Integrating the Sufficiency Economy Philosophy to Improve the Quality of Life and Nutrition Promotion for Reduce the Risk of Cardiovascular Disease in Northern Lower

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หัวข้อวิจัย การบูรณาการหลักปรัชญาเศรษฐกิจพอเพียงเพื่อพัฒนาคุณภาพชีวิตและส่งเสริมโภชนาการเพื่อลดปัจจัยเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดในเขตภาคเหนือตอนล่าง

ผู้ดำเนินการวิจัย นางวันปิติ ธรรมศรี
นายยุทธนา พิมพ์ทองงาม
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หน่วยงาน หลักสูตรอาชีวอนามัยและความปลอดภัย คณะวิทยาศาสตร์และเทคโนโลยี มหาวิทยาลัยสวนดุสิต

ปี พ.ศ. 2558

การศึกษาครั้งนี้เป็นการวิจัยเชิงปริมาณ เพื่อศึกษาลักษณะทางประชากร เศรษฐกิจ สังคม พฤติกรรมสุขภาพ และภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดของวัยก่อนสูงอายุ และค้นหาปัจจัยที่มีความสัมพันธ์กับ ภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดของวัยก่อนสูงอายุ รวมถึงเสนอแนะแนวทางประกอบการพิจารณา ส่งเสริมสุขภาพ และป้องกันภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือด โดยใช้ข้อมูลของ ต.บ้านกล้วย อ.ชนแดน จ.เพชรบูรณ์ ซึ่งประกอบด้วยกลุ่มตัวอย่างอายุ 35-59 ปี จำนวน 8,482 คน

ผลการวิเคราะห์ความสัมพันธ์ ระหว่างปัจจัยด้านประชากร เศรษฐกิจ และสังคมกับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดของวัยก่อนสูงอายุ พบว่า เพศ มีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดอย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.001 โดยเพศหญิงมีภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 11.3 ส่วนเพศชายมีภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 6.0, อายุมีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดอย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.001 โดยกลุ่มอายุ 50-59 ปี และกลุ่มอายุ 40-49 ปีมีภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 13.9 และร้อยละ 5.8 เนื่องจากอายุมากส่งผลให้เกิดความเสื่อมของหลอดเลือด ความยืดหยุ่นของผนังหลอดเลือด ลดลง อันก่อให้เกิดภาวะหลอดเลือดแดงแข็งตัว และโรคความดันโลหิตสูงและพบว่าความชุกของโรคความดันโลหิตสูงเพิ่มขึ้นตามอายุ, ระดับการศึกษามีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิด โรคหัวใจและหลอดเลือด อย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.05 โดยที่ระดับการศึกษาปริญญาตรีขึ้นไปมีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจ

และหลอดเลือดมากที่สุดร้อยละ 11.4 รองลงมาระดับมัธยมศึกษาร้อยละ 10.7 ส่วนระดับประถมศึกษาและไม่ได้เรียน มีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 8.1 เท่ากัน ผู้ที่มีการศึกษาสูงจะมีความรู้ ทัศนคติและการปฏิบัติตัวที่ถูกต้องด้านสุขภาพ แต่มักจะมีอาชีพที่ ใช้แรงงานน้อย จึงทำให้มีโอกาสเกิดภาวะเสี่ยงต่อโรคหัวใจและหลอดเลือดได้มากกว่าผู้ที่มีการศึกษาต่ำกว่า, อาชีพมีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดอย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.001 โดยกลุ่มอาชีพนอกภาคเกษตรและภาคเกษตรมีภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 10.0 และร้อยละ 7.1 ตามลำดับ อาชีพที่ต่างกันย่อมใช้แรงงานแตกต่างกันตลอดจนมีวิถีการดำเนินชีวิตที่ต่างกัน จึงทำให้มีภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดที่แตกต่างกัน, รายได้มีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดอย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.001 โดยกลุ่มผู้ที่มีรายได้สูง มีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดสูงที่สุดร้อยละ 13.0 รองลงมาผู้ที่มีรายได้น้อยร้อยละ 8.3 และผู้ที่มีรายได้ปานกลาง ร้อยละ 6.8, เขตที่อยู่อาศัยมีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือด อย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.05 โดยเขตเมืองและเขตชนบทมีภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 10.7 และร้อยละ 8.2 ตามลำดับ, การบริโภคผลไม้เป็นประจำมีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือด อย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.05 โดยผู้ที่บริโภค และ ไม่บริโภคผลไม้ มีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ10.3 และ ร้อยละ 8.1 ตามลำดับ, การออกกำลังกาย มีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิด โรคหัวใจและหลอดเลือดอย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.05 โดยผู้ที่ออกกำลังกายสม่ำเสมอเป็นระยะเวลาไม่น้อยกว่า 30 นาที มีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดมากที่สุดร้อยละ 14.2 สำหรับผู้ที่ออกกำลังกายนานๆครั้ง และออกกำลังกายสม่ำเสมอแต่ระยะเวลาน้อยกว่า30 นาที มีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดเท่ากันร้อยละ 11.1 ส่วนผู้ที่ไม่ออกกำลังกายมีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดต่ำสุดร้อยละ 8.3, การดื่มแอลกอฮอล์มีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือด อย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.001 โดยผู้ที่เคยดื่มประจำมีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดสูงสุดร้อยละ 12.8 รองลงมาคือ ผู้ที่ดื่มนานๆครั้ง และดื่มประจำ มีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 12.4 ร้อยละ 5.7 และ ร้อยละ 3.6 ตามลำดับ, การสูบบุหรี่มีความสัมพันธ์กับภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือด อย่างมีนัยสำคัญทางสถิติ ที่ระดับ 0.001 โดยผู้ที่เคยสูบประจำมีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดสูงสุดร้อยละ13.8 รองลงมาผู้ที่สูบนานๆครั้ง ไม่สูบ และสูบประจำมีสัดส่วนภาวะเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือดร้อยละ 11.2 ร้อยละ 11.0 และร้อยละ 4.2 ตามลำดับ

Research Title	Integrating the Sufficiency Economy Philosophy to Improve the Quality of Life and Nutrition Promotion for Reduce the Risk of Cardiovascular Disease in Northern Lower	
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The purposes of the study were (1) to study demographic, social and economic characteristics, health behaviors and risk factors of cardiovascular diseases among the ageing population, (2) to find out factors relating to risk of having cardiovascular diseases among the ageing, and (3) to suggest guidelines for health promotion and prevention of cardiovascular diseases. A total of 8,482 cases in the Tambon Ban Kluai, Amphoe Chon Daen, Phetchabun database aged 35 - 59 years were the samples.

