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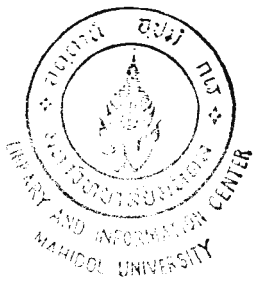

DISABILITIES AND ACTIVE LIFE EXPECTANCY IN THE THAI ELDERLY POPULATION

PIMPA KACHONDHAM

ได้รับปริญญา
จาก
บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล

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DISABILITIES AND ACTIVE LIFE EXPECTANCY IN THE THAI ELDERLY POPULATION

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The purposes of this study are: 1) to estimate the prevalence rates of disabilities by age and sex in the elderly population 2) to examine the factors aaffecting the prevalence of disabilities, and 3) to examine the quality of life in term of active life expectancy. The data source is the cross-sectional survey from the 1995 Health Interview Survey of the Population Aged 50 and Over in Thailand, conducted by the Ministry of Public Health, the Institute of Population Research, Chulalongkorn University, the Thailand Health Research Institute, the National Health Foundation, and the Health System Research Institute. Only the persons aged 60 and over are used and the sample size is 4,483 cases.

The Nagi's concept, the disablement process proposed by Verbrugge and Jette, and the disability transition propositions proposed by Myers and Lamb are adopted as the framework. The disability status is categorized as no disability, disability in instrumental activities of daily living (IADLs disability), and disability in activities of daily living (ADLs disability). The hypotheses are 1) elderly men are healthier than elderly women, and 2) educational attainment has the inverse relationship with the prevalence of disabilities.

The result revealed that the majority of the elderly had no ADLs disability, only 7 percent of the elderly had difficulty in walking around inside the house but almost one-third reported having IADLs disability. Prevalence of disabilities was higher in elderly women. Traveling alone by car or boat was found to be the toughest task especially for female elderly. Both IADLs and ADLs disabilities increased with age. The multivariate analysis using Ordered Logit Regression demonstrated that functional limitations were found to be strongly related to both IADLs and ADLs disabilities. Gender and educational attainment were found to significantly influence both types of disabilities even after controlling other variables ($p<.001$). However, it was not certain whether the higher prevalence of disabilities in women reflected the real phenomenon or it was mainly due to a higher self-concern in women.

The 1995-1996 abridged life table for population in Thailand produced by the National Statistical Office is the basis of life expectancy and the Sullivan method is employed to estimate the proportion of active life expectancy at age 60 and over. The analysis revealed that the life expectancy at age 60 and over was longer in women than in men. However, the proportion of active life (free of disabilities) in women was shorter than that in men in every age. The analysis also confirmed the hypothesis that elderly men were healthier than elderly women.

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พิมพา ขจรธรรม : ภาวะพิการและอายุคาดเฉลี่ยที่ปราศจากความพิการของผู้สูงอายุในประเทศไทย (DISABILITIES AND ACTIVE LIFE EXPECTANCY IN THE THAI ELDERLY POPULATION). คณะกรรมการควบคุมวิทยานิพนธ์ : วรชัย ทองไทย, Ph.D., ปราโมทย์ ประสาทกุล, Ph.D., สุมาลี ดีจงกิจ, Ph.D. 149 หน้า. ISBN 974-664-965-5

การศึกษาครั้งนี้เป็นการศึกษากลุ่มประชากรผู้สูงอายุชาวไทยที่มีอายุตั้งแต่ 60 ปีขึ้นไป โดยมีวัตถุประสงค์เพื่อ 1) ประมาณค่าความชุกของความพิการในผู้สูงอายุโดยแยกตามกลุ่มอายุและเพศ 2) ศึกษาปัจจัยที่มีอิทธิพลต่อความพิการ และ 3) ประเมินคุณภาพชีวิตโดยพิจารณาเฉพาะด้านอายุคาดเฉลี่ยที่ปราศจากความพิการ โดยใช้ข้อมูลจาก การสำรวจสุขภาพประชากรวัย 50 ปีขึ้นไปของประเทศไทย ปี พ.ศ. 2538 ดำเนินการโดย กระทรวงสาธารณสุข สถาบันประชากรศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย สถาบันวิจัยสาธารณสุข มูลนิธิสาธารณสุขแห่งชาติ และสถาบันวิจัยระบบสาธารณสุข โดยคัดเฉพาะผู้ที่มีอายุ 60 ปีขึ้นไปจำนวน 4,483 รายเท่านั้น

การพิจารณาความพิการใช้แนวคิดของ Nagi สำหรับแนวทางการศึกษาใช้กรอบกระบวนการความพิการของ Verbrugge และ Jette และ แนวคิดเกี่ยวกับการเปลี่ยนผ่านของความพิการ ของ Myers และ Lamb เป็นแนวทาง แต่พิจารณาเฉพาะความจำกัดในการทำกิจวัตรประจำวัน (Activities of daily living, ADLs) และความจำกัดในการทำกิจวัตรที่ถือว่าเป็นการพึ่งตนเอง (Instrumental activities of daily living, IADLs) เท่านั้น โดยมีสมมติฐานว่า ผู้สูงอายุชายจะมีภาวะสุขภาพดีกว่าผู้สูงอายุหญิง และ การศึกษามีความสัมพันธ์ผกผันกับความชุกของความพิการ

ผลการศึกษาพบว่า ผู้สูงอายุส่วนใหญ่ไม่มีความพิการ มีผู้สูงอายุเพียงประมาณร้อยละ 7 เท่านั้นที่มีความจำกัดในการทำกิจวัตรประจำวัน ซึ่งกิจกรรมที่มีปัญหามากที่สุดคือ การเดินไปมาภายในบ้าน และประมาณหนึ่งในสามของผู้สูงอายุมีความพิการประเภท มีความจำกัดในการทำกิจวัตรที่ถือว่าเป็นการพึ่งตนเอง ซึ่งกิจกรรมที่ผู้สูงอายุมีปัญหามากที่สุดคือ การเดินทางนอกบ้านด้วยตนเอง การวิเคราะห์ปัจจัยที่มีอิทธิพลต่อความพิการด้วย Ordered Logit Regression พบว่าผู้สูงอายุหญิงมีความพิการมากกว่าผู้สูงอายุชายอย่างมีนัยสำคัญทางสถิติ ($p < .001$) และพบว่าผู้สูงอายุที่มีการศึกษามีโอกาสที่จะมีความพิการน้อยกว่าผู้ที่ไม่มีการศึกษาอย่างมีนัยสำคัญทางสถิติ ($p < .001$) อย่างไรก็ตาม การศึกษานี้ไม่สามารถพิสูจน์ได้ว่า การที่ผู้หญิงมีอัตราความพิการสูงกว่าผู้ชายนั้นเนื่องมาจากมีความพิการจริงๆ หรือเป็นเพราะว่า ผู้หญิงมีความใส่ใจในสุขภาพมากกว่าผู้ชาย

การศึกษาอายุคาดเฉลี่ยที่ปราศจากความพิการ ตั้งแต่อายุ 60 ปีขึ้นไปโดยใช้ ตารางชีพซึ่งจัดทำโดยสำนักงานสถิติแห่งชาติ พ.ศ. 2539 เป็นฐานและวิธีการของ Sullivan พบว่า ถึงแม้ว่าผู้หญิงมีอายุคาดเฉลี่ยมากผู้ชายในทุกกลุ่มอายุก็ตาม แต่เมื่อพิจารณาจากสัดส่วนของช่วงเวลาแล้วพบว่าช่วงเวลาที่มีความพิการจะมากกว่าผู้ชายในทุกกลุ่มอายุ ซึ่งผลการศึกษานี้ก็ยืนยันสมมติฐานว่าผู้ชายสูงอายุมีสุขภาพดีกว่าผู้หญิงสูงอายุ

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CHAPTER I

Introduction

1.1 Introduction:

The success of the family planing program during the past three decades along with the decline in mortality rates had led to the change of the age structure of the population. From young population in the past, Thailand will gradually become the old population in the future. According to the Population projections for Thailand, the proportion of the population aged 60 and over will increase from 8.1 % in 1995 to 9.2 %, 10.2 %, 11.4% and 13.2 % in 2000, 2005, 2015 and 2025 respectively (National Economic and Social Development Board, 1990-2020). Thus the elderly will increasingly become the large subgroup of the population and will pose a new challenge to the Thai society in the future.

The advance in medical technology has led to the increase in life expectancy of the population. All nations have experienced continuous improvement in life expectancy at birth, although at different rates. As people live longer, the quality of that longer life becomes a central issue. There is considerable debate over the implications of recent mortality changes for the aggregate health characteristics of the elderly population. On the one hand, there have been questions concerning that postponing mortality from some diseases or injury may cause many people to live with disabilities. (Gruenberg, 1977;

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Kramer, 1980; Olshansky et al., 1991). On the other hand, there is some evidence showing that it is possible to compress chronic illness into the last few years of life, so that the proportion of healthy life can increase (Fries 1980, 1983; Manton 1982).

In an effort to explain the relationship between mortality, morbidity and disability, the World Health Organization Scientific Group meeting on the Epidemiology of Aging developed a model in 1984 which was further elaborated by Manton and Soldo (1985) as shown in figure 1. The model was constructed from a series of life table survival curves that describe the change in the proportion of a cohort that expect to survive to a given age without one of three basic types of health events occurring – morbidity, disability, or mortality. In this model, one more component was added to the conventional survival curve in order to complete a description of the health status of the elderly population. This component, disability curve, represents the loss of functional ability (increased dependence and loss of autonomy) that accompanies advancing age.

In figure 1 the horizontal axis represents age and the vertical axis describes the probability of surviving to a given age without suffering one of the three critical health events. The spatial relations of the three curves have substantive interpretations in terms of the changing health burden on society of age-related morbidity and disability. The area A represents the number of person-years spent free of disease, the area B represents the number of person-years spent with chronic disease but unimpaired, and area C represents the number of person-years a given cohort can expected to be disabled. Area between A

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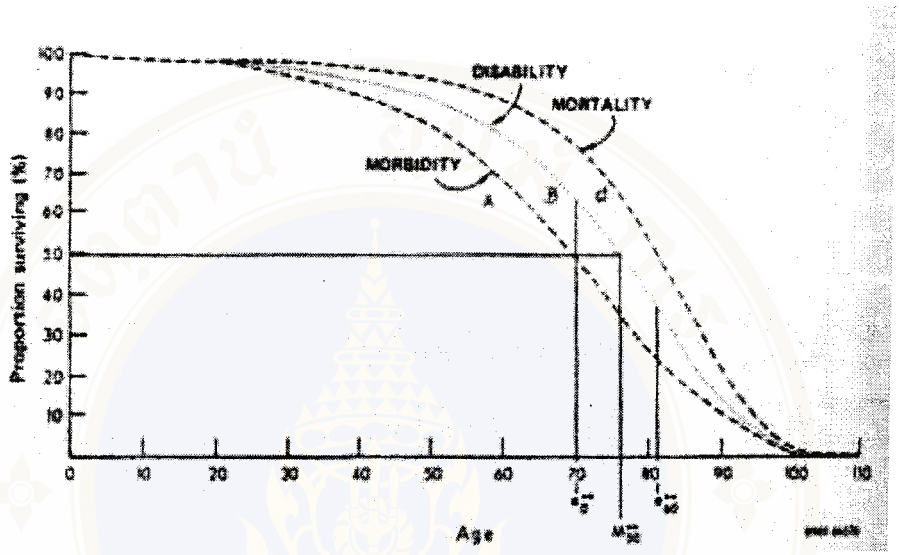
and B combined represent a measure of the potentially productive or *active life expectancy.*



Source: WHO (1984 : 29)
Figure 1 : The observed mortality and hypothetical morbidity and disability survival curves for female in the United States of America, 1980

Until recently, it has been assumed that ageing is accompanied by physiological change that may lead to impaired functioning of several body systems. However, more recent researches on ageing have challenged the inevitability of the linkage of severe functional loss and impairment with age. A number of new studies have shown that the rate of decline of physiological parameters and function with age found in prior studies was, in part, a product of design flaws (Manton, 1989). The current scientific evidence suggests that though there is certainly a strong correlation of functional loss with age, function can be preserved to more advanced age and at higher levels than was previously believed by appropriate early prevention (Fries, 1980; Manton, 1989). Some physical

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process generating impairment are subject to intervention and, in some cases, may even be partly reversed and function again.

The change in the health care system during the 20 th century from the treatment of acute illness to chronic illness management has raised the concern and need to focus on the consequences of the disease/health condition rather than the disease alone. With the increasing importance of chronic and non-communicable illness and the ageing of the population, the consequences of disease gained in significance because of the lifelong management needs. Instead of cure, functional management of the condition was the goal and outcomes became the standard for measuring the performance of the health care delivery and its effectiveness (WHO, 1997)

Most of the research in the aging population focuses on impairments or diseases and mortality, which are of little use in estimating individual's functional capacity. Impairments that cause no disability are of little importance for care of the elderly, since it is the maintenance or restoration of autonomy and independence that are at issue. Therefore, in the case of the elderly, autonomy becomes a reasonable proxy for health. A measure of autonomy is the degree to which men and women are able to function as they wish to function. This is affected by several factors such as cultural as well as health factors. Impairments represent only one element in the array of medical, social, and economic factors that may condition the likelihood of disability.

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In recent decades, there has been increasingly concern about the availability and consistency on the national data on disabled people. The most basic question commonly asked is "How many people with disabilities are there in the population?" Policy makers, planners and programme managers in all sectors are requesting statistical information on topics related to disability and rehabilitation. In order to answer this question, decisions must be made about how disability should be defined and measured. Unfortunately, there is still no general agreement with respect to the conceptual definition of disability, and no standard for measuring disability in old age (Freedman & Soldo, 1994; Pope and Talov, Eds., 1991: 77). Attempts to define the operational concept of autonomy have met with difficulties. Consequently, WHO (1980) proposed the interrelated concepts of impairment, disability and handicap as alternative ways of measuring outcome. This International Classification of Impairments, Disabilities, and Handicaps (ICIDH) is used widely around the world especially in the European countries. However, this concept has stimulated extensive discussions on disability concepts both positive and negative review in the literatures and several frameworks have been proposed as the alternative but the most accepted is the one proposed by Nagi (1965) (Haber, 1990; Nagi, 1991; Verbrugge and Jette 1994).

Disability among the aged have not received much attention in Asian and Pacific region even though The World Programme of Action Concerning Disabled Persons (1983-1992) laid out three goals: prevention, rehabilitation and equalization of opportunities (Nayar, 1996). This is also true for Thailand and very little data are available. Surveys of

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the people with disabilities in Thailand often focus on measuring impairment according to the category classified in the 1991 Rehabilitation Act. (Siripanich, 1985; NSO, 1986, 1991; Wibulpolprasert et al., 1997; IPSR, 1998). There is also no agreement about the definition of disability yielding difference estimations on people with disabilities.

Thus, this study is intended to examine and explain the discrepancies in the prevalence rates of disability in the elderly population in Thailand. Factors associated with disability will also be explored even though the causal relationship can not be elaborated due to the limitation of the cross-sectional data. In addition, the quality of life of the elderly population will be depicted in term of the proportion of active life expectancy to total life expectancy. Knowing about the risk factors associated with disability will enhance the understanding of the disablement process and may be useful for policy formulation and implementation in preventing or postponing disability and lessening any handicap conditions that likely to occur following disability. Effective planning for medical, rehabilitation and social services requires estimates of the numbers and characteristics of current and future disabled people. Thus, the outcome of this study may be useful for policy formulation that will make the quality of life of this special group of population better.

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1.2 The Objectives of the Study:

1) To estimate the prevalence of disabilities in each sex and age group.

2) To examine the factors affecting the prevalence of disabilities in the elderly population.

3) To estimate the proportion of active life expectancy to the total life expectancy of men and women at age 60 and over.

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CHAPTER II

Literature Review

2.1. Concept and Definition of Disability

Estimated number of persons with disabilities across the world varies significantly depending upon the definition. Terminology used in disability-related field has long been the subject of controversy as stated by Pope and Talov (1991:34) "*Although understanding of the medical, behavioral, social and economic aspects of disability is growing, terminology continues to breed confusion, even among professional in disability-related field..... Such confusion and inconsistency are common in emerging fields*". Several frameworks have been advanced to describe disability-related concepts, but none has been universally adopted. Differences in definition yield differences in the prevalence of disability and this is an obstacle for conducting research. Currently, there are two major conceptual frameworks in the field of disability that have been used worldwide: the International Classification of Impairments, Disabilities, and handicaps (ICIDH), and the "functional limitation," or Nagi's framework. This section will describe these two frameworks which have been frequently adopted for conducting many disability-related studies.

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2.1.1 The International Classification of Impairments, Disabilities, and Handicaps (ICIDH) (WHO, 1980)

The International Classification of Impairments, Disabilities, and Handicaps (ICIDH), was developed by WHO in 1980 in the intention of providing a framework parallel to the International Classification of Disease by emphasizing on extending the consequences of disease. The framework has four basic concepts: disease, impairment, disability, and handicap (figure 2). These four concepts are defined as follows:

a) Disease: *Something abnormal occurs within individual*; this state refers to the intrinsic pathology or disorder that occur at birth or acquired later and give rise to changes in the structure or functioning of the body. Pathological change may or may not make themselves evident; when they do they are described as "manifestations", which in medical parlance, are usually distinguished as "symptoms and signs".

b) Impairment: *Someone becomes aware of such an occurrence*; in other words, the pathological state is *exteriorized.* In the context of health experience, impairment is any loss or abnormality of psychological, physiological, or anatomical structure or function that may be temporary or permanent. In behavioral terms, the individual has become or been made aware that he is unhealthy. The losses or abnormalities include the existence or occurrence of an anomaly, defect, or loss in a limb, organ, tissue or other structure of the body, including the systems of mental function. Impairments represent disturbances at the organ level. Functional limitations are now regarded as aspect of impairment.

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WHO classified impairments (I code) into 9 categories: Intellectual impairments, Other psychological impairments, Language impairments, Aural impairments, Ocular impairments, Visceral impairments, Skeletal impairments, Disfiguring impairments and Generalized, sensory, and other impairments.

c) Disability: *The performance or behaviour of the individual may be altered* as a result of this awareness, either consequentially or cognitively. In the context of health experience, a disability is any restriction or lack (resulting from impairment) of ability to perform an activity in the manner or within the range considered normal for a human being. Disability may be temporary or permanent, reversible or irreversible. Disability is concerned with compound or integrated activities expected of the person or of the body as a whole, such as is represented by tasks, skills, and behaviour. The key feature of disability relates to *objectification* that is the problem being made objective because the activities of the body are interfered with.

In this framework, disability concerned with what happens in a relatively neutral way, rather than with the idea or any judgements that may attach to. Disabilities represent the disturbances at the level of the person. WHO classified disabilities (D code) into 9 categories: Behaviour disabilities, Communication disabilities, Personal care disabilities, Locomotor disabilities, Body disposition disabilities, Dexterity disabilities, Situational disabilities, Particular skill disabilities and Other activity restrictions.

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d) Handicap: *Either the awareness itself, or the altered behaviour or performance to which this gives rise*, may place the individual at a disadvantage relative to others, thus *socializing* the experience. In the context of health experience, handicap is a disadvantage for a given individual, resulting from impairment and disability, that limits or prevents the fulfillment of a role that is normal (depending on age, sex, and social and cultural factors) for that individual. Handicap is a social phenomenon in the essence that this concerned with the value that is attached to the individual's performance. This valuation depends on cultural norms in that society. Thus, this state poses the most problematical plane of disease consequences

WHO classified handicaps (H code) into 7 categories: Orientation handicap, Physical independent handicap, Mobility handicap, Occupation handicap, Social integration handicap, Economic self sufficiency handicap, and Other handicap.

The relationship between these four concepts is complex. Handicap may result from impairment without the mediation of a state of disability. Individual can be impaired without being disabled, and disabled without being handicapped. Example is *an individual with red-green color blindness has impairment, but it would be unlikely to lead to activity restriction (disability).* Whether the impairment constitutes a handicap would depend on circumstances - if his occupation were agricultural he might well be unaware of his impairment, but he would be at a disadvantage if he aspired to drive a railway engine, because he would be prevented from following this occupation. Another example of being handicapped without

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being disabled is someone who recovered from acute psychotic episode but who bears the stigma of being a "mental patient"(WHO, 1980).

2.1.2 Nagi's Framework:

This concept was developed by Saad Z. Nagi, the sociologist, in 1965 and was later revised in 1991. It also has four central concepts: Active Pathology, Impairment, Functional Limitation and Disability (figure2.1). This concept has recently gained a strong following among disability researchers (Pope and Tarlov, Eds., 1991: 76-108; Verbrugge, 1991; LaPlante, 1991 Verbrugge and Jette, 1994). These four concepts are defined as follow: (Nagi, 1991; Nagi, 1965)

a) Active Pathology: This state may result from infection, trauma, metabolic imbalance, degenerative disease process, or other etiology. Such a condition involves 1) interruption of or interference with normal process, and 2) the simultaneous efforts of the organism to regain a normal state. Predisposing factors that can lead to pathology such as biological, life style and behavior, or environmental (physical or social) are called risk factors.

b) Impairment: This state refers to a loss or abnormality of an anatomical, physiological, mental, or emotional nature. The concept comprises three distinct categories:

1) all conditions of pathology, which are by definition impairments because such conditions involve anatomical, physiological, mental, or emotional deviation;

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2) residual losses or abnormalities that remain after the active state of pathology has been control or eliminated (e.g. residual paralysis) ; and

3) abnormalities not associated with pathology (e.g. congenital formations).

Thus, although every pathology involves an impairment, not every impairment involves a pathology. An impairment may be presented without active pathology such as an abnormality or losses of a residual nature that remained after an active pathology has been halted or eliminated such as a person with healed amputation. A specific impairment might have different etiologies and different types of pathology. The severity of impairment varies by conditions, by the tissues and organs affected, and by the extent to which tissues and organ are damaged. (Pope & Tarlov, Eds.,1991:80)

c) Functional limitation: This state refers to manifestations at the level of the organism as a whole. All functional limitations result from impairments, but not all impairments lead to functional limitation. Several factors other than the nature and degree of impairment affect functional performance. Two individuals with the same pulmonary function level may be different in capacity to climb upstairs. Such variation may be related to the capacities of the individual' s other body systems (e.g., cardiovascular fitness, muscle strength, or pain tolerance) (Pope & Tarlov, Eds., 1991: 80). Functional limitations are the most direct way through which impairments contribute to disability. However, certain disfiguring or stigmatizing impairments can lead directly to disability without the involvement of functional deficit.

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Verbrugge and Jette (1994) further distinguished this state as restriction in performing fundamental physical and mental actions used in daily life by one's age-sex group. Such fundamental physical *actions* include overall mobility, discrete motion and strengths, trouble seeing, trouble hearing and trouble communicating; examples are walking, lifting objects, climbing stairs, reading standard-size print and hearing other people speak in a room. Basic mental actions include central cognitive and emotional functions: examples are short-term memory, intelligible speech, alertness in daytime activities, orientation in time and space and positive affect.

d) Disability: This state refers to social rather than to organismic functioning. It is an inability or limitation in performing socially defined roles and tasks of an individual within a sociocultural and physical environment. Disability reflects the gap between a person's capacities and the demands of the environment. Not all impairments or functional limitations precipitate disability, and similar patterns of disability may result from different types of impairments and functional limitation. A specific impairment will not necessarily have the same impact on activities that different people can do. Several factors contribute to shaping the dimensions and severity of disability such as:

1) the individual's definition of the situation and reactions, which at time compound the limitations;
2) the definition of the situation by others, and their reactions and expectations - especially those who are significant in the lives of the person with the disabling condition (e.g., family members, friends and associates,

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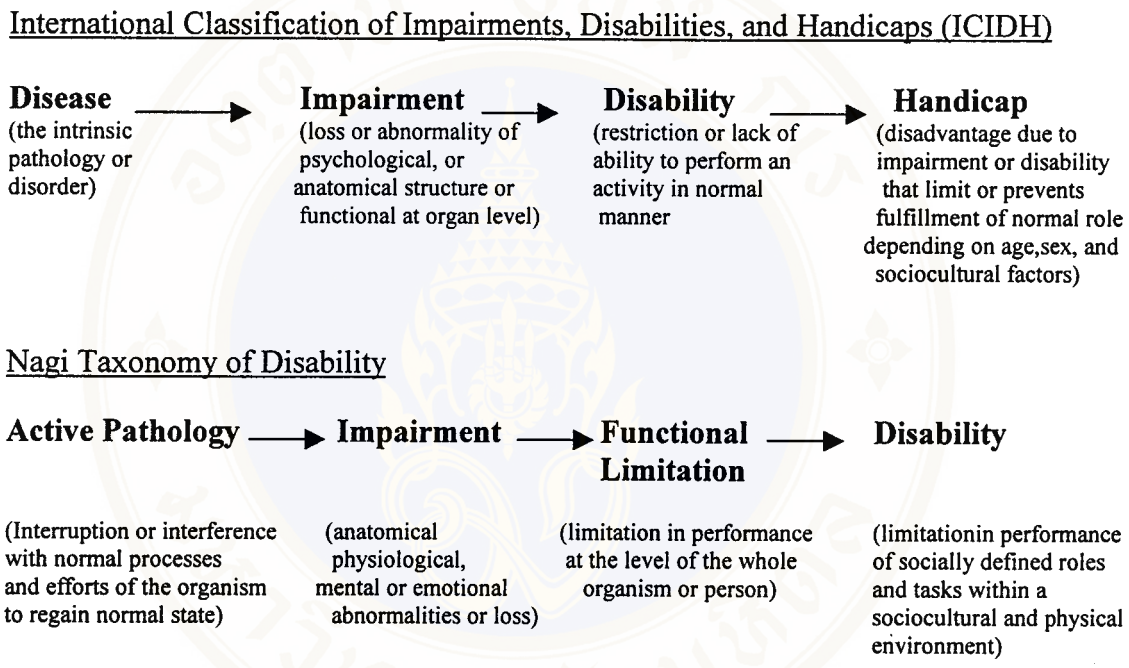
employers and co-workers, and organizations and professions that provide the services and benefits); and

3) characteristics of the environment and the degree to which it is free from, or encumbered with, physical and sociocultural barriers.



