporting sickness as compared to men. After controlling for socio-economic and household environment factors, the effect of sex on morbidity status changes little, which suggests that gender differentials in morbidity are not related with socio-economic and household environment factors. Age significantly increases the reported morbidity, and there are greatly significant likelihood of reporting sickness when people are 50 or over years ages compared to the younger people. Young people, especially who are under 40 years, are less likely to report sickness. After controlling socio-economic and household environment factors, the effect of age on morbidity status change little in 30-49 age groups, and it change significantly in older age group. In 50-59 age groups, the effect of age on morbidity status decreased by 7 percent, 11 percent in 60-69 age group, and 13 percent in over 70 age group. It suggests that some of the higher reported morbidity of the old people is associated with their different social economic and household environment statuses when compared to young adults.

Marital status is not significantly related to the reporting sickness in rural Kanchanaburi.

The effects of people's educational attainment are consistent with those showed earlier in the descriptive analysis. In Model3, compared to those with no education, people with secondary schooling (odds ratio=0.769) and higher schooling (odds ratio=0.652) have lower odds to report sickness. These results suggest that completing secondary decrease the odds of reporting sickness by 23%, having higher schooling decrease the odds of reporting sickness by 35%. As mentioned in the literature review, household income and occupation are important factors affecting the reported sickness. Contrary to expectation, economic factors are not significantly related to the reported sickness in rural Kanchanaburi.

People, those living in houses built from the traditional materials, are less likely to self-report sickness compared to those who use modern materials. This result is not in line with the findings reported in the literature review. It is also not consistent with literature review that water supply is not significantly associated with self-reported sickness. Sanitation shows a significant effect on the self-reported sickness. People, those have no their own toilet, are more likely to report sickness compared to those

who have their own toilet (odd ratio=1.174). However, the odds ratio increases only slightly. It indicates that household environment factors are not strongly associated with the morbidity status.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Some research on morbidity status within well-defined populations has been conducted in developed and developing countries. In most developed and some developing countries, extensive literature has documented a significant relationship between morbidity status and factors such as age, sex, education, and income. Therefore, morbidity is likely to be different in populations characterized by different socio-demographic characteristics. The aim of this study is to investigation of morbidity differentials by demographic, socio-economic and household environment factors in rural Kanchanaburi. Results show the morbidity differentials among some socio-demographic groups. Consistent with past research, this analysis indicate that morbidity status in rural Kanchanaburi is influenced by sex, age, education and sanitation status. Contrary to the study's hypotheses, however, economic factors and some household environment are not associated with morbidity in rural Kanchanaburi.

Many researches on morbidity have demonstrated the existence geographical difference in morbidity and those differentials might be attributed to differentials in socio-economic status. In Kanchanaburi survey, the study area was divided into five strata, which were categorized according to the main occupation of the population and land use patterns. We investigate morbidity in four rural strata and compare the level of morbidity among these strata. The results show that people in different strata in rural Kanchanaburi vary in terms of their morbidity status. In descriptive analysis, results show the significant demographic structure and socio-economic status differentials among four strata. These might cause the morbidity differentials among four strata to some extent. However, we can not see much change of morbidity status in four strata after controlling the socio-economic factors. It indicates that morbidity differentials among four strata can not be explained by individual socio-economic

factors. Some studies suggest factors which are not related to individual socio-economic characteristics, but can explain regional morbidity differences. These factors include public health policies and services, and behavioral or cultural factors (Deboosere, 2001). So these factors might affect on morbidity differences among four rural strata in Kanchanaburi to some extent. However, it is still difficult to define the relationship between morbidity status and strata because strata are not geographical conception in Kanchanaburi DSS. As mentioned earlier, the studies about morbidity in a small-area level of rural areas would be useful for morbidity analyses and for developing intervention. It might be a good way to study morbidity status in small rural areas and it also should be mentioned that four rural strata show greatly different morbidity status. In this study, we did not intend to explain the mechanisms underpinning the relationship between strata and morbidity status. Future study on morbidity should be focused in those area level or small geographic region level in rural Kanchanaburi.

Age and gender are significant determinants of the morbidity status in rural Kanchanaburi. In descriptive analysis, as compared to men, women have higher morbidity in all age groups. Gender differences are minimal in early adulthood. Second, gender differences in morbidity become larger considerably after about age 40, increasing with age, and always disfavor women. However, the differences decrease again in the oldest group. Multivariate analysis of health status confirmed the statistically significant effect of sex on morbidity. Women are two times more likely to report sickness than man. Even when socio-economic and household environment factors are controlled, gender effects on morbidity remain significant. It is worth noting that morbidity is measured by self-reported sickness in this study, so it depends on respondent's perception of illness. To some extent, women have higher likelihood to report sickness than men probably because they concern more about health as compared to men. Actually, gender differentials in health status are influenced by an interaction of complex biological, social economic and cultural factors (Elman, 1997). So single indicator, like socio-economic factors, is not enough to investigate the gender morbidity differentials. Age significantly increases the reporting of sickness. Compared to young adulthood groups, adults aged over 40 have higher odds ratios of reporting sickness. In the last model, adults aged 70 and older are almost three times

more likely to report illness more than adults age 20-29 years. After controlling socio-economic and household environment factors, the effect of age on morbidity status change significantly in older age group. It suggests that some of the higher reported morbidity of the old people is associated with their different social economic and household environment statuses when compared to young adults.

Although descriptive analysis suggests that morbidity differentials maybe related to marital status, the result show marital stats has no significant effect on reported morbidity in multiple analysis and marital status is not associated with reported morbidity status.