Finding showed that age was significantly related to risk of having cardiovascular diseases among the ageing ($p<0.001$) because in the age group 50-59 years and 40-49 years age group are at risk for cardiovascular diseases 13.9 percent and 5.8 percent, respectively due to aging resulting from degeneration of blood vessels, the flexibility of the vessel wall degradation that causes atherosclerosis, hypertension, and high blood pressure increases with age. There was a significant relationship between gender and risk of having cardiovascular diseases ($p<0.001$) which the female has a risk of cardiovascular disease equal 11.3 percent follow by male with a risk equal 6.0 percent. Among the ageing samples, it showed that educational level was significantly related to risk of having cardiovascular diseases ($p<0.05$) the level of a Bachelor's degree or above have the most risk of cardiovascular diseases at 11.4 percent followed by 10.7 percent of high school as for elementary school and uneducated have the

proportion risk of cardiovascular diseases equal to 8.1 percent seeing that the higher education is knowledgeable attitude and practice correct health but often their occupations less labor as a result the potential risk from cardiovascular disease than those with lower education. It was found that occupations was significantly related to risk of having cardiovascular diseases ($p<0.001$) by agricultural and non-agricultural occupations are at risk for cardiovascular diseases equal 10.0 percent and 7.1 percent, respectively, a different labor would be different as well as a different lifestyle. The result showed that income was significantly related to risk of having cardiovascular diseases ($p<0.001$) by a group of people with a higher income, accounting for the highest risk of cardiovascular disease equal 13.0 per cent, followed by those with low income (8.3 percent) and moderate income (6.8 percent). The result revealed that residential area of the aging population was related to risk of having cardiovascular diseases significantly ($p<0.05$) by urban and rural areas are at risk for cardiovascular disease equal 10.7 percent and 8.2 percent, respectively. There was a significant relationship between regular consumption of fruits and risk of having cardiovascular diseases ($p<0.05$). There was a significant relationship between exercising and risk of having cardiovascular diseases ($p<0.05$) by regular and not consumption of fruits is a proportional risk of cardiovascular disease equal 10.3 percent and 8.1 percent, respectively. There was a significant relationship between drinking alcohol and risk of having cardiovascular diseases ($p<0.001$) by those who ever regularly drink have highest risk equal 12.8 percent, followed by those who not drink, infrequently and regularly drink account for the risk equal 12.4, 5.7 and 3.6 percent, respectively. It showed statistically significant relationship between smoking and risk of having cardiovascular diseases ($p<0.001$) people who ever regularly smoke have highest risk equal 13.8 percent followed by those who infrequently, and regularly equal 11.2, 11.0 and 4.2 percent, respectively.

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Researchers

2016

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Chapter 1
Introduction

Background

Currently, chronic diseases, such as cardiovascular disease, have become the leading causes of morbidity and mortality among Thai people. This trend is rising due to improper food consumption behavior and lack of exercise. In Thailand, the cardiovascular disease rate increased sharply from 56.5 to 168.0 per 100,000 peoples in 1985 and1997. In the same period the prevalence of diabetes rose from 33.3 in 1985 to 147.2 per 100,000 peoples in 1997 (Khonputsa et al., 2012). Many epidemiologic studies have shown a strong relationship between this type of food and chronic disease such as obesity, coronary heart disease and hypertension. Dietary intake of some nutrients or food items, mainly fatty acids and carbohydrates, has been found to be directly related to lipid risk factors in healthy persons and also those with cardiovascular disease risk (Bondonno, Croft, & Hodgson, 2016).

Cardiovascular diseases (CVD) are growing contributors to global disease burdens, with epidemics of CVD advancing across many regions of the world which are experiencing a rapid health transition. Diet and nutrition have been extensively investigated as risk factors for major cardiovascular diseases like coronary heart disease (CHD) and stroke and are also linked to other cardiovascular risk factors like diabetes, high blood pressure and obesity. The interpretation of evidence needs to involve a critical appraisal of methodological issues related to measurement of exposures, nature of outcome variables, types of research design and careful separation of cause, consequence and confounding as the basis for observed associations.

Thailand is a country that has cherished its history and culture through the centuries. One unique feature of Thai culture is its customs related to eating. Although Thailand is situated between two great cultural nations, China and India, from which traces of cultural influences can be found, the uniqueness of Thai eating habits persist until today. The unique Thai cuisine has been mentioned worldwide and has tempted people the world over to experience Thai food because of its exquisite savory flavors,

colors, and textures. There are thousands of Thai recipes both from new creations and passed down from ancient Thai wisdom. Thai food uses an enormous variety of different fresh food produced from the fertile soil and abundant water resources and have been acclaimed and confirmed by modern medical science as good for physical health (Bondonno, Croft, & Hodgson, 2016). The present socio-economic growth and changes has altered the major cause of death to be from chronic disease rather than infections as in the past. Examples of chronic disease are cardiovascular disease, hypertension and others. Thai people are working out of the home then they cannot or do not have the time to cook. Thus, the Thais people often consume ready to eat to eat food such as one plate dishes, fast food and ready to eat meals.