Source: Verbrugge and Jette (1994:2)
Figure 2 : Two conceptual schemes for disablement

There is not much disagreement over the terms *pathology* and *impairment* because the concepts base on the medical context. However, the term *functional limitations* and *disability* had been the topic of controversy as Verbrugge and Jette (1994:6) pointed out "*In the absence of a well-accepted conceptual scheme, the scientific literature on disability contains a bedlam vocabulary. Terms have been invented and operationalized in myriad ways……Combining words usually*

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obscures rather than illuminates the matters (e.g. "functioning disabilities, impaired physical functioning in daily living activities"

In order to differentiate between these two concepts, LaPlante (1991) and Verbrugge and Jette (1994) used the typology "*actions* versus *activities*" and "*task* versus *role*". *Actions* are the basic units of human performance (Homans, 1974 in LaPlante, 1991). Example of *actions* are walking, lifting objects, climbing upstairs, reading standard-sized print, and hearing other people speak in a room, talking, thinking, and remembering. Functional limitations usually refer to actions that individual performed. *Activities* encompass the occupying roles like student or teacher. Playing, working, reading a newspaper are examples of activities. Personnel care (activities of daily living; ADLs) and household management (instrumental activities of daily living; IADLs) are the aspects of disability because they are activities a person does as a member of society even if they occur in private, rather than public, settings (Verbrugge & Jette 1994).

Nagi, on the other hand, did not differentiate these two concepts by action - activity but concerned about the essence of roles (Nagi, 1991). Roles are learned, organized, and purposeful patterns of behavior and not isolated muscle responses. Activities of daily living are learned, organized, and purposeful patterns of behavior. They required organized locomotor and neurologic functioning and are prominently influenced by cultural forces and learning (Katz et al., 1963, 1976). These activities are part of the set of expectation in the family, vocational, and a variety of other roles.

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Pope and Tarlov (1991) elaborated the distinction of disability from pathology, impairment, and functional limitation by pointing out the role of factor external to the individual. "*Disability is defined by the attributes and interactions of the individual and environment, where as the preceding stages are defined solely by characteristics of the individual. For example, whether a person with an impairment is able to work depends not only on the nature of severity of his or her impairment and resulting functional limitation, but also on such factors as the state of the economy, characteristics of the work place, availability of transportation, and the individual's particular work skills and training*" (Pope & Tarlov, Eds.,1991:82).

In summary, there is no general agreement with respect to the conceptual definition of disability, and no - standard for measuring disability in old age. Operational measures of functional disability vary across surveys (Freedman & Soldo, 1994). Statistical information about people with disabilities varies from countries to countries. Moreover, even within the same country, prevalence of disabilities differed according to the definition and measurement used. Most of the developing countries adopt the concept of impairment while countries in Europe and Northern America either adopt the concept of disability or functional limitation or combining the two concepts (UN, 1996). The concepts of disability used in most of the major national surveys in the USA such as The National Health Interview Survey (NHIS) 1992, The National Long Term Care Survey 1982, 1984, and 1989 stem from the concepts of activity limitation. In the NHIS survey, disability refers to the state of being limited, due to a chronic mental or physical health condition, in the type or amount of activities

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that a person is expected to perform. The types of such normative activities depend principle on age. The NHIS defines these major activities as

1) ordinary play for children under 5 years of age;
2) attending school for children and adolescents 5-17 years of age;
3) working or keeping house for people 18-69 years of age; and
4) capacity for self care (for example, the ability to perform such activities of daily living (ADL) as bathing, dressing, eating, or getting around the home without the help of another person) and home management (for example, the ability to perform such instrumental activities of daily living(IADL) as doing household chores, doing necessary business, shopping, or getting around for other purposes without the help of another person) for those 70 years of age and over (LaPlante & Carlson, 1998).

In the American with Disability Act (ADA), the definition of a person with a disability as meeting one or more of the following criteria:

a) A physical or mental impairment that substantially limits one or more of the major life activities of such individual.
b) A record of such an impairment.
c) Being regarded as having such an impairment.

A major life activity means functions such as caring for one's self, performing manual tasks, walking, seeing, hearing, speaking, breathing, learning, working, and participating in community activities (U.S. House of Representatives, 1990 in LaPlante, 1991).

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The definition used in ADA differ from most of the disabilities related researches in that it includes persons with impairments who are not limited in major life activities, but are perceived by others to be limited.

In Thailand, according to the Rehabilitation Act 1994, people with disabilities are classified into 5 categories (Office of Committee on Rehabilitation of Disabled Persons, 1991). Classification system is based on the concept of impairment and functional limitation. These 5 categories are

a) Persons with visually impairment.
b) Persons with hearing impairment /communication disorder.
c) Persons with physically impairment /mobility disorder.
d) Persons with mentally impairment/ behavioral disorder.
e) Persons with intellectual disorder.

2.2 Measurement of Disability

A wide range of instruments has been developed for the assessment of physical functioning in aging populations. It is important to recognize that physical functioning is just one of the many domains of functioning that are important to consider in evaluating overall health status and the impact of disease. Verbrugge (1991) argued that other domains of human activity are just as important and should be considered in disability research as well. Those domains of human activities are personal care (ADLs); house and yard chores (include most IADLs); shopping and errands; job (paid work); hobbies and other leisure at home; active sports and physical

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recreation; entertainment away from home; religious services or activities; public service, clubs, and adult education, socializing with friends and relatives; local transportation etc.

These domains are interrelated. Any measure of physical functioning will have a cognitive component, and social functioning is strongly related to all the other domains of function. The relationships must be considered when developing and interpreting measures of physical functioning (Guralnix & Lacroix, 1992).

However, most surveys focus only two domains of activity: personal care (called activities of daily living, or ADLs) and household management (called instrumental activities of daily living, or IADLs). These two domains are just two aspects of daily life. They are important because they considered obligatory for survive and independent living.

2.2.1 The Activities of Daily Living (ADLs)

The most commonly assessed measures of functioning are self-care activities that are usually known as activities of daily living (ADLs). This measure was originally developed in 1963 by Katz and colleagues as a result from a series of studies carried out at the Benjamin Rose Hospital in Cleveland, Ohio. The Index of ADLs was developed to study results of treatment and prognosis in the elderly patients with hip fracture. Design of the instrument is based on the theory that when functional ability is lost, it is recovered in a specific development sequence on the basis of primary biological and psychosocial function. The index reflects the adequacy of

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organized neurological and locomotor responses that are influenced by environmental and cultural force (Katz et al, 1963; Katz & Akpom, 1976; Katz, 1983).

The instrument includes six major functional categories score from A to G or other, with A being totally independent and G as being totally dependent in ADLs. Scoring is based on the patient' s ability to perform a task without assistance of another person. The original ADLs scale introduced by Katz and colleagues includes six functions: bathing, dressing, going to toilet, transferring, continence, and feeding which are activities that people perform habitually and universally. ADLs scale is usually arranged hierarchically from the most basic of human function (using the toilet and eating) to somewhat higher function (dressing and bathing). For most uses of ADLs, there are five basic activities, excluding continence that are always addressed. Although continence is an important area of assessment in older population, it is general not included in population estimates of ADLs impairment, as incontinence has many forms and may be present in persons who are otherwise in very good health (Guralnix & Lacroix, 1992).

The Katz Index of ADLs has been widely used for assessing disability in several U.S. national surveys such as the National Long-term Care Survey, the Supplement on Aging, the National Medical Expenditure Survey etc. It also has been useful to clinicians, researchers, and health service planners. Many investigators, however, have found this index is not very sensitive (Dittmar et al., 1997; Applegate et. al, 1990).

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2.2.2 The Instrumental Activities of Daily Living (IADLs)

The ADLs Index do not measure adaptation to the environment, and thus they underestimate the number of elders who can maintain themselves in the community (Spector et al, 1987; Rodger & Miller, 1997). Lawton and Brody (1969) developed the measure of instrumental activities to capture more complex maintenance life activities. The measurement is used to assess the abilities that are necessary for independent living in the community but are more difficult and complex than the personal self-care domain represented by ADLs. There are eight areas of assessment on the IADLs Scale: shopping, food preparation, house keeping, doing laundry, using transportation, taking medications, handling finances, and using the telephone. Originally, scores were based on observation of behavior and need for assistance and rating was done by social workers. The eight categories are rated according to three to five levels of independence. Higher scores indicated increased need for assistance. The IADLs Scale is gender specific. When administer to men, food preparation, house keeping, and laundry categories are usually omitted.

The IADLs incorporate more than just the physical domain of functioning and may be difficult to interpret as direct measure of physical functioning and disability. Cognitive functioning, motivation as well as opportunities to perform these activities will be important not only in influencing respondent's ability to answer questions about them but also in maintaining the ability to perform them. Persons residing in a nursing home may not have opportunity to prepare food or go shopping and may actually lose the ability to perform tasks that they were capable of performing before they entered the nursing home. Persons who report difficulty in shopping may

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be because of geographic location or availability of transportation. Nevertheless, the IADLs can serve a valuable role as indicators of need for help to perform tasks that are necessary if the individual is to continue to reside in the community (Guralnix & Lacroix, 1992). The IADLs Scale has been widely used in many surveys such as the National Health Interview Survey, Survey of Income and Program Paricipation, National Long-Term Care Survey, and Supplement on Ageing (Pope & Tarlov, Eds., 1991: 40-45 ; Dittmar, 1997).

2.3. Disability and the Disablement Process

Disablement is multidimensional phenomena. The term "disablement" refers to impacts that chronic conditions have on the functioning of specific body systems and on people's abilities to act in necessary, usual, expected and personally desired ways in their society. Verbrugge and Jette (1994) proposed the model of disablement process by adopting the Nagi scheme as the main foundation, but also drew on the scope of ICIDH. The model describes 1) how chronic and acute conditions affect functioning on person's abilities, and 2) the personal and environmental factors that speed or slow disablement, intervention inserted to avoid, retard or reverse it, and exacerbators that hasten it. This process encompasses both medical and social factors as so called "*sociomedical scope*". This model can be used to generate hypotheses in disability research, the association of specific diseases, associated impairments, functional limitations and risk of disability. The components of this model described by Verbrugge and Jette (1994) are as follow:

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2.3.1 The Main Pathway: there are four concepts within this pathway: pathology, impairment, functional limitation and disability.

a) Pathology refers to biochemical and physiological abnormalities that are detected and medically labeled as disease, injury or congenital/ developmental conditions. Examples of pathology are osteoarthritis, lung cancer, Alzheimer's disease, mental retardation etc.

b) Impairment is dysfunction and significant structural abnormalities in specific body systems. Impairments include anomalies, defects, or losses and relate to the specific functional system but not to the organism as a whole. A specific impairment might have different etiologies and different types of pathology. However, all pathologies are accompanied by impairments. Examples of impairment are absence or displacement of body parts, paralysis and stiffness of joint.

c) Functional Limitation is the term proposed by Nagi (1975, 1991) to describe effects manifested in the performance or performance capacity of person as a whole. All functional limitations result from impairments, but not all impairments lead to functional limitations. Example of functional limitations are the inability to lift a 25 pound box, to walking up stairs, reading standard-size print and hearing other people speak in a room. Functional limitations are the most direct way through which impairments contribute to disability. However, certain disfiguring or stigmatizing impairments can lead directly to disability without the involvement of a functional deficit (Nagi, 1991).

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d) Disability is the expression of a physical or mental limitation in doing activities in any domain of life (the domains typical for one's age-sex group) due to a health or physical problem. Disability refers to social rather than organismic function. As mentioned earlier, current studies on disability in the elderly often focus on just 2 domains of life such as personnel care (basic activities of daily living; ADLs), household management (instrumental activities of daily living; IADLs). These measures originated in industrial societies where debate has centered on long-term care systems and the ability of individuals to function in everyday life (Katz et al., 1983).

2.3.2 Risk Factors: Risk factors are demographic, social, life-style, behavioral, psychological, environmental and biological characteristics of an individual that can affect the presence and severity of impairment, functional limitation and disability. Risk factors may exist prior to the onset of a chronic condition or may appear after the onset of a disease.

2.3.3 Interventions: Interventions are processes introduced to reduce restriction/difficulties. They serve as "buffers". Interventions include medical care and rehabilitation, medications and other therapeutic regimens, external supports (personal assistance, special equipment and devices) modifications of the environment, life style and behavioral change, psychosocial attributes and coping, and activity accommodations. The locus of intervention can be intra-individual or extra-individual and can operate on all four features of the main pathway. Intervention is inserted during the disablement process in an effort to avoid, retard or reverse outcomes.

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Generally, medical interventions work on the left side (pathology and impairments); personal and allied health profession interventions work on the right side (functional limitations and disability); and societal interventions work on the far side (disability).

2.3.4 Exacerbators: Exacerbators are less common than interventions, but they can have great power in prompting or maintaining dysfunction. Exacerbators can happen in three ways:

(1) Intervention can go awry such as side effects of medical intervention.

(2) Adverse outcome of behavioral or attitude that individuals reacted to their health problem.

(3) Societal unresponsive to people with disability such as architectural barriers, social prejudice and disincentives from employment in disability insurance programs.

Exacerbators may be operating on all four features just like interventions but will have negative consequences for functioning.

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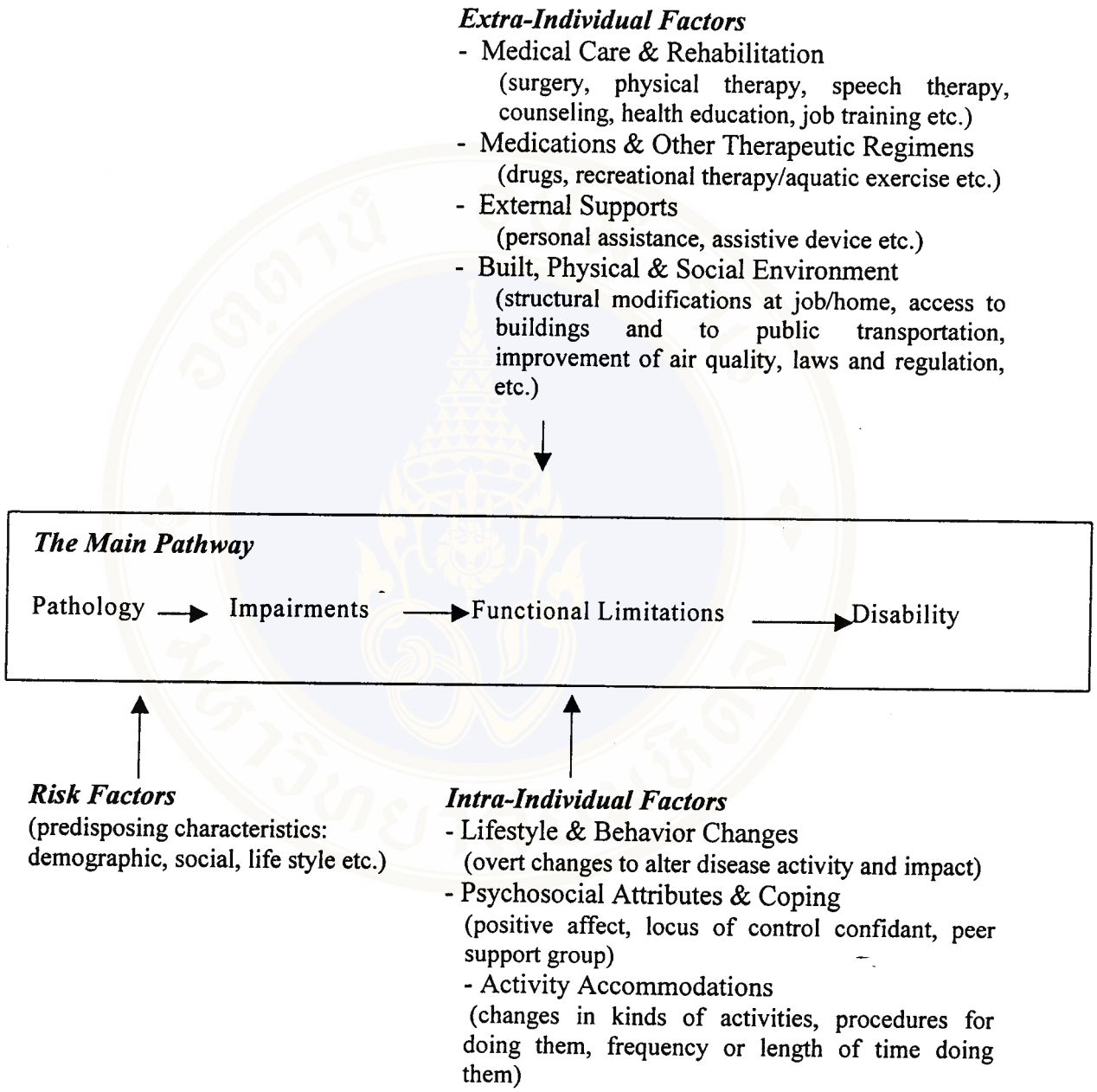
Model of the Disablement Process



Source : Verbrugge and Jette (1994:4)
Figure 3: A Model of the Disablement Process.

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So far, it is clear that the field of disability has not reached a consensus on the definition of disability. Up until recently, the ICIDH (the WHO framework) has been favored in public health and political settings, while the Nagi framework is preferred in scientific and clinical ones. But because of the conceptual clarity, the Nagi scheme has gained more acceptances from prominent health-related professional such as Centers for Disease Control, the Institute of Medicine (Verbrugge, 1991, Pope & Tarlov, Eds., 1991: 77). The ICIDH, which were developed by WHO, has stimulated an active and provocative critique of disability concepts and has received both positive and negative reviews. Some researchers pointed out that the ICIDH seems to have some internal inconsistencies and less conceptual clarity (Harber, 1990; Pope & Talov, Eds., 1991: 77; Nagi, 1991). Other reviewers have concluded that, despite its flaws, adoption of the basic ICIDH definitions would enhance understanding of disability definitions (Rehabilitation International and World Rehabilitation Fund, 1986). However, the term *handicap*, which has a negative connotation that was included in its classification, has led many disability researchers to accept the Nagi framework (Harber, 1990; Verbrugge & Jette 1994). Currently, the WHO is preparing an updated version of the ICIDH-2 which has different taxonomy from the ICIDH. The terms "Activities and Participation" are used to substitute for "Disabilities and Handicaps" respectively (WHO, no date). Thus, this paper will adopt the Nagi framework and the disablement process elaborated by Verbrugge and Jette to be used as the analytical base for the following section.

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2.4 Factors associated with Disabilities

As stated earlier, disability is multidimensional process and the relationship between various risk factors and disability is not simple. Progression from pathology to impairment to functional limitation to disability is not unidirectional. Identifying risk factors can be a first step to the understanding of the disablement process and to develop preventive interventions. Following are some of the risk factors that have been studied in the disability-related area.

2.4.1 Age

Age is strongly linked to disability. Increasing age increases the chance of becoming disabled. Older persons may have a greater risk of becoming disabled because they are more likely to have more chronic conditions such as arthritis, cancer, Parkinson's disease, ischemic heart disease, visual impairment, hearing impairment and senile dementia, which will likely to develop into disabilities later. In addition to clearly defined diseases, many physiologic and anatomical alterations both related to age and intrinsic to the individual contribute importantly to health status. These changes associated with ageing are linked with the additional appearance of chronic "geriatric conditions," such as hearing impairment, urinary incontinence. And underlying these "geriatric conditions" and physiologic alterations is a set of vulnerabilities associated with ageing that also puts the older adult at increasing risk of worsening health and death. Examples are increased susceptibility to heat and cold exposure, decrease immune responses to infection. (Fried & Wallace, 1991).

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2.4.2 Gender

Gender differences in function among older adult are not well understood. One proposal for greater disability among females relates to their longer survival from the onset of disability which means that while the incidence of disability is similar, the prevalence is higher in women (McGee et al., 1998). Others argued that women often report more functional problems than men. Difference in reporting of disability may be subject to gender role difference and thereby reflect cultural factors than disability (Roger et al. 1992, Johnson & Wolinsky, 1994). Rahkonen and Takala (1998) found that men reported more problems in some health conditions such as hearing problems while more women reported difficulties in climbing stairs and carry a heavy bag. Merrill et al. argued that gender difference in function is due to women's greater prevalence of nonfatal condition but disabling conditions and diseases such as arthritis and migraine headaches (Merrill et al., 1997). While Palmore and Burchett (1997) found that gender difference in disability was not significant. They concluded that whatever gender differences there are in disability risk, they are not attributable to gender as such but to the association of gender with other predictors such as age, poverty, and depression (women are older, poorer, and have more depression).

2.4.3 Education

Education has been linked to lower morbidity rates. Although the exact mechanism remains unknown, education most likely operates on health and functioning through a combination of health promotion and disease prevention practices (Freedman & Soldo, 1994). Education is also a means for acquiring higher income. Higher education is closely associated with higher income (Roger et al.,

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1992). Moreover, education is believed to be correlated with flexibility and adaptability, which are necessary for adjusting to the changes imposed by a potentially disabling condition (Pope and Tarlov, 1991). Nevertheless, the reason why people with higher levels of education have lower level of disease and disability remained largely unexplained (Sagan, 1987 cited in Pope & Tarlov, Eds.,1991: 93).

2.4.4 Socioeconomic Status

Socioeconomic status and the risk of disability are inversely related. Prevalence rates of disability are usually higher among lower socioeconomic groups. There are factors associated with being poor that powerfully increase the risk of pathology and the progression to disability. Differences in personal expectations, demands of the social and living environments, ability to control personal and social circumstances, access to adequate health care, and individual behavior have all been hypothesized to play a role (Pope & Tarlov, Eds., 1991: 93). Palmore and Burchettt (1997) suggested that poverty is related to various factors that impair health such as poor health care, poor diet, poor sanitation, poor housing.

2.4.5 Place of Residence

Because of the differences in availability and accessibility of the health care services. People who live in rural areas are at disadvantage status because they are less accessible to the health care so people living in rural area are expected to report worse health than those living in urban areas. In the industrialized countries, the prevalence of disabilities was lower in urban metropolitan areas than in rural areas (Bebblington, 1992 cited in Myers and Lamb,1993). Rahkonen and Takala (1998)

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found that in Finland, urbanization was related to both functional disability and health in men but not in women. Men living in urban areas reported less functional disability and better health. It is possible that the healthiest men have moved from the countryside to cities while among women, such movement might be less related to health status.

2.4.6 Marital Status

Marriage provides individuals with a sense of meaning and importance that promotes health. According to social support theory, individual with more social support exhibits better health. But there were studies shown that men benefit more than women from being married because of traditional sex role norm. Traditionally, women have been more responsible for health care in the family and so are more ably suited to continue such care for their husband. So within marriage, men will exhibit less disability than women (Roger et al., 1992

2.4.7 Occupation

Rahkonen and Takala (1998) found that former occupations had effected on health of the elderly people even though they left labor market long ago. Former occupations as workers and farmers continue to be associated with poorer functional ability. The health of farmer is poor and their working conditions were difficult in earlier years, when most worked on small farms.