In the literature, one of the most important factors governing the health status of a population is its educational level. Therefore, it was also hypothesized that the highest prevalence of morbidity were in those with lowest educational attainment. This is consistent with our study in rural Kanchanaburi. In descriptive analysis, it shows that people with no education and primary schooling have the highest morbidity level compared to other education groups. Although both male and female reported illness level decrease with higher education level, female always have the higher morbidity level in all education attainment groups compared to male. For younger adults and adults over 60, the data show reported morbidity status change little among different educational attainment groups. It might suggest that education has more significant effect on morbidity status in middle adulthood than younger and older adulthoods. In multiple analysis, it shows that people with secondary and higher education attainment have lower odds of reporting sickness compared to people with no education. It indicates that educational attainments have a significant effect on reported morbidity status in rural Kanchanaburi.

As shown in the literature, morbidity status is also attributed to economic status differentials. Therefore, it was also hypothesized that people with higher economic position could have lower reported morbidity level. However, we can not get the evidence from our study to support this hypothesis. There are no significant morbidity differentials among different household income and occupation groups. In this setting, economic factors are not strongly associated with reported morbidity status and they are not major factors in determining morbidity status in rural Kanchanburi. It also must be mentioned that income is always questionable about its validity, especially in

rural area where household income is very difficult to measure accurately. In addition, occupation categories might be too crude to analyse in this study, which might affect our result to some extent.

Another hypothesis is that people with better household environment status may have lower reported morbidity level. In descriptive analysis, it shows a little morbidity differentials by different household environment factors. In multiple analysis, it shows that type of house and sanitation have significant effect on reported morbidity. It is consistent with pass studies, people without their own toilets have much higher likelihood of reporting sickness than those with their own toilets. People living in house built from the traditional materials are less likely to report sickness. It does appear that a modern life style is associated with a greater probability of reporting sickness. However, this does not appear to be the results of higher income, as household income is not significantly associated with reporting sickness. It is an unexpected result that water supply does not have a statistically significant association with reported sickness and it is also not consistent with those studies in literature that water supply is a critical component of health status in rural area. Actually, compared to other developing countries, Thailand has the better household environment status in rural area. In descriptive analysis, it shows 75 percent of people living in house built from the modern materials, 62 percent of people whose household have pipe water system in their houses and 85 percent of people whose household have their own toilets in rural Kanchanaburi. It indicates that most of people live under a better household environment, which might explain why there are no much morbidity differentials by household environment factors in rural Kanchanaburi to some extent. However, it must also be mentioned that sanitation status has a significant effect on reported morbidity and we still can not neglect household environment effects on morbidity.

In conclusion, age, sex, educational attainment, and sanitation status are determinant factors affecting on morbidity status in rural Kanchanaburi, and there are significant morbidity differentials among these groups. There are no significant association between household income, nor occupation status and morbidity status. It seems that economic factors are not major factors affecting morbidity status in this

setting. In addition, this study does not find a significant effect of water supply on morbidity status.

5.2 Recommendation

Based on the study's findings, recommendations are made in relation to programs and research.

5.2.1 Program recommendation

Improving the adult health in rural area of developing countries is one of the greatest challenges for health policy makers. The goal of the Thai government is to provide primary health care to cover all communities in rural areas, but there has been a disparity of provision of primary health care among rural areas. In this study, it shows that there are significant morbidity differentials among some groups in rural Kanchanaburi DSS. Health policy and program should be flexible taking into consideration the distinctiveness of different social groups.

Informations on regional differentials on morbidity are necessary. Prevention program planning should be made according to morbidity pattern and health situation in these small rural regions.

Greater attention needs to be paid to health status of women and older people who have higher morbidity level. It appears that those groups are more likely to suffer from diseases and which can have major impacts on their quality of life.

This study also suggests that we need to educate people and to improve sanitary facilities in order to reduce morbidity in rural areas. It is proved that educational level is one of the most important factors governing the health status of a population, especially in middle adulthood groups. The data also showed the high proportion of illiterate people in rural Kanchanaburi. So programs should be conducted in order to improve the education level in this area. The information about sanitation and other environment factors still should be stressed.

5.2.2 Research recommendations

Both the concept of morbidity and its measurement are plagued by conceptual and methodological difficulties. In this study, the focus is placed on self-reported measures of morbidity. It is also necessary to check the categorized diseases by demographic and socio-economic factors in order to predict morbidity pattern accurately in future study.

Although this thesis studies morbidity differentials among four rural strata, it is difficult to check the relationship between morbidity and strata because strata is multiple concept in this study. There is a need for deeper analysis of regional patterns of morbidity in rural Kanchanaburi through geographical data sets. It also should be checked whether region differentials in morbidity can be explained by other factors which are not related to individual socio-economic characteristics.

The focus of the future research should investigate the sex and age differences in morbidity, especially to the morbidity status of women in reproductive period and older people in rural area.

Education shows the significant effect on the morbidity level in this study. However, there is still a need for more elaborated analysis of association between educational attainment and morbidity status after controlling other socio-demographic factors. It is also necessary to examine the educational effects on morbidity status between women and men, among different age groups.

Although socio-demographic factors have significant effects on morbidity status, there are other determinants that have been found in other studies to correlate with morbidity status. Among other things are health risk behaviors, self-care behavior, health-seeking behaviors, and the more general functional limitations. It might be useful for future research to consider including these measures in the survey instrument.

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