A growing body of scientific evidence supports the role of diet in maintaining health and preventing certain risk-modifiable chronic diseases. For example, it is well accepted that certain dietary fat types modulates blood cholesterol levels and thus alter the risk of cardiovascular disease The major kinds of fatty acids in the foods we eat are saturated, polyunsaturated, monounsaturated and *trans*-fatty acids. Saturated fatty acids, trans fats and dietary cholesterol raise blood cholesterol. Epidemiological (Hu et al., 1997; Keys et al., 1986) and experimental data (Keys, Anderson, & Grande, 1957; Keys, Anderson, & Grande, 1965) indicate that a diet high in saturated fatty acids is associated with high levels of serum total cholesterol, which in turn, are related to a high incidence of cardiovascular disease. Keys et al. (Keys et al., 1986) found an association between the percentage of total energy from saturated fatty acids and serum cholesterol. They also reported that the intake of saturated fatty acids, as a percentage of energy, was strongly correlated with coronary death rates. Keys and Kimura (Keys & Kimura, 1970) compared the connection of plasma cholesterol with total fat and saturated fatty acid intake among three populations, Crete, Tanushimaru and Zutphen. Their results indicated that the level of saturated fatty acids in the diet rather than the amount of total fat was the main factor that explained the lower plasma cholesterol levels in the population in Crete compared with Zutphen. Population studies show an association between low fat diets and low incidence of coronary heart disease (Shaper & Jones, 2012), although the desirability of low fat diets and the effects of such diets on the proportion of serum cholesterol in LDL and HDL fractions are not well established (Connor & Connor, 1997; Grundy, 1997). There is also no agreement as to

the desirable intake of monounsaturated fatty acids relative to carbohydrate (Grundy, 1997). Low fat, high carbohydrate diets decrease HDL cholesterol and increase triacylglycerol (Connor & Connor, 1997; Katan, Grundy, & Willett, 1997) and are less effective than diets high in polyunsaturated fatty acids to decrease serum total cholesterol (Keys, Anderson, & Grande, 1957; Keys, Anderson, & Grande, 1965). Hu et al. (Hu et al., 1997) found an inverse association between the dietary intake of polyunsaturated fatty acids (PUFA) and the incidence of coronary disease. This is in line with several controlled studies demonstrating the cholesterol-decreasing effect of PUFA when exchanged for saturated fatty acids in the diet (Ginsberg et al., 1998; Mensink & Katan, 1992; Yu, Derr, Etherton, & Kris-Etherton, 1995). While excess dietary sodium exacerbates hypertension in sensitive individuals and antioxidant compounds found in diverse fruits and vegetables may reduce the risk of certain NCD.

Currently, the eating style of Thai people has changed by being influenced delete from by western culture as well as the increased hurried pace of living which makes it hard for people to cook their own meals. In the past, Thai people had their meals with family but now more people eat out, especially in western restaurants. People might not get a proper diet from such high energy, high fat and low dietary fiber food. An imbalanced diet as well as less exercise and more stress are causes of chronic disease such as cardiovascular disease, hypertension, obesity and other. These diseases are becoming major problems for public health in the population of the world (Hornstra et al., 1998).

The ready to eat food products is designed to sustain an individual engaged in heavy activity such as military training or during actual military operations when normal food service facilities are not available. Some Ready to eat food products has been modified from the set meal and is also popular among Thais. There are a number of varieties of ready to eat food products, which are sold in food shops and food centers in department stores. From the Thai Recommended Dairy Intake (RDI), energy distribution from fat should not be more than 30 percent. Consumers who frequently eat ready to eat food products may have higher risk of over nutrition. Some traditional Thai one-plate dishes can provide appropriate energy from fat, protein and carbohydrate, and are recommended to eat. The ready to eat meal is a totally self-contained operational ration consisting of a full meal packed in a flexible meal bag .

The message below has shown that the market of ready to eat food products was an enlargement “A principal policy for the company is the expansion of production capacity, to meet rapidly growing consumer demand. Local demand represents only one side of the demand equation: export demand is another variable with promising growth of approximately 50% in 2002 for frozen foods. The company expanded its frozen foods production facility, through the acquisition of an adjacent factory and land. The company plans to commence production of Halal certified frozen prepared meals, for export to Muslim countries. Production plans are also preparing for the introduction of frozen dim sum products, chili pastes and various seasoning sauces.

Research Objectives

1.To analyze the nutrients those are related to cardiovascular disease risk factor among ageing population in the northern lower.

2.To find out factors relating to risk of having cardiovascular diseases among ageing of ageing population in the northern lower.

3.To evaluate the physiological changes to the risk of cardiovascular disease in older.

Scope of Research

This research focuses on a group of middle-aged and elderly (age> 35 years) in rural and remote areas outside the municipality in the northern lower comprising nine provinces of Phitsanulok, Tak, Phetchabun, Sukhothai, Uttaradit, Nakhon Sawan, Uthai Thani, Kamphaeng Phet and Phichit implementation period of one year.

Limitation

This study used secondary data from the survey of public health Center of Tambon Ban Kluai, Amphoe Chon Daen, Phetchabun year 2556 aimed at monitoring the population. Not to learn about healthy habits and risk of cardiovascular disease

directly. The restrictions on the coverage and the profile of the variables are used for the study. In the assessment and measurement of risk from cardiovascular disease, which does not affect the body's blood pressure. Or the review of the biochemistry of sugar and fat into the blood, only the data from the report illness or symptoms of chronic self-groups. And because some people never get a diagnosis and cannot find risk in all study samples thus may affect the integrity of the study. In addition, samples of the project from Tambon Ban Kluai, Amphoe Chon Daen cannot refer to the population of Northern Lower. The sampling of projects, sampling of zoning areas, it is not in proportion for the population.

Despite limitations of compliance and physical activity factors, these authors found a strong association between adherence to the guidelines and a lower BMI, thus predicting lower incidence of overweight and obesity. The average intakes by adults in vulnerable circumstances often fall well below dietary guidelines for fruits, vegetables, whole grains, and low-fat dairy, while being higher than recommended in salt, sugar, saturated fat, and cholesterol .

The lists of barriers to good nutrition which have emerged as themes in these various focus group studies reflect similarities. Lack of access to healthy foods due to economic limitations, transportation problems, functional impairments, cultural issues and/or lack of knowledge and skills are significant barriers. These, coupled with easier access to unhealthy foods, and lack of perceived self-efficacy to alter nutrition-related behavior or health outcomes, were barriers common to the various groups studied. Interventions have been developed and are described in the literature to address these barriers.

Research Hypothesis

1. People in the Northern Region are at high risk for cardiovascular disease.
2. The theory of self-efficacy to improve the quality of life and nutrition promotion for reducing the risk of cardiovascular disease effects.

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Definitions of Research Terms

Adjusted rates: Terms used when results have undergone statistical transformation to permit fair comparison between groups differing in some characteristic that may affect risk of disease.

Analytical study: An observational study that describes associations and analyses them for possible cause and effect.

Alternative hypothesis: The hypothesis that the researcher is testing in the study. In scientific methodology, we start with the assumption that it is not true until proved otherwise, by rejecting the null hypothesis.

Anonymous linked information: Information which cannot be linked to the person to whom it refers, ensuring that the investigator cannot know the identity of the person and there is complete confidentiality in a study.