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2.4.8 Chronic Conditions/ Illnesses

As age increases, chronic conditions become prominent. Both the number and severity of chronic and acute illness increased with age. There was a strong association between the number of chronic conditions and the proportion of people with disability as assessed by inability to perform self-care, however, chronic illnesses do not necessarily result in disability, and the prevalence of disability is lower than the prevalence of chronic illness. The relationship between impairment and disability depends not just on the severity of underlying pathological processes, but also on other factors such as host-environment interactions, therapeutic, social and other interventions, as well as the expectations of society (Bowling & Grundy, 1997; Kampen et al., 1998).

In USA, forty percent of community-dwelling people 65 years and over report limitation in their activities due to chronic conditions; as a result, 10 percent are unable to carry on their daily activities (National Center for Health Statistics, 1986). Verbrugge et al. (1989) found that health problems were the main driver of disability, and socio-demographic characteristics have only small additional effects. And as the number of chronic conditions increased, disability rose rapidly, almost exponentially. Laplante (1991) found that the number of chronic conditions reported by those who are limited in their activities increased with age, and that degree of limitation increases with the number of conditions.

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2.4.9 Lifestyles and Behavior

Persons who smoked may be at greater risks that may lead to disability because smoking increases the risk of various conditions such as emphysema, cancer, and stroke. (Palmore & Burchett, 1997). Longitudinal study by Vita et al.(1998) found that persons with lower health risks (defined in terms of smoking, body-mass index, and exercise) have initial disability at an older age and have lower levels of cumulative disability and disability at any given age than do persons with higher health risks. These findings suggest that for the average person, efforts to reduce modifiable health risks may result in a postponement of initial disability and decreased lifetime disability (Vita et al, 1998)

2.5. Life Expectancy, Health Expectancy and Active Life Expectancy

In the past decades, life expectancy has increased in almost every countries. At the same time, a rise in chronic diseases and disability in the elderly has also been observed in many countries. This phenomenon has raised the question concerning the quality of that longer life. "Does the observed increase in life expectancy concur with decreasing morbidity or are the additional years spent in a prolonged state of illness and dependency?" In aging societies, the answer to this question will have a profound impact on national health and long-term care systems. Traditional measurement of a population's health status that focuses on mortality rates or morbidity rates separately does not provide enough information about the health status of the population. Consequently, there has been continuing efforts on the development of an index that can reflect information on the living population as well as on the level of mortality.

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The concept of integrated health indicator was first proposed by Sanders in 1964. But the technique commonly adopted by several researchers was the one developed by Sullivan, a health statistician, in 1971. Sullivan proposed the technique for combining mortality and morbidity rates into a single index that could measure some aspects of health status of the population. These two related indices are based upon a life table model. They are the expectation of life free of disability and the expectation of disability.

During the past decades, researchers have been trying to measure health along these lines. For example, Katz and his colleague (1983) proposed the concept of "active life expectancy" measure as a tool for describing the relative change of functional status and life expectancy at advance ages. They used the life table technique to define the expected duration of well-being in the noninstitutionalized elderly population. Instead of death, the end point of active life expectancy is loss of independence in the activities of daily living (ADLs), as measure by the index of ADLs. In 1988, Bebbington calculated the Expectation of Life Without Disability (ELWD) for England and Wales by following the method of Robine et al. (1986).

In 1989, an International Network on Health expectancy and the Disability Process (REVES) was established by several health-related organizations from many countries. Several workshops was held in different countries in an attempt to promote multidisciplinary discussion of basic disability concepts, in particular those contained in the International Classification of Impairments, Disabilities and Handicaps (ICIDH).

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In an effort to improve international comparability of health expectancy indicators, Robine and Michel (1992) proposed that the term '**health expectancy**' should be used generally to refer to the class of indicators relating to expectation of life in specific health states. The concept of health expectancy encompasses many indicators relating to expectation of life in specific health states. Examples of health expectancies include those based on health states defined by ICIDH such as disability-free life expectancy, handicap-free life expectancy, life expectancy with disability, etc (Mathers et al (1994). During the past decade, this concept has broadened to include many indicators such as health expectancy based on self-rated health status, on the presence or absence of chronic illness, and for specific conditions such as dementia. Several types of health expectancies studied in many countries were presented in each workshop and several terminology were used depend upon the objective of the studies. Following are some of the terms frequently used in the context of health expectancy (Mathers et al., 1994)

a) **Health Expectancy**: The term recommended by the International Network on Health Expectancy (REVES), refers to the average number of years an individual is expected to live in a given health state (however defined) if the current patterns of mortality and health states continue to apply. A statistical abstraction based either on existing age-specific death rates and age-specific prevalence of health states (Sullivan method) or on age-specific transition rates between health states (multistate life table method). The term health expectancy is a general term referring to any one of the class of indicators known as health expectancies.

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b) Health Expectancies: The general term referring to the entire class of indicators expressed in term of life expectancy in a given state of health (however defined). Health expectancies are hypothetical measures and indicators of current health and mortality conditions. Health expectancies include both positive and negative health states which may be defined in term of impairment, disability, and handicap, self-rated health, and other concepts. The sum of health expectancies in a complete set of health states should always equal total life expectancy.

Although this concept has been generally accepted by member of REVES, there still no universal agreement on what kind of health states should be coverage. Some researchers used health expectancies based on self-rated health status, on the presence or absence of chronic diseases (Ramussen 1990), and for specific conditions such as dementia (Ritchie et al. 1993).

c) Healthy Life Expectancy or Life Expectancy in Good Health is the term that has been commonly used as a generic synonym for disability-free life expectancy. However, the term "healthy" refers, by implication, to only 'healthy' health state, it is recommended that the term 'health expectancy' is much preferable. Currently, the term '**perceived health expectancy**' is often been used to refer to health expectancies in self-rated health states. Survey questions commonly asked people to rate their health status using categories such as excellent, good, fair or poor. Scales are commonly divided into two categories: a healthy set such as excellent/good and an 'unhealthy' set such as fair/poor (Mathers et al. 1994).

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d) Disability–free Life Expectancy refers to the average number of years an individual is expected to live free of disability if the current patterns of mortality and disability continue to apply. A statistical abstraction based either on existing age-specific death rates plus age-specific disability prevalence (the Sullivan method) or on age-specific disability transition rates (multistate life table method). The subcommittee of REVES recommended breaking disability-free life expectancy into functional limitation-free and activity restriction-free life expectancy (Boshuizen et al.,1994).

e) Active Life Expectancy (ALE), the term commonly used in North America, is a particular form of disability-free life expectancy based on health states defined in terms of activities of daily living (ADLs). This term has been criticized to be potentially ambiguous and confusing because it has been used for many years to refer to economically active life expectancy or the expected years in the paid labor force. The term '**ADL-free life expectancy**' is recommended as a substitution to refer to life expectancy free of ADL limitations (Mathers et al. 1994).

Nevertheless, this term is still widely used in the United States (Katz et al., 1983; Rogers et al., 1989; Manton, et al., 1997; Guralnix et al., 1993; Verbrugge, 1994). When it first introduced, ALE was calculated by using two categories: disabled or non-disabled. Contemporary ALE calculations now used the severity distribution and calculate various ALEs (such as any disability, mild, moderate disability or severe disability) (Verbrugge, 1994: 25).

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2.6. Theories Concerning the Evolution of the Health Status of Population

Since the late 1970, there have been questions on the affect of declining in the death rates on both the length and quality of life. Researchers have been attempting to determine whether declining mortality leads to additional years of health or additional years of disability. The controversy surrounding increases in life expectancy and their implications for the health of the elderly population is depicted as the relationship between the three curves in figure 1 (WHO, 1984). There are three groups of proposition concerning this issue. The first one is a general decline in health as proposed by Gruenberg (1977) and Kramer (1980), an improvement in health proposed by Fries (1980, 1989), and the last view proposed by Manton (1982) is dynamic equilibrium.

According to Gruenberg and Kramer, the decline in mortality rates is the result of a decline in fatality rate of chronic diseases rather than a decline in the incidence of these diseases or a slow in their rate of progression. They argued that as life span increase, more person-years are spent in poor health and dependence. The postponement of death will result in what Kramer called '***the pandemic of mental disorders, chronic diseases and disabilities***' (Kramer, 1980). They demonstrated that an absolute increase in population morbidity and disability appears inevitable as a result of a combination of improved survival among those with disabling conditions, and a result of population aging. This pessimistic view has gained a considerable support among researchers (Bebbington ,1988; Olshansky et al.,1991; Crimmins et al., 1994)

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Olshansky et al. (1991) further refined this theory, which they call the '***expansion of morbidity hypothesis***'. This hypothesis rests on two lines of reasoning. First, the medical technology will improve survival from disabling conditions associated with fatal diseases, but the progression of the diseases themselves remains unchanged. Second, declining mortality from fatal diseases leads to a shift in the causes of disability from fatal diseases to nonfatal diseases of aging. It appeared that advances in medical technology are likely to postpone or reduce case fatality rates, but have little or no impact on the nonfatal diseases of aging. They concluded that "*if, in the current mortality transition, we are unavoidably trading off a lower risk of death from fatal diseases at older ages for an extension of disabled years, then more attention must be given to ameliorating the nonfatal diseases of aging*" (Olshansky et al. 1991:212).

The optimistic view, the theory of '***the compression of morbidity***', was first proposed by Fries (1980; 1989). He hypothesized that morbidity will be prevented and postponed, becoming compressed into a shorter duration of time as a result of improved life-styles. These good health habits were smoking cessation, decrease in dietary fat, moderate alcohol consumption, seat belt use, and regular exercise. Fries proposed that a person could live a disease-free, fully autonomous life until "natural" death from biological senescence. The compression of morbidity thesis postulated that (a) if the morbid period is defined as the period from the onset of chronic infirmity until death, and (b) if the time of occurrence of such morbid events can be postpone, and (c) if adult life expectancy is relatively constant, then (d) morbidity will be compressed into a shorter period of time.

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This concept would imply that it is theoretically possible for the mortality curve to be near rectangular, with the whole cohort of the population moving to the point of the currently observed maximum age of death. Once rectangularization is achieved, death occurs from natural process of senescence. The survival curve for morbidity and disability would then approximate to the mortality survival curve (WHO, 1984). Consequently, this concept has attracted considerable attention since it carries two optimistic prospects for the future. The first is that the human life-span is biologically limited, life expectancy will therefore be bounded at levels near those currently observed in developed countries. Fries suggested limits of from 82.4 to 85.6 years for life expectancy at birth. The second prospect is that death can occur "disease-free". Thus, not only is there a boundary to the human life-span that is within reach in developed nations, but living out the life-span need not burden the health services (WHO, 1984; Crimmins et al., 1994).

The last proposition, '***the dynamic equilibrium***', was proposed by Manton (Manton, 1982; 1989). According to this concept, the increase in life expectancy is partly explained by a slowing down in the rate of progression of chronic diseases. Thus although the decline in mortality lends to an increase in the prevalence of chronic disease, these diseases will general decrease in it severity (Robine,1994). Riley and Bond (1983) reviewed a wide range of recent scientific evidence on ageing and found that many of the physiological changes associated with ageing could be identified with age-related pathological changes and were not directly tied to intrinsic aging processes. The evidence suggested that (a) the three health outcomes were interrelated, (2) changes or intervention at one level would have feedback to other

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health outcomes (i.e., improvement in morbidity or slowing the rate of progression of chronic disease would have impact on mortality), and (3) there were great opportunities for specific interventions into select dimensions of age-related health changes than heretofore recognized.

The finding would suggest, in term of figure 1, that all three curves could be moved, and that an appropriate allocation of resources could compress the morbid and disabled period, but not with an absolutely fixed mortality curve (Manton & Soldo, 1985)

Recently, an attempt to develop theoretical perspectives on healthy life expectancy was proposed by Myers and Lamb in 1993 (Myers & Lamb, 1993). Using the epidemiologic transition theory developed by Omran (1971; 1983) as a framework, they proposed a set of propositions so called "***the disability transition***" which try to explain how disability patterns might be considered within the epidemiologic transition framework. This disability transition proposition has nine propositions as follow:

Proposition 1: Overall crude levels of disability incidence are higher in the initial stages of an epidemiologic transition and prevalence levels are lower. As the transition proceeds, a reversal in these levels occurs.

Proposition 2: Underlying causes of disablement shift during the transition from those attributable to communicable diseases to noncommunicable diseases.

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Proposition 3: During the transition, disability prevalence levels shift from being higher at younger ages to being higher at older ages.

Proposition 4: The mean age of overall disability rises in age during the transition and disability onset become more compressed around the average age.

Proposition 5: During the transition, prevalence levels of disability shift from being higher for males to being higher for females.

Proposition 6: Prevalence levels of disability are greater in lower socioeconomic groups than in higher socioeconomic groups, and the differential becomes stronger through the transition.

Proposition 7: The differential in disability prevalence levels during the transition widens so that the levels in disability in urban areas become much greater than in rural areas.

Proposition 8: Prevalence levels of disablement increase during the transition due to heightened social awareness.

Proposition 9: During the transition, healthy life expectancy rises with increasing life expectancy, however the percentage of life expected to be lived in healthy states declines.

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2. 7. Literature Relevant to Health Life Expectancy

2.7.1 Methods of Calculating Health Life Expectancy

Methods used in calculating health expectancy could be divided in three methods: the unistate method (the Sullivan method), the multistate method and the double decrement method. The first two methods had been more widely used than the last one (Saito et al., 1999). This part will briefly discuss each method.

2.7.1.1 The Unistate Method (The Sullivan Method)

In 1971, Sullivan proposed a technique for merging death rates with illness rates. A primary objective of this study was development of a summary measure, which reflected change over time in the health status of the population (Sullivan, 1971).

This technique employed a relatively simple modification of the conventional life table model to compute the expected duration of certain defined conditions of interest among the population. Two related indices, the expectation of life free of disability and the expectation of disability, were hypothetical values derived from a period life table. Data required to compute these indices were a current abridges life table and a set of current age-specific rates for disability days applicable to the population group of interest. *Disability was defined broadly as institutional confinement for health care, prolong incapacitation that does not include institutional care and short-term episodes of restriction on a person's usual activities.* Another measurement, *bed disability*, was also included in an alternative version of this study.

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Bed disability included any period spent in the hospitals or other institutions for health care and also days of noninstitutional illness involving confinement to bed for more than half the daylight hours.

This technique has been adopted by many researchers in several developing countries. However, there has been a topic of considerable discussion of the use of conventional or unistate methods of analysis (Rogers et al. 1989). Unistate life table analysis is deficient in that they ignore the possibility of a return transition from dependent to independent status (Rogers et al. 1989). For example, in the study of 'The Expectation of Life without Disability' by Bebbington (1988), the assumption was as follow:

"*An inherent assumption behind the study is that disability is irreversible. This is a popular image of long-term disability, but probably fallacious even though there is no evidence about the rate of recovery from 'limiting long-standing illness'. However, the expectation of continuing life without disability can be calculated if we assumed that disability is irreversible. Once someone became disabled, they are forever lost to the healthy population just as if they had died (Bebbington, 1988:323).*"

In addition, the Sullivan method was not a traditional life table measure because it rested on a combination of prevalence and incidence rates. Thus, the results of the Sullivan method were limited in that they indicated nothing about the expected life cycle events of individuals exposed to current mortality and morbidity conditions (Saito et al., 1999).

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However, the Sullivan method will continue to be the method of choice in many countries because it uses the cross-sectional data which are readily available in many countries. To date, Sullivan health expectancies have provided health indicators on populations of at least 37 countries (Robine et al., 1995 cited in Saito et al., 1999).

2.7.1.2 The Double Decrement Method

In 1983, Katz et al. proposed the concept of "active life expectancy" as a tool for describing the relative change of functional status and life expectancy at advance ages (Katz, 1983). Four functions of activities of daily living (ADLs) were evaluated. These functions were bathing, dressing, transferring, and eating. Functional statuses were classified as living in the community and fully independent in ADLs, dependent in at least one ADLs function, institutionalized, or deceased. Transitions from a healthy state to all of these states were used to estimate active life expectancy. Thus, with this method, life table measures were based on incidence measures of health change like traditional life tables.

However, this method had been criticized because by treating all states as 'absorbing states' it ignored the potential for returns to healthy life from unhealthy life. An absorbing state was one that there was no return. ADLs disability and institutionalization were both states which people could recover from disability and be released from institutions. Thus, it could produce an estimate of active life expectancy that was biased downward. Furthermore, this method did mot corporate differential mortality for the different states of health into model. For example, sicker

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people could be expected to have higher mortality than well people. For this reason, current interest centers on the multistate life table rather than the multiple-decrement life table (Saito et al., 1999).

2.7.1.3 The Multistate Life Table Method

An alternative method, multistate life-table analysis, was recently developed in the late 1980's. The technique treats dependency status as a temporary rather than as an irreversible transition. It incorporates processes such as recovery and rehabilitation into the calculations (Manton & Stallard, 1988; Rogers et al., 1989). The basic features of the multistate model that make it a valuable tool for analysis of life expectancy are (Saito et al., 1999)

a) It is based on incidence measures representing current health conditions.

b) It allows movement in both directions between all nonabsorbing states.

c) It allows death rates to differ by state.

Compare to the use of multistate life tables in monitoring trends over time, the unistate method seems to have some deficiencies as an approximation to disability-free life expectancy, but at least data are available for its calculation in most countries. The multistate life table method, on the other hand, would be the method of choice for estimating trends but the longitudinal data it requires are rarely available in many nations. This is especially true in Thailand, which most of the available data are cross-sectional.

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2.7.2 Studies on Health Life Expectancy

Katz et al. (1983) examined active life expectancy in regard to sex and economic status as well as age. The source of data used in this study were the first and second waves of the Messachusetts Health Care Panel Study. The study was conducted in 1974 and 1976. The total of 1,624 people aged 65 and over were initially interviewed and followed two years later. The study found that, overall, little consistent difference was demonstrated in active life between men and women. In the 65-69 category, women had 1.3 more years of active life expectancy than men. No definite sex differences were demonstrated in other age groups. However, when the total life expectancy was taking into consideration, the percentage of remaining independent years of life was larger for men than for women in all age groups. An importance difference was found between the poor and nonpoor. In each age group, active life expectancy was longer for the nonpoor than for the poor. The difference in favor of the nonpoor ranged from 2.4 additional years for the 65-69 group, to less than 1 additional year, for those aged 75 or older. Gender difference was found in most age group. In general, the percentage of remaining dependent years was larger for women.

Rogers et al. (1989) applied multistate analysis to study active life expectancy of the United States elderly population by using the data from 1986 Longitudinal Study of Aging (LSOA). The 1986 LSOA was based on the participants in the 1984 Supplement on Aging (SOA). The SOA was added in the 1984 Nation Health Interview Survey (NHIS) and is a national probability sample of the noninstitutionized civilian. The 1986 LSOA reinterviewed 5,151 people who were aged 70 years and over in the SOA 1984. The respondents were classified into two categories: dependent

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or independent on the basis of their ADLs responses. The measurement used in the study based on dependency and not difficulty in performing ADLs. Seven ADLs included the ability to bathe, dress, transfer (get in and out of bed or chair), eat without assistance, walk, toilet (get to or use the toilet), and get outside. Respondents were considered dependent if they received help from another person in carrying out any one of these tasks. For the dependent group, those who dependent in one or two ADLs were classified as 'less dependents', where those who dependent in three or more ADLs were the 'more dependents'.

The study found that many elderly were living long, active lives, and that many individuals who became dependent were dependent only temporarily and then return to an independent status. The results also revealed that the elderly population is heterogeneous regarding to health status. Gender difference was found in this study. Though, women lived longer than men, men lived a greater proportion of their lives in an active status. Moreover, the projection had shown that the elderly population would grow in size until 2035. Then, although the total number of elderly may decline, because the ageing of the elderly, the proportion of the dependent elderly may increase.

Crimmins et al. (1994) studied the consequences of change in mortality and morbidity rates for change in health status life expectancy and the prevalence of health problems among the population aged 70 and over. Data from the Longitudinal Study of Aging (LSOA) from 1984 was used as a baseline with the follow-up in 1986, 1988, and 1990. In this study, functional statuses were defined as dependent and

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independent states. The dependent state included those who unabled to perform any ADLs, and those who abled to perform ADLs but unabled to perform any IADLs. For the independent state, the subjects were divided into those who abled to perform ADLs and IADLs but having difficulty in doing some function (functional limitations), and those who had no difficulty in performing all the above activities. The multistate life table method was used for analysis.

The result of this study revealed that in the early stage of declining death rate from chronic diseases, a population could experience longer life but worsen health. Total life expectancy at age 70 was 12.6 years as estimated by multistate method. At age 70, one would spend 2.88 years (or 24 % of the remaining life) in dependent states and 5.36 years with some functional difficulties but able to live independently. As they get older, individual would spend higher proportion of their remaining lives in dependent state.

Life expectancy at age 70 for the four groups ranged from 5.5 years for those needing personal care to 18.0 years for those who had no problem. For the middle groups, the values were 7.8 years for those needed help in managing independent living and 15.3 years for those with some functional problems.

Guralnix et al. (1993) studied active life expectancy in different socioeconomic status. In this study, active life referred to the average number of remaining years of life expected to free from disability in the activities of daily living at specific ages; and disabled life expectancy was defined residually as the total life

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expectancy minus the active life expectancy. Increment- decrement life tables or multistate life table was used to calculate these parameters from the longitudinal data. The sample size was 4,057 persons 65 years old and over. This study found the strong influence of educational attainment on both total life expectancy and active life expectancy in both sexes. Those with higher education had more advantage in both total life expectancy and active life expectancy. In this cohort, 65 year-old men and women could expect 2.5 to 4.6 more years of total life expectancy and 2.4 to 3.9 years more of active life expectancy than subjects of the same age and sex with less education. This finding is of great importance for public policy because education level is alterable risk factor. And at the population level, raising the education could have profound effects on health-related behavior and health outcome. When considering gender difference, women had twice as many years of life with disability as men at all ages.

Mutafova et al. (1997) studied health expectancy in non-institutionalized population aged 60 and over in Bulgaria by using cross-sectional study. Health expectancy was divided into three categories: disability-free life expectancy (DFLE); handicap-free life expectancy (HFLE); and healthy life expectancy (HLE). Long-term disability referred to person's own assessment of dependent or independent in carry out these activities; locomotion, transfer, dressing, washing, feeding, toilette, continence, hearing and seeing.

For the measurement of handicap, questions about confinement to various kinds of activities was interpreted as difference degree of handicap. Confinement to

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house, to chair and to bed were interpreted as 'light handicap', 'moderate handicap', and 'severe handicap' respectively. The last measurement, healthy life expectancy, was based on perceived health as experienced by the respondents.

The result of this study did not differ substantially from those in other countries. It was found that though women may on average live longer, but a greater proportion of their life was spent in disablement. For example, life expectancy at 60 for men was about 16.0 years of which 8.0 years (49.7 %) would be spent free of disability. While for women, the average life expectancy at 60 would be 19.3 years of which 7.3 years (38.3%) would be spent without disability.

Jitapunkul et al. (1999) studied health expectancy which compose of life expectancy, long-term disability free life expectancy (LDFLE), total disability free life expectancy (TDFLE), and active life expectancy (ALE) in the Thai elderly population. He found that in every age group, men have shorter LDFLE than women. At age 60, men can expect to live 20.29 years but the period of life without long- term disability and active life expectancy will be only 16.39 years and 19.65 years respectively. Whereas women can expect to live another 23.89 years in which 20.20 years and 21.30 years will be the period of life without long-term disability and active life expectancy respectively. However, when consider the proportion of disability free life expectancy to total life expectancy, women seem to have disadvantage in health status compare to men.

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In spite of the effort of REVES to encourage the international harmonization of concepts, survey methods to enhance comparability of data, it is still difficult to compare measures of health life expectancy even across the nations. Nevertheless, several studies tried to compare disability-free life expectancy at age 65 from various countries across the world. Most countries used Sullivan method to calculate disability-free life expectancy. But despite increasing efforts to internationally standardize methods, direct geographic comparisons were still difficult because of the differences in study protocol and the definitions of disability. The conclusion was that it was not possible to determine whether the proportion of disability-free life expectancy is lower when life expectancy is higher (Robine 1994; Romieu & Robine 1994; Lamb et al., 1992). However, the DFLE/LE ratio was generally higher for males than for females for nearly all countries.

Some countries such as the United States, France, United Kingdom, Australia and the Netherlands did the time series studies that could provide comparisons over time. The French series from 1981 to 1991 showed a slightly change in both sex. Disability-free life expectancy at age 65 increased in France by 1.3 years for men and 2.3 years for women (Robine 1994). Contrary, Mathers (1991) found that the Australian study 1981-1988 indicated a reduction in disability-free life expectancy (Robine 1994).

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Table 1: Disability-free life expectancy at age 65 in selected countries

Country	Males			Females		
	LE (yrs.)	DFLE (yrs.)	DFLE/LE (%)	LE (yrs.)	DFLE (yrs.)	DFLE/LE (%)
Thailand, 1989	12.6	11.7	92.9	14.2	12.9	90.8
Malaysia, 1984	13.4	12.3	91.8	15.0	13.8	92.0
Philippines, 1984	12.4	10.8	87.1	13.8	11.3	81.9
China, 1987	12.5	8.9	71.2	14.6	9.9	67.8
United States, 1985	14.6	10.5	71.9	18.6	13.4	72.0
Japan, 1985	15.5	14.2	91.0	18.9	17.1	90.5
Canada, 1986	14.9	8.1	54.4	19.2	9.4	49.0
Spain, 1986	15.0	6.8	45.3	18.4	6.5	35.3
United Kingdom, 1988	13.7	7.6	55.5	17.6	8.8	50.0
Australia, 1988	14.8	6.7	45.3	18.7	8.6	46.0
Switzerland, 1988-89	15.4	12.2	79.2	19.6	14.9	76.0
Netherlands, 1990	14.0	9.0	64.3	19.0	8.0	42.1
France, 1991	15.7	10.1	64.3	20.1	12.1	60.2

Note: LE = Life expectancy; DFLE = Disability-free life expectancy
Source: Network on Health Expectancy 1993 in Romieu and Robine, 1994: 67

Increase in life expectancy and quality of life will continue to be the central issue. In the future, health expectancy will come to be as important a measure as life expectancy is today. In the United States, "years of active life" are now included among national health goals for the year 2000 (Office of Disease Prevention and Health Promotion 1991). Many countries with aging populations now recognize the need to improve data collection and more rigorous analyses to a deeper understanding of trends in health expectancy. Hence, the need for longitudinal data will be the utmost important if we to answer the question "Are we live a better longer life?."

2.8. Conceptual Framework:

This study has three objectives as stated in chapter 1. To accomplish these objectives, the procedures that will be used for analysis are as follow:

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2.8.1 Prevalence of Disabilities

Disability prevalence refers to the percentage of population with disability at a specific point in time. Population aged 60 and over will be categorized into three groups, none-disabled, instrumental activities of daily living disability (IADLs disabled) and activities of daily living disability (ADLs disabled). Persons with IADLs disability are defined as those who have difficulty/limitation in performing any one or more of these five activities: grocery shopping, cooking, washing clothes, cleaning house, and travelling alone by boat or by car. Persons with ADLs disability are defined as those who have difficulty/limitation in performing any one or more of these four activities: walking around inside the house, eating, putting on clothes (dressing), and taking a bath/going to the bath room. The rates of disabilities are categorized by age and sex..

2.8.2 Factors Affecting the Prevalence of Disabilities

Disablement is multidimensional phenomena. Not all impairments are accompanied by disability. There are many risk factors contribute to disability. Those risk factors may be biological, environmental, and lifestyle and behavior. Most risk factors were related to disabilities through the mediation of functional limitations. Variables that will be used to examine factors affecting disabilities are: age, gender, marital status, education, place of residence, occupation in the past, number of chronic conditions and risky behavior (smoking). Hierarchical Ordered Logistic Regression is used to study the association between these group of risk factors and disability outcome.

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2.8.3 Proportion of Active life Expectancy

Total life expectancy is the average number of years of remaining life expected for a person of a given age in a specific population group. Active life expectancy refers to average number of years of life free from disability in the activities of daily living and instrumental activities of daily living at the specific ages. The disabled life expectancy is defined residually as the total life expectancy minus the active life expectancy. Life table technique and the Sullivan method are used to calculate the number of years expected to live at age 60 and over in both active and disabled states. Proportion of active life expectancy to total life expectancy between men and women will be compared to answer whether women will live longer and healthier than men, or vice versa. As mentioned earlier, for elderly, autonomy (ability to function as own wish) is proxy of health.

2.9. Hypothesis

Hypotheses in this study are derived from the literature review previously. Two propositions from the disability transition proposed by Myers and Lamb (1993) are selected to formulate the two hypotheses. The first one is proposition 5 which proposed that "During the transition, prevalence levels of disability shift from being higher for males to being higher for females". The second proposition is proposition 6 which proposed that "Prevalence levels of disability are greater in lower socioeconomic groups than in higher socioeconomic groups, and the differential becomes stronger through the transition". The two hypotheses are set as follow:

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a) Elderly men are healthier than elderly women.

b) Education attainment has the inverse relationship with prevalence of disabilities.

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CHAPTER III

Research Methodology

3.1 Data Source

The data used for this study is the secondary data from the Health Interview Survey of the Population Aged 50 and over in Thailand, 1995 (SWETH). This survey was conducted by The Ministry of Public Health; the Institute of Population Studies, Chulalongkorn University; the Thailand Health Research Institute; the National Health Foundation; and the Health System Research Institute, with the partial fund from the World Health Organization, the Regents of the University of Michigan, USA.

The cross-sectional survey was conducted mainly by direct interviewing the selected sample. Two provinces from each of the 12 zones categorized according to the Ministry of Public Health plus Bangkok Metropolis were selected. Multistage Random Sampling technique was used to select 2 districts from 24 provinces, 2 sub-districts from each district and approximately 175 households from each district. Total sample of households was 18,000 and one member aged 50 and over in each household was selected to include in the survey. In Bangkok, the samples were selected by cluster sampling from the blocks of the households.

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The total number of the sample is 7,713. But for this study, the analysis is restricted to the population aged 60 and over which reduced the number of the sample to 4,483.

For the comparison of the disability prevalence rates, data from two publishes reports will be drawn. These two sources of data are from the National Health Examination Survey 1996-1997 conducted by The Ministry of Public Health and the National Health Foundation and the 1994 Survey of the Elderly in Thailand conducted by the National Statistical Office.

3.2 Definition and Measurement of the Variables

3.2.1 The Dependent Variables:

The dependent variables, disability status, were classified into 3 categories: no disability, Instrumental Activities of Daily Living (IADLs) disability, and Activities of Daily Living (ADLs) disability. **Disability** refers to the consequences that specific diseases or chronic condition have on the person's ability to perform socially defined roles and tasks expected of an individual within a sociocultural and physical environment (Verbrugge & Jette, 1994). The operational definitions for these variables were as follow:

a) Instrumental Activities of Daily Living (IADLs) Disability.

In this study, disability status was assessed by self-reported or proxy interview. To be classified as having IADLs disability, the respondents had to answer that they did not or unable to perform any one or more of the five activities of daily

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living (IADLs) because of health problem. These five activities were 1) grocery shopping, 2) cooking, 3) washing clothes, 4) cleaning house , and 5) travelling alone by boat or by car

b) Activities of Daily Living (ADLs) Disability

ADLs disability status was also assessed by self-reported or proxy interview. To be classified as having ADLs disability, the respondents had to answer that they had significant difficulty in performing any one or more of these four basic activities. The level of difficulty was divided into three levels: no, some, and very. Only persons who stated that they had 'very difficulty' in performing any one of the following activities would be classified as having ADLs disability. These activities were: 1) walking around inside the house, 2) eating, 3) putting on clothes (dressing), and 4)taking a bath/ going to the bathroom.

3.2.2 The Independent Variables:

The independent variables were grouped into 3 categories as demographic variables, socioeconomic variables, and health & behavior variables.

a) Demographic Variables: The variables that belonged to this group were:

1) Age: Age was categorized into 5 groups as follow: 60 – 64, 65-69, 70-74, 75-79, and 80 and over.
2) Sex: Sex was the nominal variable that is 'men' and 'women'.

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3) Marital Status : Marital status was categorized into three groups: married; divorced, separated or widow, and single.

b) Socioeconomic Variables: The variables that belonged to this group were:

1) Education: Education was categorized as: no schooling, Primary (Pratom 1-7), and Secondary level or higher.

2) Place of residence: Place of residence refered to the place where respondents lived at the time of the interview which was defines as urban and rural.

3) Occupation: Occupation refered to the main or longest job respondents held for their living during their working age. In this study, occupation was divided into three categories: agriculture/forestry /hunting /fishery; mining/ industry/sanitary, and service /professional. The respondents were asked a series of questions regarding work history. First, the respondents were asked whether they had ever work to earn their living or not. Those who answered "yes'' were then asked the type of main/longest job.

c) Health and Behavior Variables: The variables that belonged to this group were:

1) Chronic Conditions: Chronic conditions refered to any kind of diseases or ill conditions the respondents had experienced during the past 6 months. In this study, 16 chronic conditions

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commonly found in the elderly were included. These specific conditions all have public health importance due to their prevalence or high mortality rates. These selected conditions were: high blood pressure, heart problem, diabetes, cataract, pterygium, ear problem, arthritis, back pain, tuberculosis, asthma, stomach problem, liver problem, fracture, cancer, paralysis/hemi-paresis and kidney/urinary tract problem.

2) Smoking: Smoking was defined as 'never', 'ever-smoker', and 'current smoker'.

3) Functional Limitations: Functional Limitations refered to limitation in performance fundamental physical and mental actions used in daily life. (Verbrugge and Jette, 1994) In this study, functional status was assessed by self-reported or proxy interview. Even though four questions about functions were asked, only three items were used to define functional limitations. The question concerning difficulty in lifting about 10 kilograms object was excluded because this weight was regarded as too heavy for the elderly. Furthermore, all major surveys in the United States employed only about 10 pounds object which were about 4.5 kilogram. Functional limitations was operationally defined as having significant difficulty to perform one or more of any of these three physical actions in daily life: 1)squatting, 2) walking about 1 km., and 3) climbing stairs for 2-3 steps

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Another variables that were used for analysis of the quality of life were as follow:

d). Active Life Expectancy referred to the average number of years an individual is expected to live without having significant difficulty to perform any IADLs or ADLs mentioned above. The disabled life expectancy was defined residually as the total life expectancy minus the active life expectancy.

e). Life Expectancy at age 60 referred to the average number of years an individual is expected to live after age 60 if the current pattern of mortality continues to apply.

3.3. Analytic Methods

This study employed the Statistical Package for Social Sciences (SPSS) program version 9.0 and the STATA program version 6 to analyze the data. The SPSS program was used for analyzing the first two steps while the last step, the multinomial analysis, was analyzed by using the STATA program. Statistical analysis was organized as follow:

a) The descriptive statistics such as frequency counting, mean and standard deviation was used to describe socio-demographic and health status characteristics of the samples.

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46575

b) For the analysis of prevalence of disabilities, frequency counting was used to delineate the proportion of samples in each health states: none-disabled, IADLs disabled and ADLs disabled. The prevalence of disabilities in each state was estimated for each sex and age group.

c) Cross - tabulation was used to examine the effects of independent variables on the prevalence of disabilities. Chi-square test and the 0.5 level of significant was used to determine which independent variables would be included for multivariate analysis (Ordered Logistic Regression).

d) Ordered Logistic Regression technique (ordinal logit regression) was used to demonstrate the influence of independent factors on disability status. The STATA program, version 6 was used for analysis. First step was the bivariate examination of the relationship between the independent variables and disability status. The second step was the multivariate analysis using the hierarchical model. This hierachical comprised of 5 models (model A –D). Model A included only socio-demographic variables such as sex, age group, educational attainment, marital status and place of residence. This model was used to test the hypothesis whether these socio-demographic variables had a significant influence on the presence of disability.

Model B included behavioral variable (cigarette smoking) along with socio-demographic variables to see whether it had a significant influence on disability status when adjusting for socio-demographic factors. Model C included the previous two factors plus a group of health factors. Model D comprised of all socio-demographic

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variables, health behavior variable and functional limitations but health conditions were excluded. Finally, model E comprises of all four groups of independent variable. The dependent variable (disability status) was arranged hierarchically from no disability to more severe disability. Theses categories were no disability (category 1), IADLs disability only (category 2), and both IADLs and ADLs disability (category 3).

For each groups of independent variables, the reference categories were arranged as: 'males' for gender, aged '60-64' for age group, 'no schooling' for educational attainment, 'currently married' for marital status, 'urban' for place of residence, 'current smoker' for cigarette smoking, 'no' for each chronic conditions, and 'no' for each of the three functions.

e) Life table technique and the Sullivan method were used to calculate the number of years expected to live in each health states for specific age-sex group. For the analysis of life expectancy at age 60, the life table obtained from the 1995-1996 Survey of Population Change (NSO, 1997) produced by the National Statistical Office was employed as the base for calculating active life expectancy at age 60 and over. The active life expectancy of males and females were calculated separately because of gender difference in mortality and prevalence of disabilities.

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CHAPTER IV

Results and Discussion

The content in this chapter contained the results from the study according to the objectives stated in chapter 1. The presentation of the results was arranged in four sections. The first section was the presentation of the general characteristic of the sample and the prevalence of chronic conditions. The second section was the prevalence of disabilities. The third section was the examination of the influence of independent variables on prevalence of disabilities. And the final section was the estimation of the proportion of active life expectancy to the total life expectancy.

4.1 Section One

4.1.1 General Characteristic

Table 2 displayed the general characteristics of the sample. The sample comprised of 4,483 elderly aged 60 through 109, which mean age was 69.2 years. There were 1,800 males and 2,683 females. Most of the subject's ages were between 60-64 years and 65-69 years (33% and 27% respectively). However, since there were small number of the samples over aged 80, the age group was rearranged into 5 groups for further analysis. These age groups were 60-64 years, 65-69 years, 70-74 years, 75-79 years, and 80 years and above.

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Table 2: Percentage distribution of the samples by sex and socio-demographic characteristic

Characteristic	Percent	Number
Sex		
• Male	40.2	1,800
• Female	59.8	2,683
Age Group		
• 60-64	32.9	1,474
• 65-69	26.7	1,198
• 70-74	17.8	1,991
• 75-79	11.1	498
• 80-84	7.1	317
• 85 and over	4.4	197
Educational Attainment		
• No schooling	32.9	1,474
• Pratom 1-7	59.6	2,674
• Secondary and higher	6.5	292
• No specified	1.0	43
Marital Status		
• Married	49.8	2,231
• Separate/Divorced/Widow	48.0	2,152
• Single	2.2	99
• No answer	0.0	1
History of Main/Longest Job		
• Agriculture	70.5	3,037
• Mining/Industry/Construction	7.4	318
• Service/Professional	21.3	953
Place of Residence		
• Urban	27.2	1,218
• Rural	72.8	3,265
Total	**100.0**	**4,483**

In the past, education system was not well established and most of the schools were concentrated in major cities. The opportunity to get education was mostly limited to the more advantage group of people. Therefore, it was not unexpected to find that majority of the sample (60%) received only primary education (pratom 1-7) or even had

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never been in school at all (32 %). Only a small portion (6%) had more than secondary level of education (greater than 'pratom 7') and some did not specified their education attainment (1%). This figure was comparable with the 1994 survey of elderly in Thailand conducted by the National Statistical Office (NSO, 1994). In that survey, the proportion of elderly who had no schooling was 32% and 51% had only 'pratom 4' education.

About half of the sample was married and 48 % was either separate/divorced or widow. Only 2 % of the sample was single. The number of respondents in this 'single' group was small so it was collapsed with the 'separate/divorced/widow' group. Thus, for multivariate analysis, the marital status was divided into 'currently married' and 'not currently married' group. About three-fourths of the sample lived in the rural area and the rest was in the urban area.

For type of occupations, respondents were asked to answer a set of questions regarding work history. For those who reported that they were still working or had worked during their adulthood, questions about the type of main or longest job were clarified. Over two-thirds of the sample (70%) worked in the agricultural area that had long been the major occupation of the Thai population. The second category, 'service/professional' comprised about one-fifth of the sample. Only small proportion of the sample (7%) had worked in 'mining/industry/construction'.

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4.1.2 Prevalence of Chronic Conditions

This section focused on only two aspects of chronic conditions: types of specific diseases or impairments (table 3) and the magnitude or numbers of chronic conditions (table 4). The relationship between chronic conditions and disabilities will be thoroughly examined in the following section.

4.1.2.1 Type of Chronic Conditions

Table 3 displayed selected chronic conditions according to the prevalence level. Most of these conditions were nonfatal. Chi-square test revealed that gender difference was prominent in most chronic conditions in which the prevalence was higher in women. Musculoskeletal problems such as back pain, rheumatism/arthritis were the most frequent bothersome in daily life. The prominence of rheumatism/arthritis was striking, especially for women. Nearly half of the elderly (45%) reported having rheumatism/arthritis and about two-thirds of the elderly had back pain. The next most frequently reported condition was high blood pressure (23 %). These results were concordance with other studies both in Thailand and in the United States (NSO, 1997; Jitapankul et al., 1999; Verbrugge at al., 1989; Verbrugge, 1991). In most studies about the elderly, arthritis had long been the most prevalence condition, followed closely by high blood pressure, hearing and vision conditions especially among women. For example, the 1988 National Health Interview Survey (NHIS) in the United States reported that arthritis ranked the highest (49%), follow by high blood pressure (30%), hearing impairment (32%), heart disease (30%), and chronic sinusitis (12%). Arthritis produced

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the highest physical limitation rates for middle-aged and older women while heart diseases had more impact on men (Verbrugge, 1984, 1991; Pope and Tarlov, 1991; Verbrugge at al., 1995,1989; Rudberg et al.,1993)

Table 3: Percent of the elderly reported having chronic conditions by sex

Chronic Conditions	Male	Female	Total	p- value
Back Pain	63.8	70.2	67.7	<.001
Rheumatism/Arthritis	35.9	45.2	41.5	<.001
High Blood Pressure	18.6	26.3	23.2	<.001
Stomach Problem	20.3	20.8	20.6	.647
Heart Problem	8.7	17.6	14.0	<.001
Cataract	10.3	12.9	11.9	.007
Pterygium	8.7	13.8	11.7	<.001
Ear Problem	8.1	7.3	7.6	.325
Diabetes	4.7	7.2	6.2	.001
Asthma	7.5	4.2	5.5	<.001
Kidney/Urinary problem	6.7	4.5	5.4	.002
Paralysed/semi-paralysed	3.9	2.6	3.1	<.016
Tuberculosis	3.0	1.9	2.4	<.022
Fractures	1.1	1.1	1.1	.936
Liver Disease	1.0	0.6	0.8	.127
Cancer	0.3	0.6	0.5	.095

4.1.2.2 The Magnitude of Chronic Conditions

As people get older, chronic conditions become almost inevitable. Many chronic conditions are associated with the aging process, which contributes to the widely held stereotype that aging is synonymous with a decline in functional capacity

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(Pope and Tarlov, 1991). Furthermore, older people often have several chronic conditions simultaneously (comorbidity). Many studies found close relationship between chronic conditions and disability (Verbrugge et al.,1989; Verbrugge, 1991; Kaplan et al., 1993; Rudberg et al., 1993; Jitapunkul et al., 1999). Verbrugge at al. (1989) found that as number of chronic conditions increased, disability rose rapidly, almost exponentially.

In this study, 16 chronic conditions commonly found in the elderly were included. These specific conditions all have public health importance due to their prevalence or high mortality rates. These selected conditions were: high blood pressure, heart problem, diabetes, cataract, pterygium, ear problem, arthritis, back pain, tuberculosis, asthma, stomach problem, liver problem, fracture, cancer, paralysis/hemi-paresis and kidney/urinary tract problem. These conditions were based on self or proxy reported (in case the subjects were unable to give the answer). Respondents were asked whether they had any of these conditions during the past six months. As illustrated in table 4, all of the elderly in this study reported that they had at least three chronic conditions. The highest number of chronic conditions was 13 conditions in which only 3 persons (0.1%) reported. About half of the elderly had 5-6 conditions (mean = 6, S.D. = 1.5). There was significant gender difference in the average number of chronic conditions as was examined by t-test ($p<.001$). Women, on the average, had 6.2 conditions (S.D. = 1.4) while men reported 5.8 conditions (S.D = 1.4). Generally speaking, men seemed to have better health than women did as they had less number of chronic conditions. For example, about one–sixth of men (15%) had 1-4 conditions compared to one- tenth (11%)

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in women and only one-fourth (27%) of men had seven or more conditions while more than one-third (39%) of women experienced these unpleasant situation. Thus, the first hypothesis, elderly men are healthier than elderly women, is accepted.

Table 4: Percentage distribution of the elderly by number of chronic conditions and mean of chronic conditions by sex

Number of Chronic Conditions	Male	Female	Total
0 Chronic Condition	.0	.0	.0
1 Chronic Condition	.0	.0	.0
2 Chronic Conditions	.0	.0	.0
3 Chronic Conditions	1.1	0.4	0.7
4 Chronic Conditions	14.3	10.7	12.1
5 Chronic Conditions	30.2	23.5	26.1
6 Chronic Conditions	27.7	26.4	26.9
7 Chronic Conditions	16.1	20.0	18.4
8 Chronic Conditions	7.0	11.4	9.7
9 Chronic Conditions	2.6	5.0	4.0
10 Chronic Conditions	0.6	2.1	1.5
11 Chronic Conditions	0.3	0.3	0.3
12 Chronic Conditions	0.1	0.1	0.1
13 Chronic Conditions	0.1	0.1	0.1
Total	**100.0**	**100.0**	**100.0**
(Number)	(1,791)	(2,673)	(4,483)
Mean	**5.8*** **	**6.2**	**6.1**

Note : *** significant at <.001

Chronic conditions are important in ageing study and for ageing policy. Their effect can be either (a) high prevalence but low disability impact, or (b) low prevalence

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but high disability impact. This section examined only prevalence and magnitude of selected chronic conditions. The result revealed that all of the elderly in this survey had experienced more or less of the chronic conditions in the past six months. This finding was rather striking since it was difference from studies in the U.S. in which it was estimated from the 1988 National Health Interview Survey (NHIS) that almost 85 percent of the elderly had one or more chronic conditions (Pope and Tarlov, 1991; Verbrugge et al., 1989). It was not certain why Thai elderly had more chronic conditions. The reason for this disparity might be from the difference in the content of the questionnaire or it might reflect the true unpleasant situation of Thai people. Thus, further research is needed to investigate this matter.

The evidence from this finding seems to support the pessimistic view of health status, the expansion of morbidity hypothesis, which was proposed by Gruenberg (1977): Kramer (1980), and Olshansky (1991). Comorbidity was common in Thai elderly. There seem to be gender difference in the prevalence of some chronic conditions in which men were at the advantage situation. As hypothesized, on average, elderly women were less healthy compared to elderly men. This finding was concordant with other studies. However, though all the elderly had some chronic conditions, not all of them might have disabilities concomitantly. Many elderly persons might still be able to function independently. The study in the U.S. found that though about 85 percent of the elderly had at least one chronic condition, only 40 percent reported having activity limitation

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(Kane et al., 1981; Pope and Tarlov, 1991). The answer to the question "Did it mean that these elderly would also experience disability?" will be discussed in the following section.

4.2 Section Two: Prevalence of Disabilities

Disability prevalence refers to the proportion of a population with disability at a specific point of time. Since the measurement of disability varies across the survey, comparison between surveys is difficult even within the country. Moreover, differences in terminology also created confusion among readers. As stated in chapter two, there are two major frameworks in disability study: the ICDH concept proposed by WHO, and the Nagi's concepts. This study adopted the later one.

Although activities of human are complex and have variety, surveys of the elderly populations generally focus on two domains of activity: personal care activities (ADLs) which are considered as the least basic functions and person's ability to carry out activities essential to maintain independence (IADLs) which are more complex behavior (Verbrugge, 1991; Freedman and Soldo, 1994).

4.2.1 The Activities of Daily Living (ADLs)

The activities of daily living (ADLs) referred to the basic tasks of everyday life, such as eating, dressing, taking bath or toileting, transferring, and walking around inside the house. According to Katz' original study, activities of daily living were considered

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hierarchical which ability to feed oneself was the most fundamental follow by continence, transferring, going to the toilet, bathing and dressing. (Katz et al., 1963; Katz, 1983; Katz and Apkom, 1976).