Assignment: The process in an experiment where the researcher allocates subjects to two or more groups, trying to achieve having groups as identical as possible to allow a valid comparison of the results. Matching and random assignment are the two most common methods.

Attributable risk: An estimate to quantify the contribution which a particular risk factor makes in producing the disease within a population.

Audit of a trial: A systematic examination, carried out independently of those directly involved in the clinical trial.

Bar or column charts: A graphic method of describing the data, where the frequency of a particular category is reflected in the height of the bar in the graph.

Baseline: A phase in an intervention study where the participants have not received any intervention.

Basic risk: An expression of the likelihood that a particular event will occur within a particular population.

Before-and-after study: A method of control in which results from experimental subjects are compared with outcomes from patients treated before the new intervention was available. These are called historic controls.

Bell-shaped curve: The characteristic shape of the curve of a normal distribution, where the data are equally distributed around the mean.

Beneficence: An ethical principle implying that every effort should be made to maximize the benefits to the subjects in health research.

Bias: If the study sample is not representative of the population, the inference we make from the result may be misleading.

Blinding: A randomized controlled trial may be blinded if participants in the trial are likely to change their behavior in a systematic way that may influence the outcome of the study when they are aware of which intervention they receive. The term "masking" is often used instead of "blinding".

Case–control study: A type of observational analytical longitudinal retrospective study in which a group of subjects with a specified outcome (cases) and a group without that outcome (controls) are identified. Investigators then compare the extent to which each subject was previously exposed to the variable of interest, such as risk factor, a treatment, or an intervention.

Categorical variables: Data where each individual variable is one of a number of mutually exclusive classes.

Central tendency: The average (mean), middle (median) or most common (mode) score for numerical data in a frequency distribution.

Chi-square (χ^2): A statistical test used for categorical data. It is based on a comparison of the frequencies observed and the frequencies expected in the various categories.

Cluster sampling: A type of random sampling, based first on the random selection of certain subgroups, from which the sample can be taken.

Coding: A method of analysis of qualitative data obtained for example in interviews, where categories are labelled to facilitate computer analysis and examination of relationships.

Cohort study: The term used in clinical and epidemiological research to describe a longitudinal prospective observational study.

Confidence interval: A statistic of the expected range in which the population value will be found, at a given level of confidence or probability.

Conflict of interest: Investigators may have vested interests in the research. These may be intellectual property interests as well as commercial interests. Such interest should be explicitly declared.

Confounder: In simple terms, confounders are all of the “other things” that could explain the result of the research. In technical terms, confounders are factors that are associated with both exposure and outcome.

Consecutive sampling: A sampling procedure in which subjects are selected by taking every individual that presents over a specified period of time.

Continuous variables: Data which are measured on a continuous scale. They are numbers that can be added, subtracted, multiplied and divided.

Correlation: The strength and direction of the association between two variables. Correlation does not mean causation.

Correlation coefficient: A statistic designed to measure the size and direction of the association between two variables. The value varies between 0 and ± 1 (1 means complete correlation).

Cost–benefit analysis: A type of economic study design in which both costs and benefits of interventions are expressed in monetary units, allowing direct comparison of competing interventions.

Cost–effectiveness analysis: A type of economic study design in which the net monetary costs of a health care intervention per unit measure of clinical outcome or effectiveness allows direct comparison of competing interventions.

Crossover study: A special design of controlled trials in which half of the participants are randomly assigned to start with the placebo and then switch to active treatment, while the other half does the opposite.

Cross-sectional study: An observational study design in which measurements are made on a single occasion.

Cross-tabulation tables: Frequency distribution tables that examine the relationship between several of the variables at once, for better description of the data or in order to look for differences or relevant associations.

Crude rates: Terms used when results have not been adjusted for confounding factors.

Dependent or output variables: Responses or consequents those are contingent on independent variables.

Descriptive statistics: Statistics designed to summarize and describe characteristics of the data. Descriptive statistics helps us to make sense of a large volume of data.

Descriptive study: An observational study that simply describes the distribution of a characteristic.

Directional research hypothesis: The research hypothesis outlining a relationship may be directional or non-directional. For example, a relationship between smoking and cardiovascular disease can only be directional. It is expected in the hypothesis that it will increase cardiovascular disease. The relationship between oral hormonal contraceptives and certain disease conditions can be non-directional. The disease conditions may increase or decrease as a result of oral hormonal contraceptive use.

Disability-adjusted life years (DALYs) lost: An international measure of the burden of disease that expresses both time lost through premature death and time lived with a disability.

Discrete or discontinuous data: Numerical variables that are not measured on a continuous scale.

Distributive justice: An ethical principle implying that participation in the research should correlate with expected benefits. No population group should carry an undue burden of research for the benefit of another group.

Duplicate or redundant publication: Publication of a paper that overlaps substantially with one already published by the same authors.

Effect size: The amount of change associated with an intervention or risk factor. It is important in determining how significant the findings are in actual practice.

Ephemeral literature: Literature judged to have a short period of usefulness and only for a small audience, not normally considered worth indexing or cataloguing. It may, however, be important. It includes reports, proceedings of conferences and other types of publication.

Essential national health research: Each developing country should establish and strengthen an appropriate health research base to understand its own problems, improve health policy and management, enhance the effectiveness of limited resources,

foster innovation and experimentation, and provide the foundation for a stronger developing country voice in setting international priorities.

Experimental or intervention study: A study design in which the investigators test the effect of an intervention on the events taking place in the study.

External validity: The extent to which the results of the study sample may be generalized to the population from which the sample was withdrawn; also called generalizability.

Focus group discussion: A method of qualitative research used when information and insights will be better gained from the interaction of a group than from in-depth interviews with individuals.

Forced-choice format: A format for closed-response questions used to elicit attitudes of the respondents to a certain statement. The respondent choices are limited to four: strongly agree, agree, disagree and strongly disagree. This format, different from the Likert format, does not allow an undecided answer.

Fraud: Scientific fraud is deliberate deception and may take the form of fabricating data, inventing patients, or manipulating data to provide a desired answer.

Frequency distribution: The way in which scores within a given sample are distributed.

Frequency distribution curve: A graphic method for summarizing data and looking at them, in which each variable is plotted against the frequency with which it is found.

Frequency distribution table: A table that gives the frequency with which a particular value appears in the data.