To be classified as having 'ADL disabilities' in this study, a person had to report **significant difficulty** (a lot of difficulty) to do any one of the four activities. These activities were walking around inside the house, eating, putting on cloth (dressing), and taking a bath. Level of difficulty was divided into three levels: no difficulty, some difficulty and a lot of difficulty. This study adopted the definition suggested by Verbrugge and Jette (1994) that might be difference from another surveys. These authors proposed that disability should be measured in simple, direct manner by self-reports or proxy reports about degree of difficulty (none, some, a lot and unable). They argued that when disability was measured by question about dependency such as 'having someone's help to do an activity' in many studies, it really measures a buffer to disability, not disability itself (Verbrugge and Jette, 1994).

There is still no consensus about how disability should be defined or measured. For example, the national survey in Thailand conducted by the National Foundation of Health and the Ministry of Public Health adopted the concept of 'dependency' to measure problem in activities of daily living (Jitapankul et al., 1999). Verbrugge (1991) pointed out that questions about difficulty/limitation to perform activities by oneself measured 'intrinsic disability' while questions about ability to perform activities with assistance

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reflected 'actual disability'. This author suggested that surveys should incorporate both intrinsic disability and actual disability in order to capture both dimensions of disability. Analysis of dependency was necessary for assessing need of long-term care service. However, the purposes of this study were to estimate the proportion of elderly with limitation in major activities and the relationship between disabilities and various factors. Thus, the 'difficulty' definition (self report) was more suitable for our objectives.

4.1.2.1 Type of ADLs Disability

As illustrated in table 5, the majority of the elderly (82 %) had no difficulty in doing any activity of daily living. About 12 % reported that they had some difficulty. Only 6 % reported having a lot of difficulty of which would be considered as having ADLs disability. When disability was examined by type of activities of daily living, the most frequently reported ADL limitations was walking inside the house (17%) follow by bathing (6%). The least troublesome task was doing self-dressing in which only 3 % of the elderly had difficulty in doing this task.

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Table 5: Percentage distribution of the elderly by level, type of ADLs disability and sex

Type of ADLs Disability	Level of Difficulty			Total	(Number)**	p-value
	None	Some	Very*			
Walking inside House	**83.0**	**11.1**	**5.9**	**100.0**	**(4,477)**	<.001
• Male	86.5	8.1	5.4	100.0	(1,798)	
• Female	80.7	13.1	6.2	100.0	(2,679)	
Bathing	**93.7**	**3.1**	**3.2**	**100.0**	**(4,476)**	.032
• Male	94.6	2.3	3.1	100.0	(1,798)	
• Female	93.1	3.7	3.2	100.0	(2,678)	
Dressing	**96.9**	**1.6**	**1.5**	**100.0**	**(4,477)**	.004
• Male	96.8	1.1	2.1	100.0	(1,798)	
• Female	96.9	1.9	1.1	100.0	(2,679)	
Eating	**96.6**	**2.3**	**1.1**	**100.0**	**(4,477)**	.120
• Male	96.9	1.8	1.3	100.0	(1,798)	
• Female	96.4	2.6	1.0	100.0	(2,679)	
Total	**81.9**	**11.6**	**6.5***	**100.0**	**(4,476)**	

Note * = ADLs Disability
** = The total number was not equal to 4,483 persons due to missing data.

A breakdown by level of limitation showed that about 6 % of the elderly had severe limitation in walking around inside the house. Fortunately, only a few of the elderly were very limited in eating and dressing (1.1% and 1.5% respectively) which were considered the most severe physical functions. This finding indicated the hierarchical pattern of disabilities that was similar to another studies (Katz et al.,1963; Dunlop et al., 1997; Kennedy & LaPlante, 1997). Walking requires locomotor functioning. It involves lower extremity strength while bathing, dressing and eating require more upper extremity strength.

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A further breakdown by gender revealed that gender difference was found to be statistically difference in three out of four activities in which 'eating' was the exceptional task. Women had more difficulty than men in 'walking inside the house' and 'bathing' while 'dressing' was in opposite direction.

The percentage of elderly who had problem performing ADLs were low compared to the 1994 survey of elderly in Thailand (NSO, 1994) and Jitapankul et al. (1999) in which the percentage of elderly with 'problem in walking' (dependency) inside the house were 7% and 8 % respectively. For 'bathing', the figure was similar to that study by Jitapankul et al. (1999). For other activities such as eating and dressing, the prevalence in this study was about 1-2 % lower.

The difference in scaling method could produce dramatic effects on prevalence estimates of the elderly. For example, Jette (1994) found that the use of 'difficulty' scales produced estimates of disability in specific ADLs anywhere from 1.2 to 5 times greater than 'human assistance' scales (dependency scaled). Kennedy and La Plante (1997) did a study that distinguished between the population needing help with ADLs from those who reported difficulty with ADLs but did not need assistance. They employed the data from the 1990 and 1991 Survey of Income and Program Participation (SIPP), a household survey of the noninstitutional population in the United States, which covered population aged 15 and over. They found that the discrepancy between those who need help and those who reported difficulty varied substantially upon the activities. For example, for

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'transferring' (from bed to chair), 1.7 % reported difficulty while only 1 % need help. In contrast, activities such as bathing, dressing, eating and toileting, the percentage of those who had difficulty were 0.9%, 0.6%, 0.3% and 0.5% while the percentage of those who need help were 1.4%, 1.1%, 0.3% and 0.6% respectively. When taken together, the percentage of persons who had difficulty performing any ADLs was generally slightly higher than those who need help in any ADLs.

4.2.1.2 The Magnitude of ADLs Disability

The magnitude of disability could be assessed by number of items individuals reported having difficulty. Overall, the majority of the elderly (94%) reported no significant difficulty in doing any of these four activities of daily living. For person who had ADLs disability, most of them had only one disability (4 %) and very few had all four disabilities (0.8%).

There was inconsistency in the magnitude of ADLs disability between gender though it was statistical significant ($p = .019$). For example, in the last category of table 6, more men had more cumulative disabilities compared to women but this could be due to the small number of the samples in this category (18 men and 17 women).

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Table 6: Percentage distribution of the elderly by number of ADLs disability and sex

Level of ADLs Disability	Male	Female	Total
No ADL Disability	94.0	93.1	93.5
1 ADL	3.0	4.1	3.7
2 ADL	1.0	1.7	1.4
3 ADL	0.9	0.5	0.7
4 ADL	1.0	0.6	0.8
Total	100.0	100.0	100.0
(Number)	(1,798)	(2,678)	(4,476)

$p = .019$

Note : the total number was not equal to 4,483 persons due to missing data

In conclusion, overall, men were better than women in regard of these basic activities for daily living except bathing, which women performed better. The most problematic was 'walking inside the house'. Though the majority of the elderly were not considered as having ADLs disability, even the small portion of those who faced these problems deserved some attention because these functions were considered essential for survival in the society. In addition, this survey covered only people that reside in the community. If the resident in the institutions were included, this figure would have been higher.

4.2.2 The Instrumental Activities of Daily Living (IADLs)

Another measurement, instrumental activities of daily living or IADLs, such as shopping, preparing meals, money management, using the telephone, light housework,

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laundry, and getting around to places beyond walking distance were commonly included in major surveys. ADLs and IADLs are thought to be hierarchical, with ADL limitations representing more severe disability. Almost all of the persons who have ADLs limitation also have IADLs limitation.

In this study, the measurement of Instrumental Activities of Daily Living (IADLs) was indirectly derived from a series of three questions: whether the respondents performed the activities, how often was those activities done (every day, 4-6 times a week, 1-3 times a week and not done), and the reason for not performing those activities. For those who answered that they "did not do" these activities, a question about the reason was asked. Only the persons who stated that the reason they did not do those activities was '***health problem***' would be classified as having IADLs disability. Only five activities were included in this study. These activities were: grocery shopping, cooking, washing clothes, cleaning the house and travelling by car/boat by oneself. For 'travelling by oneself' activity, a question whether a person had any limitation (difficulty) in doing this activity was asked. Only persons who answered "***unable to do***" were regarded as having disability.

4.2.2.1 Type of IADLs Disabilities

When IADLs were categorized according to type of activities, the result in table 7 explicitly showed that the most problematic function the elderly encountered was 'travelling by car/boat by oneself'. Almost one-fourth of the samples was unable to

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do this function. Women had much more trouble doing this function than men. For other functions, the proportion of men and women having problems were rather similar ranging from 7 to 9 percent.

Table 7: Percentage of elderly reported having IADLs disability by type of activities and sex

Type of Activities	Male	Female	Total	p-value
Travelling Alone	13.8	29.7	23.3	<.001
Grocery Shopping	9.3	9.1	9.2	.835
Cleaning House	7.8	7.4	7.5	.621
Cooking	7.9	7.9	7.9	.995
Washing Clothes	6.9	7.2	7.1	.715

The finding that a large proportion of elderly reported having problem with 'travelling alone' was similar to Jitapunkul's study. In contrary, the data from the United States showed much lower rates of IADLs limitations. For example, the 1990 population census in the United States found only 6.9 % of population aged 60 and over reported they had difficulty to go outside home alone (National Aging Information Center, 1996). Prevalence of IADLs limitations from the National Long Term Care Survey ranged from 5.3% in 1982, 5.7% and 4.4 % in 1984 and 1989 respectively (Freedman & Soldo, 1994). Such difference could indicate the inadequate facilities designed for people with disabilities or inaccessible transportation system in Thailand. Women had much more

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problem with this task more than men (p<.001). However, for other tasks, there was no evidence of gender difference.

4.2.2.2 The Magnitude of IADL Disabilities

As demonstrated in table 8, almost one-third of the elderly had problem with instrumental activities of daily living. Compared with table 6, only 7 % of the elderly had problem in doing basic activities of daily living, ADLs was considered more basic activities that were essential for survival while IADLs were necessary to reside independently in the community. For those who had IADLs disability, the majority of them had only 1 IADLs disability (23%) and very few (1%) had all 5 IADLs disability. Gender difference was also found in these activities which men seemed to be better than women ($p < .001$). Therefore, the hypothesis that elderly men are healthier than elderly women is accepted.

Table 8: Percent distribution of the elderly by number of IADLs disability and sex

Level of IADL Disability	Male	Female	Total
No IADL Disability	76.4	62.4	68.0
1 IADL	14.7	28.2	22.8
2 IADL	2.3	2.0	2.1
3 IADL	1.4	1.6	1.5
4 IADL	4.2	4.5	4.4
5 IADL	1.1	1.2	1.2
Total	100.0	100.0	100.0
(Number)	(1,798)	(2,671)	(4,479)

$p < .001$

Note: The total number was not equal to 4,483 persons due to missing data

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Instrumental activities of daily living comprised of many functions ranging from 1-8 items. Measurement of IADL activities in the United States often include more functions such as ability to handle finance, managing medication and ability to use telephone. The Chula Index which was developed to measure instrumental activities of daily living in Thai population covered 7 functions such as travelling outside, using public transportation, managing money, cooking/preparing food, cleaning house, washing clothes, and ironing clothes (Jitapunkul et al., 1999). However, the items in this study covered only 5 functions but essential ones. Though some tasks in IADLs such as cooking, shopping for food or cleaning house were considered gender sensitive, many men did not gave the reason for not performing these tasks as 'it was women's job' instead their reason was 'because of health problem'. Limitation in 'travelling by oneself' contributed to discrepancy between gender. This function is important and limitation in this function will lead to dependency status thus will eventually place the burden for the family..

4.2.3 Prevalence of Functional Limitations

Functional limitations, the term proposed by Nagi (1975, 1991), is part of the 'Disablement Process'. This term refers to the restrictions in performing fundamental physical and mental actions used in daily life (Verbrugge & Jette, 1994). These actions included walking, lifting objects, climbing stairs, reading standard-size print and hearing other people speak in the room etc..

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Three physical functions were included in this study. These physical functions were crouching, walking about 1 kilometer and walking up 2-3 stairs. Level of difficulty was defined as : no, some, very, and unable at all. To be classified as having functional limitations, the respondents had to report that they had significant difficulty in performing any activities (very difficulty and unable to do).

4.2.3.1 Type of Functional Limitations

Table 9 showed the finding when function limitations was breakdown into type of functions. Crouching was the most problematic function for many elderly follow by walking about 1 kilometer. Almost 40% had some problem with crouching while only 19% had problem in walking upstairs. Gender difference was found to be statistically significant in all three functions in which more women than men reported having every level of limitation. This finding also supported the first hypothesis, which proposed that elderly men are healthier than elderly women.

Table 9: Percentage Distribution of the Elderly by Level and Type of Functional Limitations

Type of Functional Limitations	Level of Limitation				Total (N=4,476)	P-value
	None	Some	Very*	Unable*		
Crouching	**60.2**	**22.5**	**8.8**	**8.4**	**100.0**	<.001
• Male	68.5	19.0	6.4	6.1	100.0	
• Female	54.6	24.9	10.5	10.0	100.0	
Walking 1Km.	**63.0**	**12.9**	**7.7**	**16.4**	**100.0**	<.001
• Male	74.1	9.5	4.9	11.5	100.0	
• Female	55.5	15.2	9.6	19.7	100.0	
Climbing Stairs	**81.0**	**10.7**	**3.9**	**4.4**	**100.0**	<.001
• Male	86.4	7.5	2.5	3.7	100.0	
• Female	77.4	12.9	4.9	4.9	100.0	

Note: * = having functional limitation ; the total number was not equal to 4,483 persons due to missing data

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Again, differences in scaling and number of functions included made comparison across surveys difficulty. However, looking at detail defined in the surveys by type of functions could elaborate more meaningful information. For example, study in Taiwan that included 2 functions: climbing stairs and walking 200-300 meters found the percentage of the elderly having any difficulty were 26 % and 20% respectively in 1989. In 1993, these corresponding figures were 24% and 17% (Zimmer et al., 1998). Using 'dependency scale', Jitapunkul et al. (1999) found that about 23% of the elderly were dependent in 'climbing stairs' function. The percentages of persons having limitation in climbing 2-3 stairs were similar between Thai and Taiwanese. However, for 'walking' function, the difference in defining distance made these figures not comparable. The survey in Taiwan used the distance of 200-300 meters while the walking distance in this survey was 1 kilometer.

4.2.3.2 The Magnitude of Functional Limitations

Table 10 displayed magnitude of functional limitations. About two-third of the elderly had no functional limitation. Again, women reported having more functional limitations compared to men (p <.001). While only 22% of men reported having some limitation, more than one-third (38%) of women suffered any one or more from these conditions. Fortunately, the majority of them had only one limitation.

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Table 10: Percentage distribution of the elderly by number of functional limitations and sex

Number of Functional Limitations	Male	Female	Total
No Functional Limitations	78.1	62.4	68.7
1 Functional Limitations	13.2	21.9	18.4
2 Functional Limitations	4.3	9.5	7.5
3 Functional Limitations	4.3	6.1	5.4
Total	100.0	100.0	100.0
(Number)	(1,798)	(2,681)	(4,479)

$p < .001$

Note : the total number was not equal to 4,483 persons due to missing data ;

In conclusion, more women than men had limitation performing functions that considered important in daily life. Crouching was the most problematic among the three functions follow by walking about 1 kilometer distance. For those who reported having functional limitation, most of them had problem in one function.

4.2.4 Prevalence of Disabilities by Age and Sex

Prevalence of disabilities by age and sex was illustrated in table 11. The proportion of elderly with limitation rose rapidly after age 70. Women, in every age group, reported more limitation than men. The exceptional was the prevalence of ADLs disability in the 70-74 age group in which the prevalence in women was lower than men. The result from table 5, which demonstrated that men had more limitation than women in dressing and eating, could explain this unusual finding.

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Table 11: Percentage distribution of prevalence of disabilities by age and sex

Age Group	ADLs		IADLs		Total	
	Male	Female	Male	Female	Male	Female
60-64	2.56	2.73	14.38	21.45	16.94	24.18
65-69	2.74	3.88	15.82	27.29	18.56	31.17
70-74	8.75	6.07	17.19	33.26	25.94	39.33
75-79	8.25	12.17	27.84	44.74	36.09	56.91
80 and over	18.68	20.78	36.81	51.81	55.49	72.59

Limitation in IADLs was prominent in women regardless of age. For example, over one-fifth of women in the youngest age group reported having IADLs disability compared with less than 15% of men in the same age. The percentage of IADLs disability in women steadily increased with age and overcome with their males' counterpart. The high rate of IADLs disability especially in women was rather distressing because this could imply that level of dependency would be high too. The result from table 7 implicitly showed that 'travelling alone by bus/car' attributed to this high rate of IADLs disability. Considered that about one in every three women aged 70-74 would not be able to go out by oneself and had to rely on someone else was not a pleasant situation that any society would desire.

In conclusion, the finding from table 11 supported the first hypothesis that elderly men are healthier than elderly women. There was not substantial difference between

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gender in ADLs as compared to IADLs. Much of the discrepancy in disability rates could be attributable to limitation in IADLs, travelling alone by bus/car in particular.

However, since this study was based on self- reported therefore it was unable to ascertain whether the higher prevalence of disabilities in women reflected the real unhealthy condition or just the higher level of awareness in women. The disability transition proposed that prevalence levels of disablement increase during the transition due to heightened social awareness (Myers & Lamb, 1993). Some researchers argued that women often report more functional problems than men (Roger et al., 1992; Johnson & Wolinsky, 1994). Therefore, it could be said that levels of disablement among women are higher than men during the transition. Further study is needed to examine this speculation, however.

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4.3 Section Three: Factors Influencing the Prevalence of Disabilities

Several risk factors are thought to be associated with the disablement process. According to the Nagi's concept and the World Health Organization' s International Classification of Impairments, Disabilities, and Handicaps (ICIDH), the pathway to disability is initiated by several risk factors. These risk factors are causes that predispose the individual to chronic and enduring impacts.

For the multivariate study, cases with any missing data (2.9%) were omitted which left the total of 4,352 cases to be analyzed. Dependent variable (disability status) was first divided into four groups according to the level of severity that was from no limitation to limitation in the most basic activities (personal care activities or activities of daily living). These four groups were no disability, IADLs disability only, ADLs disability only, and both IADLs and ADLs disability. The result revealed that the majority of the sample had no disability, about one-fourth had only IADLs disability, 1% had ADLs disability only, and 5% had both IADLs and ADLs disabilities (table 12).

Table 12: Percentage and number distribution of elderly by type of disabilities

Type of Disabilities	Percent	Number
NO Disability	67.2	2,924
IADLs Disability only	26.3	1,144
ADLs Disability only*	1.0	45
Both IADLs and ADLs*	5.5	239
Total	**100.00**	**4,352**

Note * will be collapsed into one category (ADLs+)

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However, as demonstrated in table 12, the number of elderly who had only ADLs disability comprised only 1% (45 persons) which were considered too small for multivariate analysis. Thus, the groups with ADLs disability only and both IADLs and ADLs disabilities were collapsed into one group for analytical purpose. In general, person who had limitation in ADLs almost always had problem with IADLs concomitantly because ADLs were considered as basic activities essential for survival while IADLs comprised of more complex functions necessary for independent living in the community (Katz et al., 1963; Katz and Apkom, 1976; Lawton and Brody, 1969). This finding was compatible with other studies which found that the percentage of elderly with ADLs dependence only were less than 2%. For example, the study of the well-being of older people in Cleveland, Ohio 1975-1976 found that 25 out of 1,607 elderly (1.6%) had ADLs dependency only; the Gorgia-Medicaid project found 9 out of 1,104 elderly (0.8%) with ADLs dependency only (Spector et al., 1987).

The independent variables, risk factors, were divided into two groups: socio-demographic factor and behavioral factor. These factors were hypothesized to relate to disability through the intermediate variables, impairments and functional limitations, as was depicted in the disablement model described previously in chapter two. However, in the following analysis, socio-demographic, behavior, health and functional limitations were treated as independent variables.

The analysis was performed in two steps. The first step involved bivariate analysis between each independent variables and disabilities outcome. The cross-

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tabulation was adopted and evaluated using the Chi-square with 0.5 level of significant. Only the significant variables were included in the second step. The second step, the ordered logistic regression (ordinal logit regression), was used to analyze the multivariate relationships between several independent variables and disabilities outcome, which were categorized in ordered from no disability (category 1) to more severe disability (IADLs disability – category 2) and the most severe disability (both IADLs and ADLs disability- category 3).. All of these analyses were performed using the STATA program, version 6.

4.3.1 Bivariate Analysis between Risk Factors and Disabilities

As illustrated in table 13, all the socio-demographic and behavioral variables except occupation were significantly related to disabilities outcome. Men reported having any type of disabilities less than women especially for IADLs disability. Almost one-third of women (31%) reported they did not do these instrumental activities of daily living because of health problem compared to only 18 % in men. For the most severe disability (both IADLs and ADLs disability), more women than men were in this group (7% compared to 6%). Therefore, this finding supported the first hypothesis, "elderly men are healthier than elderly women".

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Table 13: Percentage distribution of elderly by type of disabilities and characteristics

Characteristic	Type of Disabilities (%)			Total	(Number)	p-value
	None	IADLs only	ADLs *			
Sex						<.001
• Men	75.5	18.7	5.8	100.0	(1,734)	
• Women	61.7	31.3	7.0	100.0	(2,618)	
Age Group						<.001
• 60-64	79.1	18.3	2.6	100.0	(1,439)	
• 65-69	74.2	22.4	3.4	100.0	(1,167)	
• 70-74	65.8	27.0	7.2	100.0	(779)	
• 75 –79	51.3	37.9	10.9	100.0	(478)	
• 80 and over	32.9	46.8	20.3	100.0	(489)	
Educational Attainment						<.001
• No Schooling	54.0	36.2	9.9	100.0	(1,451)	
• Pratom 1-7	73.5	21.8	4.7	100.0	(2,615)	
• Secondary and Higher	76.6	17.1	6.3	100.0	(286)	
Marital Status						<.001
• Married	74.1	20.8	5.1	100.0	(2,167)	
• Separated/Divorced/ Widow	60.5	31.5	8.0	100.0	(2,087)	
• Single	57.1	35.7	7.1	100.0	(98)	
History of Main/Longest Job						.128
• Agriculture	66.8	27.1	6.1	100.0	(2,987)	
• Mining/Industry/ Construction	71.1	21.2	7.7	100.0	(311)	
• Service/Professional	67.2	25.5	7.3	100.0	1,054	
Place of Residence						.038
• Urban	65.1	26.9	8.0	100.0	(1,176)	
• Rural	67.9	26.1	6.0	100.0	(3,176)	
Cigarette Smoking						<.001
• Currently Smoke	74.5	21.0	4.5	100.0	(1,178)	
• Ever Smoked	68.9	21.5	9.6	100.0	(758)	
• Never Smoke	63.1	30.4	6.5	100.0	(2,416)	

Note * both IADLs and ADLs disability

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46575

Prevalence of disabilities increased with age. The proportion of elderly with no disability declined as people got older. Nearly half of people aged 75-79 years experienced from some kind of disabilities. And two out of every three elderly in the oldest old group had disabilities.

Educational attainment was significantly related with disabilities outcome. People who had never been to school experienced the highest level of both IADLs and ADLs disabilities. In contrary, over three-quarter of persons with secondary education or higher were in the 'no disability' group. Therefore, the second hypothesis, educational attainment has the inverse relationship with disabilities, is accepted.

Elderly who were still married seemed to be in better situation than the other two groups. Almost three-quarter of the married (74%) elderly reported no problem in performing these activities while over half of the elderly (57%) who were never married reported having disability. However, the number of elderly who had never been married was quite small. Only 98 people (2.2%) were in this category and this could create some error in the result. As shown in table 13, thirty-five persons of the elderly who were 'single' had IADLs disability and only 7 persons had both ADLs and IADLs disabilities. Thus, the 'single' group was merged with the 'separate/divorce/widow' group to eliminate problem with zero cell count when using multivariate analysis.

Although the relationship between occupation and disabilities was not statistical significantly, it was interesting to see that elderly who had been working in

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the agricultural area had more IADLs disability while those who had been working in service or professional had more severe disability (both ADLs and IADLs). Place of current residence seemed to have slightly related to having both ADLs and IADLs disabilities. The elderly who resided in urban area had more disabilities than those counterparts.

Health behavior such as cigarette smoking was significantly related to disabilities outcome. However, the high percentage of IADLs disabilities (30%) among those who never smoked was unexpected. Theoretically, it was presumed that people who never smoked should have better health than smokers as supported by several researches. One possible explanation could be the indirect effect of smoking (secondary smoker). People who were themselves none-smoker might inhale smoked-air from other surrounding smokers. However, further investigation by using multivariate statistic might uncover this relationship.

The influences of chronic conditions on disabilities were demonstrated in table 12 using cross-tabulation. Though 16 conditions were listed in the questionnaire, only significant conditions were selected to be included in the multivariate analysis. Chronic conditions such as tuberculosis, liver disease, fractures and cancer was excluded from further analysis because of the small number of cases. For example, out of 103 cases with tuberculosis, only 30 cases reported having IADLs disability and only 6 cases had both disabilities. Only 30 and 48 elderly reported they had liver disease and fractures respectively. Some condition such as back pain was also excluded from analysis because it was difficult to differentiate whether it was really an

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impairment or just the feeling of discomfort without any underlying pathology. Most of the studies did not include this symptom in their analysis. Pterygium was also excluded because it was not significantly related to disabilities ($p > .05$).

These criteria left only 9 conditions that had statistical significant at the level less than 0.05 to be included for multivariate analysis (table 16). These conditions were high blood pressure, heart problem, diabetes, cataract, ear problem, arthritis/rhumatism, asthma, paresis/paralysis and kidney/urinary tract problem. Because the effect of chronic conditions on functions varied among conditions, thus instead of using number of chronic conditions, this study employed separate conditions to enter in the model.

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Table 14: Percentage distribution of elderly by type of disabilities and chronic conditions

Conditions	Type of Disabilities (%) None	IADLs only	ADLs *	Total	(Number)	p-value
High Blood Pressure						<.001
• No	69.1	25.3	5.6	100.0	3,346	
• Yes	60.8	29.5	9.6	100.0	1,006	
Heart Problem						<.001
• No	68.4	25.5	6.1	100.0	3,747	
• Yes	59.3	31.4	9.3	100.0	605	
Diabetes						<.001
• No	67.7	26.2	6.1	100.0	4,086	
• Yes	59.4	27.4	13.2	100.0	266	
Cataract						<.001
• No	68.5	25.5	6.0	100.0	3,842	
• Yes	57.7	32.2	10.2	100.0	510	
Pterygium						.206
• No	67.1	26.1	6.7	100.0	3,844	
• Yes	67.2	26.3	6.5	100.0	508	
Ear Problem						.029
• No	67.7	26.0	6.3	100.0	4,022	
• Yes	61.2	29.7	9.1	100.0	330	
Rheumatism						<.001
• No	69.5	25.3	5.2	100.0	2,552	
• Yes	63.9	27.7	8.4	100.0	1,800	
Back Pain						.004
• No	69.1	23.4	7.5	100.0	1,409	
• Yes	66.3	27.7	6.0	100.0	2,943	
Tuberculosis						.789
• No	67.2	26.2	6.5	100.0	4,249	
• Yes	65.1	29.1	5.8	100.0	103	
Asthma						.022
• No	67.6	26.0	6.4	100.0	4,111	
• Yes	59.3	31.5	9.1	100.0	241	
Stomach Problem						.889
• No	67.3	26.1	6.6	100.0	3,460	
• Yes	66.7	26.9	6.4	100.0	892	
Liver Disease						.246
• No	67.3	26.3	6.5	100.0	4,322	
• Yes	56.7	30.0	13.3	100.0	30	
Fracture						<.001
• No	67.3	26.4	6.3	100.0	4,304	
• Yes	60.4	14.6	25.0	100.0	48	
Cancer						.729
• No	67.2	26.3	6.5	100.0	4,332	
• Yes	60.0	30.0	10.0	100.0	20	
Paresis/Paralysis						<.001
• No	68.9	26.5	4.7	100.0	4,216	
• Yes	15.4	20.6	64.0	100.0	136	
Kidney/Urinary Problem						<.001
• No	67.9	26.1	6.0	100.0	4,115	
• Yes	55.3	30.0	14.8	100.0	237	

Note * both IADLs and ADLs disability

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The influence of functional limitations and disabilities were depicted in table 15. It showed that functional limitations had positive impact on disabilities. All three functions were significantly related to disabilities at the level less than .001. Therefore, all three functions was included in the multivariate analysis.

Table 15: Percentage distribution of elderly by type of disabilities and functional limitations

Conditions	Type of Disabilities (%) None	IADLs only	ADLs*	Total	(Number)	p-value
Crouching						<.001
• No	73.5	24.6	1.9	100.0	(3,601)	
• Yes	37.0	34.4	28.6	100.0	(751)	
Walking 1 km.						<.001
• No	80.1	19.2	0.7	100.0	(3,312)	
• Yes	26.1	48.9	25.0	100.0	(1,040)	
Climbing stairs 2-3 steps						<.001
• No	72.2	25.5	2.3	100.0	(3,997)	
• Yes	11.3	35.2	53.5	100.0	(355)	

Note * both IADLs and ADLs disability

4.3.2 Multivariate Analysis of Risk Factors and Disabilities

Table 16 demonstrated the influence of risk factors on disabilities. To investigate whether which factors were related to the presence of disabilities, a serie of ordered logit regression model (hierarchical logistic regression) was employed. Disability status was categorized into 3 groups based on the hierarchical order that was from the less essential for life functions to the most essential one. First was the 'no disability' group, the 'IADLs disability only' was the second category, and the 'both ADLs and IADLs disabilities (ADLs+)' was the third category. This step comprised

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of five models which one group of independent variables was entered after one another. The reasons to do this hierarchical model were 1) because of a theoretical causal consequence, and 2) to understand how groups of control variables influence an initial association (Jette et al., 1998; Zimmer, 2000). For example, it was hypothesized that there was gender difference in the prevalence of disabilities. Did the influence of gender change when adjusted for another risk factors such as another socio-demographic factors (age, education, marriage etc.), behavior, health conditions, and functional limitations.

This hierarchical model comprised of 5 models (model A –E). Model A included only socio-demographic variables such as sex, age group, education attainment, marital status and place of residence. This model was a basic model which was tested to see how socio-demographic variables affect the presence of disability. Model B included behavioral variable (cigarette smoking) along with socio-demographic variables to see whether it had influence on disability status. Model C included the previous two factors plus a group of health factors. Model D comprised of all socio-demographic variables, behavior variable and functional limitations while health factors were excluded. Finally, model E comprised of all four groups of independent variables.

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Table 16 : Ordered Logit Regression coefficient and standard error of socio-demographic variables, behavior, chronic conditions, and functional limitations with disability status

	Model A	Model B	Model C	Model D	Model E
Intercept 1 (cut_1)	1.14 (.20)	1.24 (.21)	1.76 (.22)	1.92 (.23)	2.10 (.23)
Intercept 2 (cut_2)	3.28 (.21)	3.39 (.22)	4.15 (.23)	4.97 (.25)	5.21 (.25)
Gender (Male)					
- Female	.51 (.08)***	.49 (.10)***	.53 (.11)***	.23 (.11)*	.30 (.11)**
Age Group (60-64 yrs.)					
- 65-69 yrs	.25 (.09)**	.25 (.09)**	.29 (.10)**	.19 (.10)	.20 (.10)
- 70-74 yrs.	.64 (.10)***	.62 (.10)***	.59 (.11)***	.38 (.11)**	.37 (.11)**
- 75-79 yrs.	1.18 (.12)***	1.16 (.12)***	1.17 (.12)***	.70 (.13)***	.75 (.13)***
- 80 and over	1.91 (.12)***	1.90 (.12)***	1.97 (.12)***	1.09 (.13)***	1.18 (.14)***
Education (no schooling)					
- Pratom 1-7	-0.26 (.07)**	-0.27 (.08)***	-0.30 (.08)***	-0.17 (.08)*	-0.19 (.08)*
- Secondary ed.	-0.41 (.16)*	-0.44 (.06)**	-0.48 (.17)**	-0.27 (.18)	-0.34 (.18)
Marital Status (currently married)					
- Not currently married	.01 (.08)	.01 (.08)	.04 (.08)	.01 (.08)	.04 (.08)
Place of Residence (Urban)					
- Rural	-0.18 (.08)*	-0.17 (.11)*	-0.06 (.08)	.04 (.09)	.09 (.09)
Cigarette Smoking (current smoker)					
- Ex- smoker		.23 (.11)*	.06 (.11)	.05 (.12)	-0.03 (.12)
- Never smoke		.11 (.10)	.05 (.11)	.04 (.11)	.00 (.11)
Health Variables					
- High Blood Pressure			.16 (.08)		.02 (.09)
- Heart Problem			.23 (.10)*		.04 (.11)
- Diabetes			.32 (.14)*		.27 (.15)
- Cataract			.22 (.10)*		.21 (.11)
- Ear Problem			.04 (.13)		-0.01 (.14)
- Arthritis			.18 (.07)**		-0.07 (.08)
- Asthma			.45 (.14)**		.09 (.16)
- Paralysis/semi-paralysis			3.45 (.21)***		1.75 (.22)***
- Kidney/Urinary Tract Problem			.58 (.15)***		.43 (.15)**
Functional Limitations					
- Crouching				.87 (.10)***	.79 (.10)***
- Walking				1.67 (.09)***	1.60 (.09)***
- Climbing Stairs				2.03 (.15)***	1.76 (.15)***
LL	-3193.4612	-3191.2522	-2990.9255	-2610.8666	-2566.8093
LR Test ($\chi^{2)}$	546.04	4.42	400.65***	1160.77*** [(a)]	88.11***
R^2	0.0788	0.0794	0.1372	0.2468	0.2595

Note: significant level * < 0.05; ** <0.01; *** <0.001

(a) = Comparison of model D with model B

(.....) = reference group, for health and functional limitations: "No" is reference group

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As illustrated in tables 16, model A contained only socio-demographic variables. All of these variables except marital status were significantly associated with disabilities. The positive coefficient of females indicated the higher probability of being in the higher categories (more disabled) as compared to males. Thus, this finding confirmed the hypothesis that elderly men were healthier than elderly women. The relationship between all age groups and disabilities was positive and gradually increased with more advance age. Educational attainment was negatively related with disabilities, which also confirmed the second hypothesis. Rural resident was negatively related to disabilities. This evidence indicated that rural resident were less likely to have disabilities compared to the urban resident.

Model B included one more variable, cigarette smoking, along with all socio-demographic variables. No significant change in the relationship from the previous model (model A) was observed. For behavior variable, only the 'ever smoked but quit' was positively related to disabilities. This evidence suggested that, compared with those who were currently smoker, persons who were ex-smokers were more likely to have more disabilities.

In model C, selected chronic conditions were added. All of the significant effects from model B were still present except the effect of cigarette smoking. This evidence suggested that the effect of cigarette smoking on disabilities was probably through the effect on health or chronic conditions. For chronic conditions, only seven out of nine chronic conditions were significantly related to disabilities. These

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conditions were heart problem, diabetes, asthma, arthritis, paralysis/semi paralysis and kidney/urinary tract problem.

Model D included functional limitations together with all previous variables except health conditions. This model illustrated the strong effect of functional limitations on disabilities. All three functions were highly significantly related with disabilities (p <.001).

The final model, model E, comprised all independent variables. It could be seen that when functional limitation was included in the analysis, all the coefficients of another independent variables were either attenuated or became insignificant. However, the effect of gender, age and education were still held even though the effect of secondary education became insignificant (p =.06). This could explained by the small number of elderly in this group (N = 286) as compared with number of elderly in other categories.

For chronic conditions, only two conditions, paralysis and urinary problem, were still significant. This evidence also suggested the intermediate role of functional limitations as was depicted in the disablement process (Verbrugge and Jette, 1994; Jette et al., 1998). The effect of chronic conditions on disabilities was largely through the functional limitation. For example, heart problem or asthma commonly has effect on any physical exertion. Thus, these conditions interfered with ability to walk a long distance or walking up stairs. As demonstrated in model E, functional limitations were the strongest factor that related to disabilities. Among three functions, limitation

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in walking about 1 km had the strongest relationship with disabilities follow by ability to climbing 2-3 stairs. The influence of risk factors and functional limitation was demonstrated in the appendix.

However, all of the variables included in the models explained only small portions of the relationship (Pseudo $R^2 = 0.26$). By using the hierarchical model, it was possible to see how groups of variables influence an initial association and how groups of variables improved the prediction. For example, when only adding health behavior to the socio-demographic variables (model B), the model further reduced –2LL by 4.42 (compared with model A). Adding chronic conditions in the model (model C) further reduced –2LL by the very significant amount 400.65 ($p < .001$). Adding functional limitations in the model (model E) further reduced –2LL,compared to model C, by 88.11 at significant level less than .001. Though, with all variables included in model E, the Log Likihood improved by only small amount compared to model D, model E offered the best solution. The information about all variables and how these effects changed when other variables were introduced in the model step by step could provide clearer understanding of the disablement process.

4.3.3 Conclusion of the Effect of Risk Factors on Disabilities

4.3.2.1 Gender

Though gender differences in function among older adult are not well understood. Many researchers had tried to explain the discrepancy between gender. Some argued that cultural factors such as gender role difference might have some effect in reporting disability in the way that women often report their problem more

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than men (Roger et al., 1992; Johnson and Wolinsky, 1994). Other argued that gender difference in function was due to women's greater prevalence of nonfatal but disabling conditions such as arthritis and migraine headache (Verbrugge,1985 in Merrill et al., 1997). Merrill et al., (1997) found that men and women were generally accurate in their reported disability and that women' s higher prevalence of reported functional problem was probably a reflection of true disability. However, the result from the 1992 NHIS showed that, overall, women had a higher rate of activity limitation than men was due to the greater longevity of women. But when age -adjusted to account for the difference in the age distribution of males and females, the gender-specific rates were comparable: 15.2% of males were limited compared to 14.8 % of females (LaPlante, 1998).

In this study, women seemed to have more disability than men. Bivariate analysis demonstrated significant difference in disability prevalence between gender. The disadvantage was prominent in the IADLs disabilities in which 32% of women reported having IADLs disability compare with only 19% in men (table 13). Even after controlling for other variables (table 16), the effect of gender still exist. The result from table 7 explicitly shown that woman had much more disability in 'travelling alone' than men (30% compared to 14%). This difference could attribute to the discrepancy between gender.

Prevalence of most chronic conditions was much more prominent in women as displayed in table 3. This evidence could lead to the higher probability of having disabilities among women since chronic conditions have strong influence on the

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probability of having disabilities. Furthermore, educational attainment among women was lower than men (appendix A). As displayed in table 16, persons with higher educational attainment were less likely to have disabilities. Thus, though the speculation that higher prevalence of disabilities among women was due to the higher level of report or awareness could not be clarify now, the available evidences seem to support the true unpleasant situation among elderly women.

4.3.3.2 Age

Age was strongly linked with disability. As age increased, prevalence of disability also becomes greater. Older people have greater risks of becoming disabled because they were more likely to have more chronic conditions which, in turn, related to functional limitations. As demonstrated in table 2, all of the elderly had some chronic conditions and the average number of chronic conditions was 6. Bivariate analysis indicated significant association between age and disabilities as shown in table 13. The result form ordered logistic regression analysis confirmed the association between age and both types of disabilities. Even after controlling for other variables, particularly functional limitations, the probability of having disabilities still increased dramatically with increasing age.

4.3.3.3 Educational Attainment

Although the exact mechanism of education on health remains unknown, education might have effect on health and functioning through a combination of health promotion and disease prevention practices (Freedman and Soldo, 1994). Persons with higher education seem to have more advantage in the

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ability to accommodate the information necessary for health practice. Moreover, education is a mean for acquiring higher income (Roger et al., 1992). Zimmer et al. (1998) found that higher education played substantial role in primary prevention of morbidity, delaying the onset of disability.

Bivariate analysis in table 13 indicated that the elderly who never attended school had the highest rate of both IADLs and ADLs disability. The elderly who had more than secondary education had the lowest rate of disability. However, when functional limitations were present as in model D and E (table 16), the effect of secondary education was slightly attenuated (p = .06). After controlling for another factors, the negative coefficient in table 16 suggested that the higher the educational attainment, the lower the probability of having disabilities. Compared with those who had no schooling, the elderly who finished primary school level were less likely to have disabilities while those who had higher than primary school level were the least likely to have disabilities.

Psychosocial connection between education and health may explain this phenomenon. For example, Ross and Wu (1995) found that education affects health through a sense of personal control over one's life, which was enhanced with increase education, and through the benefits provided by social-support networks, which tend to be stronger among those who were better educated.

Freedman and Martin (1998) found that persons who were not high school graduates were consistently at twice the risk of high school graduates for

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functional limitation in late-life. They suggested that the role of education on late-life functioning might be through the knowledge about health care, more access to health care system, and ability to modify one's environment.

In conclusion, educational attainment was inversely related to disabilities. Even though the role of education to functional ability were complex and the exact mechanism were largely unknown, this result confirmed the second hypothesis and convinced that providing education would be benefit for people throughout the length of their life.

4.3.3.4 Marital status

Marital status was hypothesized to associate with disabilities in the way that married people would have lowest rate of disabilities compared to those who divorced/separated/widow or single people. According to the social support theory, individual with more social support exhibits better health. Marriage provides individual with a sense of meaning and importance that promotes health (Roger et al., 1992).

Although the bivariate analysis shown that the elderly who were widowed, divorced or separated reported the highest rate of both IADLs limitation (8%), while people who were still married had the lowest rate of ADLs disability (5%). The result from multivariate analysis (table 16) demonstrated that marital status was not significantly associate with having any kind of disabilities, which meant that the initial relationship was confounding.

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4.3.4.5 Occupation

The relationship between occupation and disability in the elderly population had not been study as frequently as other factors. Most of the studies focused on the effect of occupation and injury that could lead to disability in the working age group. Rahkonen and Takala (1998) studied the effect of former occupation on health of the elderly people in Finland. They found that former occupation as workers and farmers continue to be associated with poor functional ability in later life. The health of the farmers was poor and their working conditions were difficult in earlier years, when most worked on the farm.

Although, the result in table 13 showed that the elderly who worked in agricultural area had most difficulty in IADLs (27%) while those who were workers had most difficulty in both IADLs and ADLs (8%), there was no statistically significant association between occupation and disabilities. Thus, occupation was excluded from further analysis. However, multivariate analysis (see appendix B) displayed significant relationship between occupation and functional limitations. It was found that the elderly who worked in agricultural area was the least likely to have functional limitations. This finding was unexpected and deserved further investigation.

4.3.3.6 Place of Residence

Though bivariate analysis reviewed significant relationship between place of residence and disabilities outcome (table 13), the result from multivariate analysis indicated the inverse relationship only before controlling for chronic conditions and functional limitations (table 16). This evidence indicated the higher

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probability of having disabilities for urban people which supported the finding of Jitapunkul et al.(1999). The disability transition proposition proposed that the differential in disability prevalence level during the transition widen so that the levels in disability in urban areas become much greater than in rural area (Myers and Lamb, 1993). However, when controlling for chronic conditions and functional limitations, there was no significant effect of place of residence. This suggested that giving the same level of chronic conditions, there was no significant difference in the prevalence of disabilities between urban residence and rural residence. The initial significant relationship might be from the differences in prevalence of chronic conditions more than functional limitation as the multivariate analysis demonstrated in the appendix B (table B3) showed no relationship between place of residence and functional limitations.

4.3.3.7 Health Conditions

Chronic conditions increased a person's risk of disability, although the degree of risk varied among conditions. Chronic health conditions were significantly associated with both functional limitations (see appendix B) and disabilities. Among nine conditions, only heart disease, diabetes, cataract, arthritis, asthma, paralysis/semi-paralysis and kidney disease were significantly related with disabilities (table 16, model C). Having chronic conditions increased the risk of having disabilities. However, when functional limitations were added in the model the coefficients became insignificant (model E) and only paralysis/semi-paralysis and kidney/urinary tract problem remained significant.

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As seen in table 16 (model C and E), the conditions that posed high risk of both IADLs and ADLs disabilities were the low prevalent conditions such as Paralysis/semi-paralysis and kidney problems. The prevalence of these two conditions were only 3.1% and 5.4 % respectively (table 3). This finding confirmed with other studies as Pope and Tarlov (1991:12) stated "Indeed, the most prevalent conditions, such as sinusitis, hypertension, and hearing impairment, generally pose low risks of activity limitation, whereas the least prevalent conditions such as multiple sclerosis and lung or bronchial cancer, pose very high risks of disability."

4.3.3.8 Lifestyles and Behavior

- Persons who smoked are at greater risks of having disability because smoking increases the risk of various conditions such as emphysema, cancer and stroke (Palmore and Burchett, 1997). Table 16 revealed that before controlling for chronic conditions, the ex-smoker group had more disabilities than the currently smoking group (model B). The reason could be that persons who used to smoke might stop smoking when they had problem with their health.

4.3.3.9 Functional Limitations

Functional Limitations were strongly related with both type of disabilities. In the disablement model, functional limitations were the most direct pathway that led to disabilities. Persons who had impairments might have disabilities mainly through the effect on functional limitations. The multivariate analysis of disability outcomes demonstrated the association between various independent

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variables but when functional limitations were added in the model, the coefficient of those conditions became either attenuate or insignificant. This evidence supported the intermediate role of functional limitations as proposed in the disablement model (Pope and Tarlov, 1991; Verbrugge and Jette, 1994; Jette et al. 1998).

In conclusion, gender had difference effect upon both functional limitations and two types of disabilities. In general, elderly men were healthier than elderly women in every aspect. The probability of having either functional limitations or disabilities in elderly women was higher compared with elderly men. Thus, these evidences confirmed the hypothesis about gender difference in which elderly men were hypothesized to be healthier than elderly women.

Socio-economic factor as measured by educational attainment had strong effect on disabilities. Thus, it underpinned the important of education that could have the effect for the long period of life. This finding also underscored the important of the intermediate role of functional limitations in the development of disabilities. And because a large portion of the elderly had functional limitations, target to prevention of disabilities might aim at the provision of suitable environment that enabled people with limitation in mobility to be able to live independently in the society.

4.3.4 Estimating the probability of being in specific category

From table 17, the probability of being in specific categories (π_j) could be estimated from the following equation (Zimmer, 2000).

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$$\pi_{(j)} = 1/1+e_j^{-a_j}$$

and, $\pi_{(z)} = 1 - \pi_{z-1}$

where j was the category referred to

and a was the constant or cut_point,

z was the last constant or cut_point

Thus, The probability of being in category 1 (π_1) = $1/1+e^{-a_1}$ (1)

The probability of being in category 1 or 2 ($\pi_{1,2}$) = $1/1+e^{-a_2}$ (2)

The probability of being in category 2 (π_2) = (1) – (2)

The probability of being in category 3 (π_3) = $1- \pi_1 - \pi_2$

where; a_1 = 2.0954+.2959(female)+.1992(age1)+.3652(age2)+.7467 (age3)+1.1745(age4)-.1908(ed1)-.3400(ed2)+.0397(marriage)+.0870(rururb)-.0289 (ever smoke)+.0002(never smoke)+.0237(HT)+.0380(HD)+.2716(DM.)+.2095 (cataract)-.0085(ear problem).0768(arthritis)+.0936(asthma)+1.7197(paralysis)+.4295 (kidney)+.7924 (crouching)+1.5994(walking)+1.7647(climbing)

and, a_2 = 5.2146+.2959(female)+.1992(age1)+.3652(age2)+.7467 (age3)+1.1745(age4)-.1908(ed1)-.3400(ed2)+.0397(marriage)+.0870(rururb)-.0289 (ever smoke)+.0002(never smoke)+.0237(HT)+.0380(HD)+.2716(DM.)+.2095 (cataract)-.0085(ear problem).0768(arthritis)+.0936(asthma)+1.7197(paralysis)+.4295 (kidney)+.7924(crouching) +1.5994(walking)+1.7647(climbing)

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From above equation, the probabilities of women with various levels of educational attainment could be estimated. Table 17 demonstrated the clearer picture of the relationship between gender, educational attainment and the presence of disabilities by predicting probability of being in each category with these two variables. The probability of having no disability in males with no schooling was .68 compared with .73 in those who had secondary education and over. This pattern also held for women, however, these probabilities of having no disability for women were lower compare to men.

The probability of men who had primary education would have no disability was 0.7 while, for women, this number was slightly lower ($\pi = 0.66$). In contrary, the probability for men with primary educational attainment would have both IADLs and ADLs disability was lower than women with the some level of education ($\pi = .06$ compared to $\pi = .07$).

Table 17: Predicted probability of having IADLs and ADLs disability by level of education and sex.