Gaussian distribution: A bell-shaped frequency distribution curve, also described as “normal”.

Good clinical practice (GCP): Standard for clinical studies which encompasses the design, conduct, monitoring, termination, audit, analyses, reporting and documentation of the studies and which ensures that the studies are scientifically and ethically sound and that the clinical properties of the pharmaceutical product under investigation are properly documented.

Grantsmanship: The ability to secure grants to support research projects.

Hawthorne effect: An effect which results in the improvement of subjects' performances through being observed and/or social contact. It is an example of a placebo effect.

Histogram: A method of plotting frequency distributions.

Hypothesis: The research hypothesis is a tentative statement that can be tested by a scientific research design.

Impact factor: A measure of the frequency with which the "average article" in a journal has been cited in a particular year or period. It provides a way to judge the prestige and influence of a particular journal.

Incidence: Incidence rates relate the number of new cases of a condition in a population within a time period.

Independent or input variables: Variables that have values that are autonomous of the dependent or outcome variables. Because independent variables precede dependent variables, they are often called predictors. In epidemiology, independent variables are often called risk factors or exposure variables.

Inference: A generalization made about a population from the study of a subset or sample of that population.

Informed consent: An ethical requirement for participation in a research study, indicating that a competent person, in possession of all the relevant information, freely agrees to participate.

Internal validity: The degree to which the investigator's conclusions correctly describe what actually happened in the study. It means that within the confines of the study, results appear to be accurate, the methods and analysis used stand up to scrutiny, and the interpretation of the investigators appears supported.

Inter-observer reliability: The extent to which observers rating or measuring a particular phenomenon agree with each other.

Intra-observer reliability: The extent to which an observer rating or measuring a particular phenomenon agrees with her/his rating or measurement when presented with the same task on two different occasions.

Interquartile range: The distance between the scores representing the 25th and 75th percentile ranks in a distribution.

Likert format: A format for closed-response questions used to elicit attitudes of the respondents to a certain statement. The respondent chooses from among five categories: strongly agree, agree, undecided, disagree, and strongly disagree.

Literature: Previous research done in the area under study.

Logistic regression: Method commonly used by statisticians for multivariate analysis.

Longitudinal study: An observational study design in which measurements are made over a period of time.

Longitudinal prospective study: An observational study design in which the investigators follow subjects for future events.

Matching: A sampling method to ensure that the two groups to be compared have similar characteristics. In an intervention study, pairs of similar "matched" subjects are formed and then one member of the pair is randomly assigned to one group and the other member to the other group.

Mean: The average of a group of scores. The mean is derived by summing up the individual values and dividing by the total number of measurements.

Measurement or information bias: Measurement bias occurs when the methods of measurement are consistently dissimilar in different groups of patients.

Median: The median of a distribution is a midpoint at which one half of the observations fall below and one half fall above the value.

MEDLINE: A bibliographic database which provides details of articles and their abstracts, from peer-reviewed journals. MEDLINE is funded by the US National Institutes of Health.

Meta-analysis: A methodology to critically review research studies and statistically combine their data to help answer questions that are beyond the power of single papers.

Mode: The most frequent measurement in a distribution.

Multivariate analysis: Assessment of the independent contribution of multiple independent variables on a dependent variable, to identify those independent variables most significant in explaining the variation of the dependent variable.

Negative correlation: A negative correlation between two variables implies that as one variable gets bigger the value of the other variable becomes smaller.

Nominal categorical data: Data in which the categories cannot be ordered one above another. Examples of categorical nominal variables are gender and marital status.

Non-maleficence: An ethical principle implying that where research involves experimentation on human subjects, the subjects should suffer no harm.

Non-nominal linked information: Information linked to the person by a code (not including personal identification) known to the investigator.

Non-parametric tests: Statistical tests that can be applied when the data fall in a frequency distribution curve that is skewed. Furthermore, called “distribution free” statistics.

Normal distribution curve: A bell-shaped curve of the frequency distribution of the data.

Null hypothesis: In scientific methodology, we do not test the research hypothesis directly. Instead, we start with an assumption that there is no difference or association between the variables compared. This is called the null hypothesis (*H0*). If statistical analysis rejects the null hypothesis, it means that the alternative hypothesis is probably true, and that there a difference between the group or a relationship between the variables.

Numerical variables: Data expressed in numbers.

Objectivity Objective measures are made in a process involving a minimum amount of human interpretation, for example measurement of height.

Observational study: A study design in which the investigators observe and record events taking place in the study.

Odds ratio: Term used in case-control studies as a measure of the odds of having the risk factor among people with the disease divided by the odds of having the risk factor among people without the disease.

One-tailed test: A statistical test where a difference between two groups, if true, is expected to be in one direction. For example, the difference between passive smokers and non-smokers in the occurrence of lung cancer is expected to be in one direction. It is not expected that smoking will protect from lung cancer, and so there is no need to test for it. A one-tailed test will need a smaller sample size than a two-tailed test.

Open-ended question: A question asked without providing a pre-defined set of responses to select from.

Ordinal categorical data: Categorical data in which the variables can be ordered one above another. An example of ordinal categorical data is the number of children a woman has.

***P* value:** The probability that a difference or an association as large as the one observed could have occurred by chance alone.

Parametric tests: Statistical tests that can be applied when the data fall in a normal distribution, that is, when they are spread evenly around the mean, and the frequency distribution curve is bell-shaped or Gaussian.

Peer-reviewed journal: A journal in which the articles are vetted by independent referees for quality and interest, and is therefore more highly regarded.

Phase I clinical trials: First trials of a new active ingredient or new formulation in humans, often carried out in healthy volunteers.

Phase II clinical trials: Trials performed in a limited number of subjects and often of a comparative (e.g. placebo-controlled) design, to demonstrate therapeutic activity and to assess the short-term safety of the active ingredient in patients suffering from a disease or condition for which the active ingredient is intended.

Phase III clinical trials: Trials including larger (and possibly varied) patient groups, with the purpose of determining the short-and long-term safety/efficacy balance of formulation(s) of the active ingredient, and of assessing its overall and relative therapeutic value.

Phase IV clinical trials: Studies performed after marketing of the pharmaceutical product to discover rare and remote side-effects.

Pie chart: A graphical method of representing the frequency distribution of a set of categorical data in the shape of a pie.