Level of Disability	Males			Females		
	No School	Pratom1-7	Secondary and over	No School	Pratom1-7	Secondary and over
No Disability	0.68	0.70	0.73	0.63	0.66	0.68
IADLs Disability	0.26	0.24	0.22	0.30	0.27	0.26
Both IADLs and ADLs Disability	0.06	0.06	0.05	0.07	0.07	0.06
Total	1.00	1.00	1.00	1.00	1.00	1.00

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In conclusion, this evidence confirmed the hypothesis that elderly men were healthier than elderly women and that educational attainment had inverse relationship with the presence of disabilities.

4.4 Section Four: Active Life Expectancy

Active life expectancy refers to the average number of years an individual is expected to live free of both instrumental activities of daily living (IADLs) and activities of daily living (ADLs). Method of calculating active life expectancy could be categorized into 3 methods: the prevalence rate life table model (the Sullivan method); the double decrement life table model, and the multistate life table model. This study employed the first method, the Sullivan method, to analyzed active life expectancy. This technique was suitable for the available data, which was from the cross-sectional survey. The calculation was performed according to the guideline suggested by Jagger (1999).

The prevalence of disabilities was partition into IADLs disability and both IADLs and ADLs disability as described in preceding section. Total life expectancy at age 60 and over obtained from the report on 1995-1996 Survey of Population Change (NSO, 1997) was used as the base for calculating active life expectancy. Active life expectancy for males and females were calculated separately because of gender differences in mortality and prevalence of disabilities.

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Table 18 illustrated total life expectancy at age 60 and over, life expectancy with IADLs disability, life expectancy with ADLs disability, and life expectancy free of both IADLs and ADLs disabilities (DFLE). The results showed that men at all ages had a lower expectation of life than women. At age 60 years, men might expect to live on average 3.6 years shorter than women. These disparities were less prominent with advanced age. For life expectancy at age 75 and over, women might expect to live on average age 2.7 years longer than men.

Table 18 : Total Life Expectancy, Life Expectancy with Disabilities and Disabilities Free Life Expectancy of Thai elderly population by age and sex

Gender/Age Group	Total Life Expectancy* (years)	LE with Disabilities		DFLE	
		IADLs only (years)	ADLs+ (years)	years	Percent**
Male					
60-64	20.29	4.55	1.70	14.04	69.20
65-69	17.15	4.27	1.74	11.14	64.96
70-74	14.18	4.02	1.84	8.32	58.67
75-79	11.87	3.99	1.77	6.11	51.47
80 and over	10.90	4.01	2.04	4.85	44.50
Female					
60-64	23.89	8.84	2.47	12.58	52.66
65-69	20.20	8.27	2.48	9.45	46.78
70-74	16.89	7.63	2.51	6.75	39.96
75-79	14.60	7.26	2.66	4.68	32.05
80 and over	13.61	7.05	2.83	3.73	27.41

*Source: Report on the 1995-1996 Survey of Population Change, NSO 1997

Note : ** the percentage of disability- free of disabilities (DFLE) to total life expectancy (LE)
ADL+ means both IADLs and ADLs

In contrary to total life expectancy (LE), the average years lived without disabilities (DFLE) for women were shorter than men in every age group. For example, at age 60 years men might expect to live, on average, for further 20.3 years

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of which 14 years would be spent free of disabilities. Women at the same age might expect to live, on average, for further 23.9 years while only 12.6 years would be spent free of disabilities. When each states of health were examined as percentage of disability-free life expectancy (DFLE), it was obvious that elderly men were healthier than elderly women since the proportion of healthier life were substantially lower for women in every age group. For instance, at age 60, the percentage of life expectancy free of disabilities for women was only 52.7% while this correspond to 69.2 % in men. These disparities were even greater at more advance age groups. At age 80 and over, the percentage of expected life without disabilities for women was only 27.4% while it was 44.5% for men. Thus, the first hypothesis is accepted.

Much of the disparities were accounted by the average years of life spent with IADLs disability. As seen in tables 18, average of years spent with IADLs disability only were substantially higher for women than for men. The years spent with IADLs disability were almost double in women compared to men in every age group. However, the difference in average years spent with both IADLs and ADLs disability between men and women were less prominent compared to the disparity in average years spent with IADLs disability only.

Though the definition and measurement of disabilities was difference, the results did not differ substantially from other studies both within this country and in other countries. For example, Jitapunkul et al. (1999), using the Sullivan method, found both proportion of long-term disability free life expectancy and active life expectancy were higher in Thai elderly men than in elderly women in every age group.

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Mutafova et al.(1997), also using the Sullivan method, concluded that though Bulgarian women had higher life expectancies, their expected health proportion of life was significantly lower than that of men.

Studies using multistate life table also found similar results. For example, The study of ADLs dependency by Rogers et al. (1989) found that though women lived longer than men, men lived a greater proportion of their lives in active status. Guralnix et al. (1993) employed multistate life table technique which allowed for transition between each health states such as from nondisabled in activities of daily living at base line to disabled at the following year or disabled at the baseline to nondisabled at the following year. Theirs study found that, in sub groups defined by education and race, women consistently had twice as many years of life with disability as men at all ages. For example, at age 65, black men with lower education level had a disabled life expectancy of 1.4 years, as compared with 2.7 years for black women with a lower education level.

In conclusion, though the Sullivan method has been criticized as it is not a traditional life table measures because it rests on a combination of prevalence and incidence rates. Furthermore, this technique does not allow the probability of transition from disabled state to nondisabled state (Crimins et al., 1999; Rogers et al., 1990; Bebblington, 1988). However, this technique will continue to be popular in many countries including Thailand because it requires data that already available in many countries. It allows the production of reliable indicators of population health

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composition which are comparable across time and geographic areas (Crimins et al., 1999).

The finding in this study suggested that there was gender difference in health status. Though women lived longer than men, the large proportion of that longer life were spent in unhealthy state. Much of that unhealthy state accounted by limitation in performing instrumental of activities of daily living, travelling by oneself in particular.

4.5 Conclusion

This chapter comprised of four sections according to the objectives of the study. These sections were arranged as: 1) the health status of the elderly by looking at prevalence of chronic conditions, functional limitations, instrumental activities of daily living, and activities of daily living; 2) factors influencing the presence of disabilities; 3) estimated probability of having disabilities by sex and various level of educational attainment; and 4) life expectancy free of disabilities at age 60 and over.

All of the elderly had some chronic conditions in which men seem to be in better health than women. Problem with musculo-skeletal system such as back pain and arthritis were prominent especially in women. The first hypothesis, elderly men are healthier than elderly women, were supported by all of the evidences found throughout this chapter. The prevalence of functional limitations, IADLs disability and ADLs disability were significantly higher in women. Prevalence of disabilities differed by gender and age group. In general, women experienced both ADLs and IADLs disabilities than men regardless of age. Prevalence of disabilities rose gradually until age 70 after that the prevalence rates became accelerated.

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The most problematic task in instrumental activities of daily living was the ability to travel by oneself by car or by boat. For activities of daily living, the ability to walk around inside the house was found to be the most limitation for both elderly men and women.

Multivariate analysis using ordered logit regression also confirmed this hypothesis. There was gender difference in the presence of disabilities in which women were more likely to have both types of disability even after controlling for other variables. Furthermore, the second hypothesis, educational attainment has inverse relationship with the prevalence of disabilities, was also accepted. Persons with no school education were the group with highest probability of having disabilities. Functional limitations, which also were more prominent in women, were strongly related with the presence of both types of disabilities. Estimated probability of having disabilities by sex and three levels of educational attainment explicitly supported above conclusion.

The proportion of active life expectancy as defined by the average years lived free from IADLs and ADLs disability was performed using the Sullivan technique. The expected years living with ADLs disability was not much difference between men and women ranging around 2-3 years of the total life expectancy in every age group. However, the expected years with IADLs was much longer in both sex especially in elderly women. The result indicated that, though women seem to live longer than men, the proportion of active life were greater in men in every age group. Therefore, elderly men are healthier than elderly women.

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One of the speculations in the high prevalence rates of disabilities especially among elderly raised on the proposition that prevalence levels of disablement increase during the transition due to heightened social awareness (Myers & Lamb, 1993) could not be delineated due to the limitation of using secondary data. However, many evidences seem to suggest that the finding in this study reflected the real phenomenon.

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CHAPTER V

Summary and Recommendation

The decrease in fertility level reinforced by the decline in mortality rates during the past three decades in Thailand had led to the changing in the age structure of the population. The proportion of the population aged 60 and over compared to the total population will continue to increase in the rate that never happen before. This proportion is estimated to increase from 8.1 % in 1995 to 9.2%, 10.2%, 11.4%, and 13.2% in the year 2000, 2005, 2015 and 2025 respectively. Since aging is expected to accompany by physiological change that will lead to chronic conditions and subsequently, disabilities. The aging population will pose a new challenge in all dimensions to the Thai society in the future.

There has been debated over the implications of mortality changes for the aggregate health characteristics of the elderly population. One concern is that postponing mortality from some diseases or injury may cause people to live with disabilities, thus, the evidence of increasing population with disabling conditions is expected in the future. In contrary, there is some evidence that it is possible to compress chronic illness into the last few years of life, thus compressing the morbidity until the very end of life. However, no matter which view is, there is the need for research that focuses on the consequence of diseases/health conditions, disabilities, rather than the morbidity alone. This information is necessary for planing both in

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prevention and rehabilitation and, more important, the need and service for long-term care.

This study employed the data from the Health Interview Survey of the Population aged 50 and over, 1995 which was the joint conduct by the Ministry of Public Health; the Institute of Population Studies, Chulalongkorn University; the Thailand Health Research Institute; the National Health Foundation; and the Health System research Institute, with the partial fund from the World Health Organization, the Regents of the University of Michigan, USA. However, only the persons aged 60 and over were required for the study.

The sample comprised of 4,483 elderly aged between 60 through 109 (mean = 69.2, S.D. = 7.52). More than half of the subject was in the 60 –69 years and about 60 percent were female. Majority of these samples had only primary school level (pratom 1-7) and one-third had never been in school. About half of them were married and almost equal proportion was either separated/divorced or widow. Very few of the elderly were single. The majority of the sample lived in the rural area and had worked or still works in the agricultural area.

A list of 16 selected chronic conditions commonly found among the old population was used to assess health status of the sample. These conditions were high blood pressure, heart problem, diabetes, cataracts, peterygium, ear problem, arthritis/rheumatism, back pain, tuberculosis, asthma, stomach problem, liver problem, fracture, cancer, paralysis and kidney/urinary tract problem. All of the elderly

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reported that they have some chronic conditions. Women, on the average, had higher number of chronic conditions when compared with men. This gender difference in the average number of chronic conditions was significant at the level of less than .001. However, the rank of conditions reported was rather similar between men and women. For example, back pain was rank as the top of list among 16 conditions, followed by rheumatism/arthritis, high blood pressure and stomach problem. In almost every condition in the list, the proportion of women reported having these conditions was higher compared to men. Among the exceptional conditions which were found to be higher in men were asthma, kidney or urinary tract problem, tuberculosis and paralysis.

Disability referred to the consequence that specific health problems have on the person's ability to perform socially defined roles and tasks expected of an individual within a socio-cultural and physical environment. Disability status was defined as no disability, instrumental activities of daily living (IADLs), and activities of daily living (ADLs).

Activities of daily living (ADLs) comprised of six functions necessary for survival. These personnel care functions consisted of bathing, dressing, going to the toilet, transferring, continence, and feeding. However, only four functions of ADLs were assessed in this study. These functions were walking around in the house, eating, putting on clothes, and taking a bath. Level of difficulty was divided into 3 levels: none, some and a lot. Only persons who had a lot of difficulty were designated as having ADLs disability.

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Another measurement of disabilities, IADLs disability, was developed in order to capture more complex activities that were necessary for independent living in the community. Originally, IADLs were assessed in eight areas: shopping, food preparation, house keeping, doing laundry, using public transportation, taking medications, handling finances, and using the telephone. However, this study covered only five areas and assessment were made by self-reported or proxy interview. These five areas are grocery shopping, cooking, washing clothes, cleaning house, and travelling alone by boat or by car. Persons were asked a set of questions concerning the ability to perform these five activities. Only those who gave the reason for not performing or unable to perform as because of health problems were regarded as having IADLs disability.

The results reviewed that majority of the elderly reported no limitation in performing ADLs. When data were analyzed according to specific type of ADLs, the limitation in 'walking around inside the house' was found to be highest among other functions. About 12 percent of the sample had 'some' limitation in performing this function and 6 percent had a lot of difficulty, which was regarded as having ADLs disability. The function that ranked second in the prevalence was 'taking a bath' which about 3 percent of the elderly reported having 'some' difficulty and another similar proportion had 'a lot' of difficulty. The disability in function of 'putting on clothes' ranked the third in prevalence and disability in 'eating' was the lowest in prevalence (about 1.5 % and 1.1% respectively).

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The prevalence of IADLs disability was higher than the prevalence of ADLs disability as was expected. This finding confirmed the premises that ADLs and IADLs were hierarchical which ADLs represented more basic function. When people had ADLs disability, they usually had IADLs disability concomitantly. More than two-thirds (68%) of the subjects reported no limitation in performing IADLs. For those who reported as having IADLs disability, most of them only limited in one function. The most problematic was ability to travel alone by car or boat in which almost one-fourth of the elderly were unable to perform this activity. The limitation in this function attributed to the high percentage of elderly with IADLs disability. About one-fourth of the elderly were unable to perform this activity. When gender was taking into accounted, the result indicated that women had much more trouble than men. Almost 30 percent of women were unable to travel alone compared to only 14 percent in men.

For other IADLs functions, there was no significantly difference between gender. The prevalence of IADLs disability ranged from 7 to 9 percent in both sex. This finding was unexpected since most of the activities in the list were expected to be gender sensitive and was originally skip when assessing function in men. For example, food preparation, house keeping, and doing laundry were not administer in men. In Thailand, men were generally not expected to take care of these activities because it was assumed to be women's role by most member of the society. In the questionnaire, some respondents gave the reason for not doing these activities that because it was women's job.

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Functional limitations were assessed in three tasks: crouching, walking about 1 kilometer, and walking upstairs for 2-3 steps. Actually, the set of questions in the questionnaire concerning functional ability contains four tasks but one task, lifting things about 10 kilogram, was not included for analysis because of the criteria of 10 kilogram weight was considered too heavy. In fact the original scale set by Nagi (1976) set the criteria of only 10 pounds (about 5 kilograms).

The prevalence of functional limitations varied upon function. Crouching was found to be the most problematic task, followed closely by walking 1 kilometer. However, when degree of difficulty was taken into consideration, the proportion of elderly who reported unable to walk 1 kilometer distance was highest (16%) compared to about 8 % who were unable to crouch. Again, more women than men reported having functional limitations.

For analysis of association, two steps of statistical procedure were performed. First, the bivariate association was demonstrated using Chi-square test. Only factors that were statistical related to disability outcome were included in the second step, the multivariate analysis. The second step was performed by using the ordered logistic regression. All of these steps were performed by using STATA program, version 6.

Disability outcome was defined as no disability, IADLs disability only, and both IADLs and ADLs disability according to the hierarchical function (level of severity). Result from bivariate analysis indicated that five socio-demographic factors such as gender, age group, educational attainment, marital status, and place of

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residence were significantly associated with disability outcome. Occupation was the only factor that was not statistically related with disabilities. Health behavior, as measured by question about cigarette smoking, was significantly related to disabilities at less than .001 level.

In the multivariate analysis, only five variables that were found to have significantly related to disabilities from the bivariate analysis were included in the model. This step was performed by using hierarchical ordered logistic regression which comprised of five models. First, the socio-demographic factors were entered in the model, followed by health behavior variable in the second model. In the third model, selected health conditions were entered along with the two previous factors. Functional limitation was entered in the fourth model along with socio-demographic factors and health behavior factor but health condition factors were excluded. Finally, all variables were entered simultaneously in the last model.

The results revealed that the probability of having IADLs disability and ADLs disability was higher in female, older persons and person who had lower educational attainment. Marital status, place of residence, and cigarette smoking were not significantly associated with disability status when controlled for other variables. Heart problem, diabetes, arthritis, asthma, paralysis and kidney problems were found to have significantly related to IADLs and ADLs disability. However, when controlled for functional limitation only paralysis and kidney problems were still significant.

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This finding indicated that both IADLs and ADLs were closely related to physical abilities such as the ability to crouch, walk and climbing stairs and that risk factors such as socio-economic factors, health behavior factor and health condition factors were associated with disabilities through these physical function. Gender difference was more prominent especially in IADLs disability since this effect was still hold even after controlling for functional limitations. This phenomenon could be explained by largely difference in performing 'travelling alone' task in which the limitation was much higher in women.

Estimated probability of having disabilities by gender and level of education was performed after ordered logit regression analysis. The result supported the hypothesis that elderly men are healthier than elderly women and that educational attainment has inverse relationship with the presence of disabilities.

Analysis of quality of life in term of the proportion of active life expectancy to the total life expectancy at 60 was performed by the Sullivan method. In this study, 'active life expectancy' was defined as the average number of years an individual was expected to live without having IADLs and ADLs disability. The result revealed that though women, on average, were expected to live longer than men, their expected health portion of life was lower than that of men.

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Recommendation:

This study used secondary data from the Health Interview Survey of the Population Aged 50 and Over in Thailand, 1995, which were not designed to assess disability status in particular, thus some limitations were expected to encounter. First is the definition of disability. As mentioned in the previous chapter, there is no consensus about the definition of disability. Generally, disability has been measure in difference scales ranging from 'presence of difficulty' to 'level of difficulty' to 'the need for or actual use of assistance' to perform specific activities. Second is the limitation concerning the number of items to be included. For example, the items used to measure ADLs range from one to six activities and the items used for IADLs have ranged from 1-8 activities. In this survey, only four activities were included for ADLs and only five activities could be used to assess IADLs. Third, the period of having limitation has not been defined. Finally, the use of cross-sectional study limits the investigation of causation between the risk factors and disabilities, thus only association can be demonstrated.

Therefore, the recommendations will be divided into two parts: recommendation for further study about disability status in the elderly, and recommendation for policy formulation.

5.1 Recommendation for Further Study

5.1.1 The definition of disability should be clarified and discussion regarding this topic among those who interested in the health of the elderly. The discussion on definition should be the top priority in order to find consensus with standard definition

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and the comparison across surveys will be meaningful and the monitoring process can be set.

5.1.2 Not only the definition of disability, but the length of having limitation should also be defined and agree upon. The period of having limitation in functions should last for at least 90 days in order to cover only those who were not temporary disability.

5.1.3 The information about 'need' for assistance and the 'unmet need' of this assistance (both personal and equipment) should be included in the survey in order to capture 'handicap' situation. This picture will be benefit for policy formulation.

5.1.4 Longitudinal study is needed in study about disabilities because disability status is not a permanent condition. Many longitudinal studied in other countries have revealed that people can enter into the 'disabled state' and exit from this state. Furthermore, longitudinal study is necessary if we want to know the incidence of disability, the cause of disability, and to be able to monitor the program implemented for prevention or intervention of disabilities.

5.1.5 Some of the propositions in the disability transition need more studies and more empirical data to support. For example, the proposition stated that "*prevalence levels of disablement increase during the transition due to heightened social awareness*" need further investigation before coming into conclusion. Factors about social and environmental context have not been thoroughly study. Study to

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investigate the gender differences in self- reported is scarce. At present, the body of knowledge about disablement process is still limited. Much more knowledge is needed in order to enhance our understanding about disablement process.

5.2 Recommendation for Policy Formulation

This study revealed some interesting findings which deserved attention. First it confirmed many studies that underpinned the important role of education. Persons who had higher educational attainment were more likely to have less disability. Though the exact mechanism of educational attainment still remain unknown, education was believed to be correlated with flexibility and adaptability which were necessary to the changes imposed by a potentially disabling condition. Furthermore, education might influence on person's ability to acquire knowledge on disease prevention. Therefore, policies that impose on supporting and providing education to the people might be benefit not only to the health status of present population, but would have indirect effect on the future quality of life of this population.

Second, the findings that suggest the role of functional limitations in mediating the effect of various risk factors toward disabilities could shed some light on the intervention of disablement process. For example, the finding that a large portion of the elderly suffered or unable to perform crouching, walking a long distance, and walking 1-2 fight of stairs. The policy to interrupt or intervene the disablement process could be the adaptation of environments to enable persons who had functional limitations to be able to participate in the society. Barrier- free environment should be the designate goal of every government. Some example of the

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barrier-free environment include parking space for persons with disability, ramp to the building, slide-curved foot path, accessible public transportation, toilet designed for persons with disability etc.

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BIBLIOGRAPHY

Applegate, W. B., Blass, J. P.,& Williams, T. F. (1990). Instruments for the Functional Assessment of Older Patients. The New England Journal of Medicine, 322 (17), 1207-1213

Bebbington, A.C. (1992). Regional and social variation in disability-free life expectancy in Great Britain. Paper presented at the 6th REVES International Workshop, Montpellier, France.

_____ (1988). The expectation of life without disability in England and Wales. Social science Medicine , 27 (4), 321-326.

Boshuizen, H.C., H P A van de Water, & Perenboom, RJM. (1994). Socioeconomic differences in health expectancy in the Netherlands. Proceedings of the 7th Meeting of the International Network on Health Expectancy (REVES), Canberra, February.

Bowling, A., & Grundy, E. (1997). Activities of daily living: Changes in functional ability in three samples of elderly and very elderly people. Age and Ageing, 26, 107-114.

Crimmins, E. M., Hayward, M.D., & Saito, Y. (1994). Changing mortality and morbidity rates and the health status and life expectancy of the older population. Demography (31), 159-175.

Dittmar, S.S., Gresham, G.E.,and Granger, C.V.(1997). Functional assessment and outcome measures for the rehabilitation health personel. Aspen Publishers, Inc.

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46575

Dunlop, D.D., Hughes, S.L., & Manheim, L.M. (1997). Disability in activity of daily living: Patterns of change and a hierarchy of disability. American Journal of Public Health, 87 (3), 378-383.

Freedman, V.A., & Martin, L.G. (1998). Understanding trends in functional limitations among older Americans. American Journal of Public Health, Vol. 88 (10), 1457-1462.

Freedman, V.A.,& Soldo, J.B. (1994). Trends in disability at older ages: summary of a workshop, National Academy Press.

Fried L. P., & Wallace R.B. (1991). The complexity of chronic illness in the elderly: from clinic to community. In Wallace, R.B. & Woolson R.F. (Eds), The Epidemiologic Study of the Elderly; Oxford University Press, New York.

Fries, J. F. (1980). Aging, natural death, and the compression of morbidity. New England Journal of Medicine, Vol. 303, 130-135.

Gruenberg, E.M. (1977). The failure of success. The Milbank Memorial Fund Quarterly, 55, 3-24.

Guralnix, J. M., Kenneth, L.C., Blazer D.; Fillenbaum, G.G., & Branch, W.(1993). Educational status and active life expectancy among older blacks and whites. The New England Journal of Medicine, 329,110-116.

Haber, L.D. (1990). Issues in the definition of disability and the use of disability survey data. In Levine, D.B., Zitter, M., & Ingram,L.(Eds.), Disability statistics: An assessment, Report of the Workshop. Natinal Academic Press, Washington D.C.,35-65.

Homans, G.C. (1974) Social behavior: Its Elementary Forms. Sanfrancisco: Harcourt Brace Jovanovish. Institute of Mathematica Policy Research. 1984. Digest of

Copyright by Mahidol University

Data on Persons with Disabilities. Washington:National Institute of Disability and Rehabilitation Research.

Jagger, C. (1999, March). Health expectancy calculation by the Sullivan method: A practical guide. NUPRI Research Paper Series No. 68.

Jette, A. M., Assmann, S., Rooks D., Harris, B. A., & Crawford, S. (1998). Interrelationships among disablement concepts. Journal of Gerontology :Medical Sciences, 53 A (5), M395-M404 .

Johnson R.J., & Wolinsky, F.D. (1994). Gender, race, and health: the structure of health status among older adults. The Gerontologist , 34 (1), 24-35.

Jitapunkul, S., Kunanusoan, C., Pooncharoen W., & Suriyawongpaisal, P.(1999). In. Jitapunkul (Ed.), Health of the Thai Elderly. Holistic Publishing Ltd. (Thai).

Jitapunkul, S., Kamolratanakul, P.E.(1994). The meaning of activities of daily living in a Thai elderly population: Development of a new index. Age and Ageing, Vol.23,97-101.

Katz, S. (1983). Assessing self-maintenance: Activities of daily living, mobility, and instrumental activities of daily living. Journal of the American Geriatrics Society, Volume 31(12),21-26.