Pilot study: A preliminary study to test the feasibility of the protocol, before implementing the study proper. It may also be called “pre-test”.

Placebo effect: The phenomenon where, in an intervention study, subjects receiving, without knowing, an inert drug, show an improvement or perception of improvement in their condition, probably due to their expectations.

Population: An entire set of persons, animals, objects or events which the researcher intends to study.

Positive correlation: A positive correlation between two variables implies that as one variable gets bigger the value of the other variable also becomes bigger.

Power: A statistic indicating the probability of rejecting the null hypothesis when the alternative hypothesis is true. Statistical power of a study is thus the probability of observing an effect (of a specified effect size) if one exists.

Predictive value: The frequency with which a positive diagnostic test actually signifies disease.

Pre-test: A preliminary study to test the feasibility and appropriateness of a questionnaire, before implementing the study proper.

Pre-test/post-test design: An experimental research design in which measurements of the groups are made both before and after an intervention.

Prevalence: The overall occurrence of a particular condition in a specific population at a specific point of time.

Probability: The chance or likelihood of an event happening. Probability may vary in value from 0 (no chance) to 1 (certain). Researchers have to set the level of probability/certainty they are willing to accept for their findings.

Proportion: The ratio of one value to another expressed as a fraction of one, for instance, the proportion of women among patients with cardiovascular disease.

Proposal: A document written for the purpose of obtaining funding for a research project.

Protocol: The detailed written plan of the study. Any research study should have a protocol.

PubMed Central: A public web-based archive offering barrier-free access to peer-reviewed primary research reports in the life sciences, funded by the US National Institutes of Health.

Quality assurance: A system to ensure that the study is performed and the data are generated, recorded and reported in compliance with the protocol, good clinical practice and national regulations.

Qualitative methods: A research approach that emphasizes the non-numerical data and interpretive analysis.

Quantitative methods: A research approach that emphasizes the collection of numerical data or data than can be quantified, and statistical analysis.

Questionnaire: A means of collecting data from people where they provide written responses to a set of questions, either in their own words (open-ended questions), or by selecting from among pre-defined answers (closed response questions).

Random sampling: A sampling procedure in which a sample is drawn from a population such that each member of the population has had an equal chance of selection. Random sampling is not haphazard sampling.

Randomized controlled trials: Intervention studies are characterized by the prospective assignment of subjects, through a random method, into an experimental group and a control group.

Range: In a group of scores, the range is the difference between the maximum and minimum scores.

Ratio: A numerical expression of the relationship between one set of frequencies and another. An example is the ratio of males to females in a sample.

Rate: A numerical expression of the frequency of a condition in a given population measured in a specified period of time.

Regression equation: An equation to describe the correlation between two variables, meaning that when one of them changes by a certain amount the other changes on the average by a certain amount.

Regression line: A line drawn on a scatter diagram, to illustrate the degree and direction of the correlation between two variables.

Regression coefficient: The term used to signify the amount by which a change in one variable must be multiplied to give the corresponding average change in the other variable. It represents the degree to which the regression line slopes upwards or downwards.

Regression to the mean: A phenomenon where, upon re-measurement, previous extreme (very high or low) scores tend to move towards (regress to) the average score.

Relative risk: The ratio of the incidence of the outcome in the exposed group to the incidence of the outcome in the unexposed group.

Reliability: The extent to which a test or measurement result is reproducible.

Representative sample: A sample that accurately reflects the characteristics of the population from which it is drawn. It is a precise miniaturized representation of the proportion of elements of the population.

Retrospective study: An observational study design in which the investigators study present and past events.

Risk factors: A factor that is believed to increase the probability of a certain outcome or illness.

Rosenthal effect: The phenomenon where the expectations of the researchers in a study influence the outcome.

Sample: A subset selected for the study from the larger population.

Sampling error: The discrepancy between the values obtained from the relatively small sample and the larger population from which the sample was drawn.

Scatter diagram: A graph displaying the scatter of the relationship between two variables. The scatter diagram gives an indication of whether a correlation may exist and its direction.

Selection bias: A systematic difference between people who are selected for a study and those who are not selected.

Sensitivity: of a diagnostic test is the proportion of people who test as positive to diseases who really have the disease, i.e. they are true positive.

Skewed distribution: A frequency distribution curve which is asymmetrical, with one side of the curve extending in an elongated fashion.

Specificity: The proportion of people who test negatively for a disease.

Standard deviation: A measure of the dispersion or variability of a group of scores.

Standard error: A statistical measure of the probability that the finding in the sample will reflect the finding in the population from which the sample was drawn.

Statistical significance: A statistic indicating that the result obtained is probably not due to chance but is real. A statistically significant result does not necessarily mean that it is important or interesting.

Statistical significance test: A test to estimate the likelihood that an observed study result, for example a difference between two groups or an association, can be due to chance.

Stratified random sampling: A sampling procedure in which the researcher tries to ensure that important subgroups within the population are adequately represented.

Structured interview: An interview in which the questions are generally pre-defined, asked in a fixed order and recorded in writing.

Subjective measures: Measures involving a substantial degree of human interpretation, for example ratings of pain.

Subjects: Participants in a study. They should not be called material for the study.

Surrogate end point: A variable that is relatively easily measured and that predicts a rare or distant outcome, but which is not itself a direct measure of either harm or clinical benefit.

Systematic sampling: A sampling procedure in which subjects are selected by a simple periodic process, for example, selecting every second or third patient.

***t* test:** Statistical test used for numerical data to determine whether an observed difference between the means of two groups can be considered statistically significant, i.e. unlikely to be due to chance.

The 10/90 gap: While 90% of the global burden of disease is in developing countries, only an estimated 10% of the global resources are spent on disease problems of developing countries.

Transcript: A verbatim written version of an interview.

True negative: A diagnostic test correctly indicating that a person does not have the disease.

True positive: A diagnostic test correctly indicating that a person has the disease.

Two-tailed test: A statistical test where a difference between two groups is tested without reference to the expected direction of the difference, for example whether a risk factor, such as use of hormonal contraception will increase or decrease the

incidence of a condition. A two-tailed test will need a larger sample size than a one-tailed test.

Type I error: The error committed when, on the basis of a statistical test applied to the sample of data, a conclusion is made that there is evidence of an association between variables or difference between groups in the population, when in fact there is no difference or association. The probability of type I error is represented by the symbol alpha (α). Another name for alpha is the level of statistical significance.

Type II error: A "miss", when, on the basis of a statistical test applied to the sample of data, a conclusion is made that there is no evidence of an association between variables or difference between groups in the population, when in fact there is a difference or association. The probability of type I error is represented by the symbol beta (β).

Unlinked information: Information which cannot be linked, associated or connected with the person to whom it refers; confidentiality here is not at stake.

Univariate analysis: A set of mathematical tools to assess the relationship between one independent variable and one dependent variable.

Validity: The extent to which a test measures what it is intended to measure.

Variability: The extent to which a group of scores varies or is spread out. This is usually described by a descriptive statistic such as the range or standard deviation.

Variable: Statistical term for the score in data.

Variance: A measure of the dispersion or variability of a group of scores.

Projected Benefits of the Research

1. An effective method for a program to promote healthy nutrition to prevent physiological risk for cardiovascular disease.

2. The theory of self-efficacy to prevent risk factor for cardiovascular disease.

3. Findings can be published in a national or international journal have at least one issue and can be applied to hospitals or health centers in rural areas more effectively.

Chapter 2
Theory and Related Research

An Epidemiologic Survey of Cardiovascular Disease

The leading cause of death in the United States (U.S.) is cardiovascular disease (CVD), accounting for more deaths than all other causes combined (Ferruzzi, Coulston, & Boushey, 2012). Of these CVD related deaths, 53% are from Coronary Heart Disease (CHD) and 17% are from stroke (Mahan & Escott-Stump, 2008). The prevalence of CVD causes it to be a major public health concern, resulting in costs exceeding $403 billion in 2006 (Mahan & Escott-Stump, 2008). CVD can precipitate through a variety of causes including atherosclerosis, CHD, congestive heart failure (CHF), stroke and heart attack.

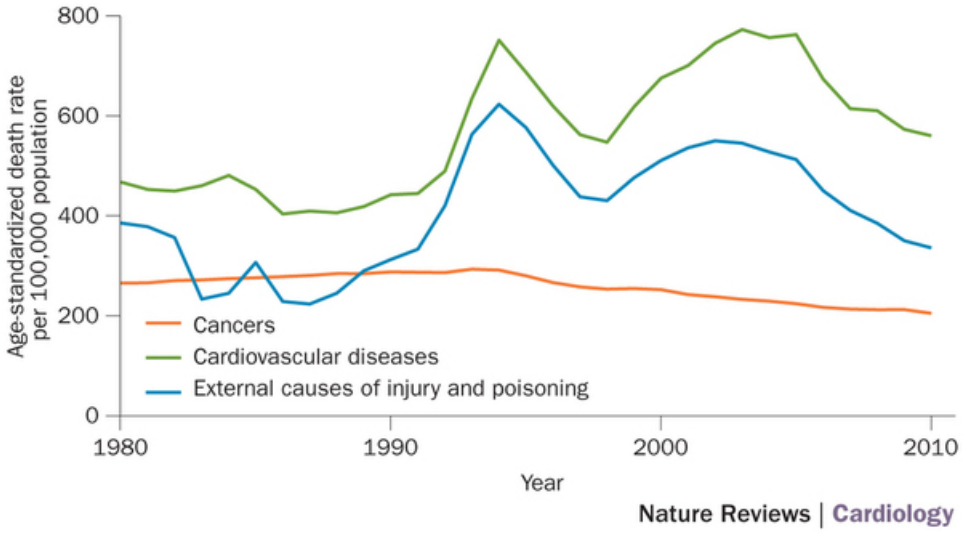


Figure 2.1 Trends in death rates from cancers, cardiovascular diseases, and external causes in adults (available from: http://www.nature.com/Nrcardio/journal/v12/n9/images_article/nrcardio.2015.82-f5.jpg [cited 15/Jan/16])

Prevalence of Cardiovascular Disease

With the combination of modifiable and non-modifiable risk factors, CVD is the leading cause of death in the U.S. accounting for more deaths than all other causes

combined (Ferruzzi, Coulston, & Boushey, 2012). Data from NHANES 2003-2006 indicated that 33.6% of the US adults age 20 and older have HTN. As for smoking, 23.1% of men and 18.3% of women age 18 and older are smokers. The percentage of the non-smoking population with detectable serum cotinine (indicating secondhand smoke) was 46.5% in 1999-2004. In 2006, approximately 7.7% of the adult population had a diagnosis of diabetes while 29% were pre-diabetic with abnormal fasting blood glucose. Prevalence of overweight and obesity in U.S. adult's age 20 years old and older is 66.3%. Of those, 32.9% of U.S. adults have a BMI greater than or equal to 30, which is classified as obese. Due to the large percentage of individuals who have at least one risk factor, it is estimated that 61.8 million individuals in the general population have CVD. Although most CVD deaths occur in persons older than 65 years of age, one third of deaths occur before average life expectancy is reached (Mahan & Escott-Stump, 2008). From 1996-2006, death rates from CVD have declined 29.2% but it is still the leading cause of death. Mortality data for 2006 showed that CVD accounted for 1 out of every 2.9 deaths in the U.S. and on average 1 death every 38 seconds is from CVD. CVD caused approximately 1 out of every 6 deaths in the U.S. in 2006. Roughly every 25 seconds an American will have a coronary event and approximately every minute someone will die from it. Americans are also affected by strokes. Mortality data from 2006 indicates that stroke accounted for approximately 1 of every 18 deaths in the U.S. . On average every 40 seconds someone in the U.S. has a stroke. As with CVD rates, stroke rate have also fallen 18.4% from 1996 to 2006, but they still remain a concern.

Atherosclerosis

Atherosclerosis is the most common contributing factor to the development of CVD (Mahan & Escott-Stump, 2008). Atherosclerosis develops when plaque builds up in the artery walls from low-density lipoproteins (LDL) ("*What is cardiovascular disease,*" 2010). The thickening and narrowing of the arterial wall is caused by the accumulation of cholesterol, smooth muscle cells, and fibroblasts causing plaque formation. With enough plaque accumulation, blood circulation is slowed or blocked altogether. Before plaque formation, endothelial dysfunction occurs causing blood vessels to become constricted. Some of the factors that contribute to endothelial dysfunction are dyslipidema (abnormality in any lipoprotein, especially LDL),

hypertension (HTN), smoking, diabetes, obesity, and diets high in saturated fat and cholesterol (Mahan & Escott-Stump, 2008). Occlusion of arteries can have detrimental effects depending on its location. In the coronary arteries atherosclerosis can cause angina, myocardial infarction (MI) or sudden death. A cerebral arterial occlusion can cause strokes, ischemic attacks, blood clots, and gangrene.