Katz, S., & Akpom, C.A. (1976). A measure of primary sociobiological functions. International Journal of Health Services, Volume 6(3), 493-507.

Katz, S., Ford, A.M., Moskowitz, R.M., Jackson, B.A., & Jaffe M.W. (1963). Studies of illness in the aged. The index of ADL: A standardized measure of biological and psycho-social function. JAMA, 185, 914 -919.

Copyright by Mahidol University

Kampen ,G.I J., Verbrugge, L.M., Merril, S.S., & Ormel, J. (1998). The impact of multiple impairments on disability in community-dwelling older people. Age and Ageing, 27,595-604

Kennedy, J. & LaPlante, M.P. (1997). A profile of adults needing asistance with activities of daily living, 1991-1992. Disability Statistics report (11). Washington DC:U.S. Department of Education, National Institue on Disability and Rehabilitation Research. Available: http://128.218.183.95 /UCSF/ [200, July].

Lamb, V.L., Myers, G., & Andrews, G. (1992). More results from recent work in developing countries. REVES paper No. 105, presented to the 5th meeting of the International Network on Health Expectancy (REVES), Ottawa.

La Plante, M.P. & Carlson, D. (1998). Disability in the United States: Prevalence and Causes, 1992 Available from :http://dsc.ucsf.edu/reps/rep1/index.html [Accessed 21 October 1998].

LaPlante, M. P. (1991). The demographic of disability. The Milbank Memorial Fund Quqrterly, Vol. 69 Supplement 1 / 2 , 55-77.

Lawton, M.P., & Brody, E.M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. The Gerontologist, Vol. 9(3), 179-186.

Mathers, C., Robine, J.M., & Wilkins R. (1994). Health expectancy indicators: Recommendations for terminology, In. Mathers, C., McCallum,J. & Robine, J. (Eds). In Advances in Health Expectancies. Proceeding of the 7th Meeting of the International Network on Health Expectancy (REVES), Canberra, February: 34-41.

Copyright by Mahidol University

Manton, K. G. (1982). Changing concepts of morbidity and mortality in the elderly population. The Milbank Memorial Fund Quarterly , 60 (2), 183-244.

Manton, K.G., & Soldo B.J. (1985) Dynamics of health changes in the oldest old: New perspectives and evidence. The Milbank Memorial Fund Quarterly, 63 (2), 206-285.

McGee,M.A., Johnson, A. L., Kay, D.W., & MRC CFAS Analysis Subcomittee. (1998). The description of activities of daily living in five centres in England and Wales. Age and Ageing, 27, 605-613.

Merrill, S.S., Seeman, T.E., Kasl, S.V., & Berkman, L.F. (1997). Gender differences in the comparison of self-reported disability and performance measures. Journal of Gerontology: Medical Sciences , 52A (1), M19-M26.

Mutafova M., Water, HPA. van de.,Perenboom, RJM., Boshuizen, HC., & Maleshov. (1997). Health expectancy calculations: A novel approach to studying population health in Bulgaria. WHO Bullentin, OMS, 75(2), 147-153.

Myers, G.C., & Lamb, V.L. (1993). Calculation in health expectancies: Harmonization consensus achieved and future perspectives. In Robine, J.M, Mathers, C., Bone, M.R., and Romieu I. (Eds.) INRERM/John Libbey Eurotext Ltd. (226), 109-119.

Nagi, S.Z. (1991). Disability concepts revisited: Implications for prevention. In Pope A.M., & Tarlov,A.R (Eds.), Disability in America: Toward a National Agenda for Prevention. Division of Health Promotion and Disease Prevention, Institute of Medicine, National Academy Press, Washington, D.C.,309-327.

Copyright by Mahidol University

Nagi, S.Z. (1976). An epidemiology of disability among adults in the United States. The Milbank Memorial Fund Quarterly /Health and Society/ Fall, 439-466.

National Economic and Social Development Board, Human Resources Planning Division. (1995). Population Projections for Thailand 1990-2020, March.

National Statistical Office. (1994). The 1994 survey of the elderly in Thailand. Office of the Prime Minister, Thailand. (in Thai).

_____. (1991). Report of the health and welfare survey. Office of the Prime Minister, Thailand. (in Thai).

Nayar,U.S. (1996). The situation of aging: the chip and the old block. In Added Years of Life in Asia. Asian Popualtion Studies Series No. 141

Office of the Committee on Rehabilitation of Disabled Persons (1991). Department of Public Welfare, Minister of Labour and Social Welfare, Thailand.

Omran, A.R. (1983). The epidemiologic transition: A preliminary update. Journal of Tropical Pediatrics, 29,305-316.

_____(1971). The epidemiologic transition: A theory of population change. The Milbank Memorial Fund Quarterly , 49, 509-538.

Palmore, E.B., & Burchett B.M. (1997). Predictors of disability in the final year of life. Journal of Aging and Health, 9 (3), 283-297.

Pope, A.M.,& Tarlov, A.V. (Eds) (1991). Disability in America: Toward a National Agenda for Prevention. Division of Health Promotion and Disease Prevention, Institute of Medicine, National Academy Press,Washington, D.C.

Rahkonen, O., & Pentti, T. (1997). Social class differences in health and functional disability among older men and women. International Journal of Health Services, 28 (2), 511-523.

Copyright by Mahidol University

Rasmussen, N. (1990) The expectation of life without disability in Denmark, REVES paper no.35, presented to the 2nd meeting of the International Network on Health Expectancy (REVES), Geneva.

Rice, D.P., & LaPlante, M.P. (1988). Chronic Illness, disability, and increasing longivity. In Sullivan, S. and Lewin, M.E. Eds. In The Economics and Ethics of Long-Term Care and Disability, Washington:American Enterprise Institute. 9-55.

Riley, M.W., & Bond, K. (1998). Beyond agenism: Postponing the onset of disability. In, Riely, M.W., Hess, B.B., & Bond, K., (Eds.) In Aging in society: Selective reveiws of recent research. Lawence Erlbaum Associates: Hillsdale, N.J., 243-252.

Ritchie, K., Jagger, C, Brayne, C., & Letenneur, L. (1993). Dementia-free expectancy: Preliminary calculations for France and the United Kingdom. In Robine J-M, Mathers D., Bone M.R., & Romieu, I. (Eds.) Calcilation of health expectancies: harmonization, concensus, achieved and future perpectives, Colloques INSERM, Vol. 226, John Libbey Eurotext, London, 233-244.

Robine, J.M. (1994). Disability-free life expectancy trends in France: 1981-1991, international comparison. In. Mathers, C., McCallum,J., & Robine, J.M.(Eds). In Advances in Health Expectancies. Proceeding of the 7th Meeting of the International Network on Health Expectancy (REVES) Canberra, February, 43-52.

Romieu, I., & Robine, J.M. (1994). World atlas on health expectancy calculation. In. Mathers, C., McCallum,J., & Robine, J.M.(Eds). In Advances in Health

Copyright by Mahidol University

Expectancies. Proceeding of the 7th Meeting of the International Network on Health Expectancy (REVES) Canberra, February, 59-69.

Roger, W., & Miller, B. (1997). A comparative analysis of ADL questions in surveys of older people. Journal of Gerontology, Series B, 52B (Special Issue), 21-36.

Roger, R.G., Rogers, A., & Belanger, A. (1994). Disability-free life among the elderly in the United States. Journal of Aging and health , 4 (1),19-42.

_____ (1989). Active life among the elderly in the United States: Multistate life-table estimates and population projections. The Milbank Quarterly , 67 (3-4), 370-411.

Ross, C.E., & Wu, C. (1995). The link between education and health. American Sociological Review, 60, 719-745.

Rudberg, M.A., Furner, S.E., Dunn, J.E., & Cassel, C.K. (1993). The relationship of visual and hearing impairments to disability: An analysis using the longitudinal study of aging. Journal of Gerontology:Medical Sciences, Vol. 48 (6), M261-M265.

Sagan, L.A. (1984). The health of nations: True cases of sickness and well-being. New York: Basic Books.

Saito, Y., Crimmins, E.M., & Hayward, M.D. (1999, March). Health expectancy: An overview. NUPRI Research Paper Series No. 67.

Sander, B.S. (1964). Measuring community health levels. American Journal of Public health, 54,1063-1070

Satariano, W.A. (1997). The disabilities of aging-looking to the physical environment. American Journal of Public health. 87(3), 331-332.

Copyright by Mahidol University

Siripanish, B., et al. (1982). Epidemiology of person with disabilities and elderly population in Thailand, n.p. (in Thai).

Spector, W.D., Sidney, K., Murrphy, J.B., & Fulton, J.P. (1987). The hierachical relationship between activities of daily living and instrumental activities of daily living. Journal of Chronic Disease, 40(6), 481-489.

Sullivan, D.F. (1971). A single index of mortality and morbidity. HSMHA Health Reports. 86 (4), 347-354.

Satariano, W.A. (1997). The disabilities of aging-looking to the physical environment. American Journal of Public health. 87(3), 331-332.

U.S. House of Representatives, (1990). American with Disabilities Act of 1990: Report Together with Minority Views, report no. 101-485, part 2. Washington.

U.S. Depart of Commerce. International Population Reports P95/92-3, Economics and Statistics Administration, Bureau of the Census.

United Nation (1996) Manual for the development of statistical information for disability programes and policies, Statistics on Special Population Groups, Series y No.8

Verbrugge, L.M., & Patrick, D.L. (1994). Seven chronic conditions: Their impact on US adults' activity levels and use of medical services. American Journal of Public Health, Vol. 85 (2), 73-182.

Verbrugge, L.M., & Jette, A.M. (1994). The disablement process. Social science Medicine , 38 (1),1-14.

Verbrugge, L.M., Lepkowski, J. M., & Yuichi, I. (1989). Comorbidity and its impact on disability. The Milbank Quarterly, Vol. 67 (3-4), 450-484.

Copyright by Mahidol University

Vita, A.J., Terry, R.B., Hubert, H.B., & Fries, J.F. (1971). Aging, health risks, and cumulative disability. The New England Journal of Medicine. (Special article). 38 (15), 1035-1040

Wibulpolpresert, Suwit., Prdabmuk, P., Reugpaibul W., Rujakom., & Peng paibul, P. (1997). Medical Rehabilitation Service System in Thailand. Health System Research Institue (in Thai).

Wilkins, R., & Owen, A.B. (1997). Health expectancy in Canada, late 1970s: demographic, regional and social dimensions. American Journal of Public Health .73 (9),1073-1080.

Wolinsky, F.D., Stump, T.E., Callahan, C.M., & Johnson, R.J. (1971). Consistency and change in functional status among older adults over time. Journal of Aging ang Health , 8 (2) ,155-182.

Whorld Health Organization (No date). International classification of impairments, disabilities, and handicaps (ICIDH-2) Available: http://www.who.ch/ICIDH {1997, October 12}

World Health Organization. (1980). International classification of impairments, disabilities, and handicaps: A manual of classification relating to the consequences of disease. Geneva.

_____ (1984). The uses of epidemiology in the study of the elderly. Technical Report Series 706.

Zimmer, Z. (2000). Logistic regression for ordered variables. Unpublished manuscript.

Zimmer, Z., Xian,L., Hermalin, A., & Chuang, Yi-Li. (1998). Educational attainment and transitions in functional status among older Taiwanese. Demography, Vol. 35 (3), August, 361-375

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APPENDIX A.

Table A1: Percentage distribution of elderly by demographic characteristics and sex

Characteristic	Male	Female	Total
Age Group			
• 60-64	35.4	31.5	33.07
• 65-69	26.4	27.1	26.8
• 70-74	17.9	17.9	17.9
• 75-79	10.6	11.2	11.0
• 80 and over	9.7	12.3	11.2
Educational Attainment			
• No Schooling	19.1	42.8	33.3
• Pratom 1-7	70.3	53.3	60.1
• Secondary and higher	10.6	3.9	6.6
Marital Status			
• Married	76.7	32.0	49.9
• Separated/Divorced/Widow	22.6	64.8	47.9
• Single	0.7	3.2	2.2
History of Main/Longest Job			
• Agriculture	66.9	69.8	68.6
• Mining/Industry/Construction	9.7	5.4	7.2
• Service/Professional	23.4	24.8	24.2
Place of Residence			
• Urban	25.0	28.4	27.0
• Rural	75.0	71.6	73.0
Cigarette Smoking			
• Currently Smoke	53.2	9.7	27.1
• Ever Smoked	31.9	7.8	17.4
• Never Smoke	14.9	82.4	55.5
Total	**100.0**	**10.0**	**100.0**
(Number)	**(1,734)**	**(2,618)**	**(4,352)**

Note : The total number was not equal to 4,483 persons due to missing data

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APPENDIX B.

Relationship of Risk Factors and Functional Limitations

Table B1:Percentage distribution of elderly by any functional limitations and characteristics

Characteristic	Any Functional Limitations* (%)		Total	(Number)	p-value
	None	Limitation			
Socio-demographic					
Sex					<.001
• Men	78.3	21.7	100.0	(1,734)	
• Women	62.6	37.4	100.0	(2,618)	
Age Group					<.001
• 60-64	80.9	19.1	100.0	(1,439)	
• 65-69	76.4	23.6	100.0	(1,167)	
• 70-74	65.9	34.1	100.0	(779)	
• 75 –79	52.9	47.1	100.0	(478)	
• 80 and over	35.8	64.2	100.0	(489)	
Educational Attainment					<.001
• No Schooling	57.1	42.9	100.0	(1,451)	
• Pratom 1-7	74.7	25.3	100.0	(2,615)	
• Secondary and Higher	75.2	24.8	100.0	(286)	
Marital Status					<.001
• Married	76.3	23.7	100.0	(2,167)	
• Separated/Divorced/Widow	61.0	39.0	100.0	(2,087)	
• Single	71.4	28.6	100.0	(98)	
History of Main/Longest Job					<.01
• Agriculture	70.0	30.0	100.0	(2,987)	
• Mining/Industry/Construction	70.7	29.3	100.0	(311)	
• Service/Professional	65.0	35.0	100.0	(1,054)	
Place of Residence					<.01
• Urban	65.1	34.9	100.0	(1,176)	
• Rural	70.2	29.8	100.0	(3,176)	
Cigarette Smoking					<.001
• Currently Smoke	78.8	21.2	100.0	(1,178)	
• Ever Smoked	68.9	31.1	100.0	(758)	
• Never Smoke	64.0	36.0	100.0	(2,416)	

Note : * All three functions (crouching, walking, and climbing stairs) were grouped into one category (any kind of functional limitations)

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Table B2: Percentage distribution of elderly by any functional limitations and chronic conditions

Chronic Conditions	Any Functional Limitations* (%)		Total	(Number)	p-value
	None	Limitation			
High Blood Pressure					<.001
• No	72.1	27.9	100.0	(3,346)	
• Yes	58.1	41.9	100.0	(1,006)	
Heart Problem					<.001
• No	70.8	29.2	100.0	(3,747)	
• Yes	56.7	43.3	100.0	(605)	
Diabetes					<.001
• No	69.5	30.5	100.0	(4,086)	
• Yes	57.9	42.1	100.0	(266)	
Cataract					<.001
• No	70.2	29.8	100.0	(3,842)	
• Yes	58.8	41.2	100.0	(510)	
Ear Problem					<.001
• No	69.6	30.4	100.0	(4,022)	
• Yes	59.7	40.3	100.0	(330)	
Rheumatism					<.001
• No	75.7	24.3	100.0	(2,552)	
• Yes	59.1	40.9	100.0	(1,800)	
Asthma					<.001
• No	69.6	30.4	100.0	(4,111)	
• Yes	56.4	43.6	100.0	(241)	
Paralysis					<.001
• No	70.7	29.3	100.0	(4,216)	
• Yes	11.0	89.0	100.0	(136)	
Kidney Problem					<.001
• No	69.6	30.4	100.0	(4,115)	
• Yes	55.7	44.3	100.0	(237)	

Note : * All three functions (crouching, walking, and climbing stairs) were grouped into one category (any kind of functional limitations)

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Table B3: Logistic Regression Coefficient and Odds Ratio of Functional Limitations

	Coefficient	Odds Ratio
Intercept	-2.93 (.27)***	
Gender (male)		
• Female	0.69 (.12)***	2.00 (.23)***
Age Group (60-64 yrs)		
• 65-69 yrs	0.34 (.10)**	1.40 (.14)**
• 70-74 yrs.	0.75 (.11)***	2.11 (.24)***
• 75-79 yrs.	1.33 (.13)***	3.79 (.50)***
• 80 yrs. And over	2.15 (.14)***	8.58 (1.18)***
Education (no Schooling)		
• Pratom 1-7	-0.19 (.08)*	0.82 (.07)*
• Secondary ed.	-0.40 (.18)*	0.67 (.14)*
Marital Status (Currently married)		
• Not married	0.09 (.08)	1.09 (.09)
Occupation (Agriculture)		
• Mining/Industry/Construction	0.31 (.15)*	1.36 (.21)*
• Service/Professional	0.38 (.11)**	1.46 (.16)**
Place of Residence (Urban)		
• Rural	0.05 (.11)	1.05 (.11)
Cigarette Smoking (current smoker)		
• Ever Smoke	0.18 (.12)	1.19 (.15)
• Never Smoke	0.14 (.11)	1.15 (.13)
Health Variables		
• Hypertension	0.33 (.09)***	1.39 (.12)***
• Heart Disease	0.34 (.10)**	1.41 (.15)**
• Diabetes	0.34 (.15)*	1.40 (.21)*
• Cataract	0.13 (.11)	1.14 (.13)
• Ear Disease	0.12 (.14)	1.13 (.15)
• Arthritis	0.78 (.08)***	2.17 (.17)***
• Asthma	0.76 (.15)***	2.13 (.33)***
• Paresis	3.09 (.29)***	21.96 (6.41)***
• Kidney Problem	0.49 (.16)**	1.63 (.26)**

Note : Significant of difference from reference category (no limitation) : * $p < 0.05$; ** $p<0.01$; *** $p <0.001$

(.....) = reference group, for health and functional limitations: "No" is reference group

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APPENDIX C: LIFE EXPECTANCY AND ACTIVE LIFE EXPECTANCY

Table C1: Active Life Expectancy of Population Aged 60 and over, Thailand 1995

Age Group	Males					Females				
	LE	IADL	ADL	DFLE	%	LE	IADL	ADL	DFLE	%
60-64	20.29	4.55	1.70	14.04	69.20	23.89	8.84	2.47	12.58	52.66
65-69	17.15	4.27	1.74	11.14	64.96	20.20	8.27	2.48	9.45	46.78
70-74	14.18	4.02	1.84	8.32	58.67	16.89	7.63	2.51	6.75	39.96
75-79	11.87	3.99	1.77	6.11	51.47	14.60	7.26	2.66	4.68	32.05
80+	10.90	4.01	2.04	4.85	44.50	13.61	7.05	2.83	3.73	27.41

Table C2: Active Life Expectancy of Male Population Aged 60 and Over, Thailand 1995

Age	Probability of Death	Number of Survival at age x	No. of Death During Age Interval	Person years lived in age interval		Total Life Expecyancy	Probability of Total Disability	Person years lived in age interval (nodis)		Life Expecyancy Free of Disabilities
x	Qx	lx	Dx	Lx	Tx	ex	P_{dis}	L_{nodis}	T_{nodis}	e_{nodis}
60-64	0.09436	76,630	7,231	365,073	1,554,839	20.29	0.1694	303,229	1,075,534	14.04
65-69	0.12183	69,399	8,455	325,860	1,189,766	17.14	0.1856	265,380	772,305	11.13
70-74	0.18767	60,945	11,438	276,130	863,906	14.18	0.2594	204,502	506,925	8.32
75-79	0.30062	49,507	14,883	210,330	587,776	11.87	0.3609	134,422	302,423	6.11
80+	1.00000	34,625	34,625	377,446	377,446	10.90	0.5549	168,001	168,001	4.85

Table C3: Active Life Expectancy of Female Population Aged 60 and Over, Thailand 1995

Age	Probability of Death	Number of Survival at age x	No. of Death During Age Interval	Person years lived in age interval		Total Life Expecyancy	Probability of Total Disability	Person years lived in age interval (nodis)		Life Expecyancy Free of Disabilities
x	Qx	lx	Dx	Lx	Tx	ex	P_{dis}	L_{nodis}	T_{nodis}	e_{nodis}
60-64	0.05779	81,567	4,714	396,052	1,948,335	23.89	0.2418	300,287	1,025,933	12.58
65-69	0.08714	76,853	6,697	367,525	1,552,283	20.20	0.3117	252,967	725,646	9.44
70-74	0.15867	70,157	11,132	322,953	1,184,758	16.89	0.3933	195,936	472,679	6.74
75-79	0.24863	59,025	14,675	258,436	861,805	14.60	0.5691	111,360	276,743	4.69
80+	1.00000	44,350	44,350	603,369	603369	13.60	0.7259	165,383	165,383	3.73

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Table C4: Abridged Life Table and Active Life Expectancy of Male Population, Thailand 1995

Age	Probability of Death	Number Alive at Beginning of Age Interval	No. Dying During Age Interval	Person years lived in age interval	Total number of years lived from age x	Total Life Expectancy	Proportion of IADL Disability	Person years lived without IADL disability in interval	Total years lived without IADL disability from age x	IADL - Disability free LE	LE with IADL Disability	Proportion of ADL Disability	Person years lived without ADL Disability in interval	Total years lived without ADL disability from age x	ADL-Disability free LE	Life expectancy with ADL Disability
x	Q_x	l_x	D_x	L_x	T_x	e_x	P_{IADL}	Lnoiadl	Tnoiadl	D_{FIADL}	eIADL	Padl	Lnoadl	Tnoadl	D_{FADL}	eADL
60-64	0.09436	76,630	7,231	365,073	1,554,837	**20.290**	0.1438	312,576	1,205,828	15.736	**4.55**	0.0256	355,727	1,424,542	18.590	**1.70**
65-69	0.12183	69,399	8,455	325,859	1,189,905	**17.146**	0.1582	274,308	893,253	12.871	**4.27**	0.0274	316,930	1,068,815	15.401	**1.74**
70-74	0.18767	60,945	11,437	276,129	863,905	**14.175**	0.1719	228,662	618,945	10.156	**4.02**	0.0875	251,968	751,884	12.337	**1.84**
75-79	0.30062	49,507	14,883	210,330	587,775	**11.873**	0.2784	151,774	390,282	7.883	**3.99**	0.0825	192,978	499,917	10.098	**1.77**
80+	1.00000	34,625	34,625	377,446	377,446	**10.901**	0.3681	238,508	238,508	6.888	**4.01**	0.1868	306,939	306,939	8.865	**2.04**

Table C5: Abridged Life Table and Active Life Expectancy of Female Population, Thailand 1995

Age	Probability of Death	Number Alive at Beginning of Age Interval	No. Dying During Age Interval	Person years lived in age interval	Total number of years lived from age x	Total Life Expectancy	Proportion of IADL Disability	Person years lived without IADL disability in interval	Total years lived without IADL disability from age x	IADL - Disability free LE	LE with IADL Disability	Proportion of ADL Disability	Person years lived without ADL Disability in interval	Total years lived without ADL disability from age x	ADL-Disability free LE	Life expectancy with ADL Disability
x	Q_x	l_x	D_x	L_x	T_x	e_x	P_{IADL}	Lnoiadl	Tnoiadl	D_{FIADL}	eIADL	Padl	Lnoadl	Tnoadl	D_{FADL}	eADL
60-64	0.05779	81,567	4,714	396,052	1,948,335	**23.886**	0.2145	311,099	1,227,441	15.048	**8.84**	0.0273	385,240	1,746,828	21.416	**2.47**
65-69	0.08714	76,853	6,697	367,525	1,552,283	**20.198**	0.2729	267,227	916,342	11.923	**8.27**	0.0388	353,265	1,361,588	17.717	**2.48**
70-74	0.15867	70,157	11,132	322,953	1,184,758	**16.887**	0.3326	215,539	649,115	9.252	**7.63**	0.0607	303,350	1,008,323	14.372	**2.51**
75-79	0.24863	59,025	14,675	258,436	861,805	**14.601**	0.4474	142,812	433,576	7.346	**7.26**	0.1217	226,984	704,973	11.944	**2.66**
80+	1.00000	44,350	44,350	603,369	603369	**13.605**	0.5181	290,764	290,764	6.556	**7.05**	0.2078	477,989	477,989	10.778	**2.83**

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BIOGRAPHY

NAME	Mrs. Pimpa Kachondham
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