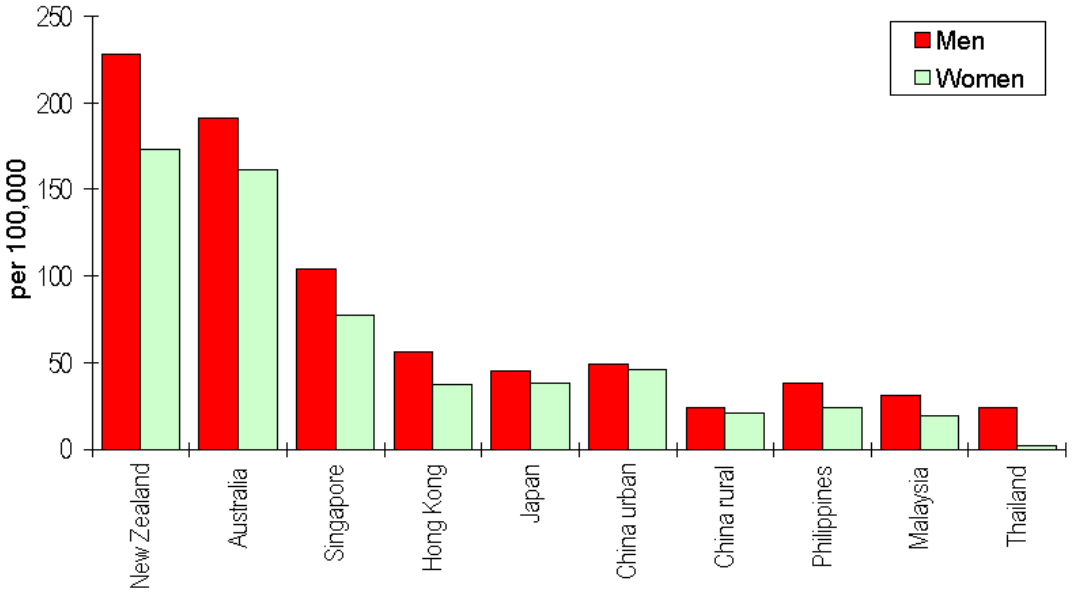


Figure 2.2 Coronary heart disease mortality in Asia Pacific countries (available from: http://apjcn.nhri.org.tw/server/apjcn/6/2/ Image311.gif [cited 10/Dec/15])

Coronary Heart Disease

Impaired blood flow to the coronary artery is classified as CHD. The incidence of CHD is high; 700,000 Americans had a new coronary attack and 500,000 had a recurrent attack in 2000 (Mahan & Escott-Stump, 2008). CHD is described as a MI or ischemia of at least one coronary artery. With the occurrence of either, heart tissue is damaged often leading to heart disease and potential death. Symptoms of CHD may or may not be detected. If symptoms are present, they include chest pain and discomfort from the heart not receiving enough oxygen, shortness of breath and fatigue with

exertion. With enough impaired blood flow to the coronary arteries, caused by plaque accumulation, angina, myocardial infarction and sudden death can result.

Congestive Heart Failure

Improved treatment of cardiovascular disorders such as MI, HTN and valvular heart disease, is projected to increase the occurrence of heart failure (Ferruzzi, Coulston, & Boushey, 2012). CHF is a sign and symptom resulting from impairment of systolic and/or diastolic functioning of the myocardium or can also be described as inefficient heart pumping. Those individuals with CHF often experience shortness of breath, chest discomfort, exercise capacity limitations, peripheral edema, anorexia and can become fatigued easily (Ferruzzi, Coulston, & Boushey, 2012). Risk factors of CHF include but are not limited to HTN, obesity, diabetes, atherosclerosis, CHD and dyslipidemia along with excess sodium intake (Mahan & Escott-Stump, 2008). Physiologically, CHF occurs similar to atherosclerosis where there is an asymptomatic phase when damage is occurring unbeknownst to the individual. Damage can be caused by an acute MI or by volume overloading on the heart (Mahan & Escott-Stump, 2008). The occurrence of damage changes the function and shape of the heart's left ventricle producing left ventricular hypertrophy to compensate for the lack of blood flow. Due to an enlarged left ventricle and the compensating overuse of the system, further damage is done, allowing for CHF to further progress.

Stroke

The two most common forms of CVD are heart attack and stroke. In the U.S., stroke is the third leading cause of death, killing about 137,000 people each year, and is a leading cause of serious long term adult disability. A stroke transpires when cerebral arteries to the brain become blocked or burst often resulting in the death of brain cells. Blockage occurs from the collection of lipoproteins on the arterial walls. High blood pressure, diabetes, smoking, and obesity can predispose an individual for a stroke.

Heart Attack

Each year, about 1.1 million people in the U.S. have heart attacks, and almost half of them die. CHD, which often results in a heart attack, is the leading killer of both

men and women in the U.S.. A heart attack occurs by either a block in the coronary artery with can be triggered by heavy physical exertion due to an increase in heart rate and blood pressure or a decrease in arterial circumference as a result of atherosclerotic plaque. Chest and upper body discomfort in the arms, neck and back, shortness of breath, nausea, vomiting, lightheadedness, fainting, or breaking out in a cold sweat are symptoms of a heart attack and should elicit help to decrease damage to the heart Heart attack prevention is linked to diet, exercise and stress factors, all of which can be modified.

Risk Factors of Cardiovascular Disease

There are many risk factors associated with CVD. Modifiable risk factors are risks that can be changed to decrease the prevalence of CVD, while non-modifiable risks are factors that cannot be altered. These risk factors do not cause CVD but have a positive association with acquiring the disease. CVD may not develop if a risk factor is present but it has been shown that the presence of multiple risk factors does increase the chance of developing CVD.

Modifiable Risk Factors

Modifiable risk factors are responsible for approximately 80% of CVD and strokes. These factors include smoking, physical inactivity, alcohol, weight, HTN, diabetes and poor diet.

Smoking and Tobacco

Smoking and tobacco has been recognized for more than 40 years as an increased risk for CVD (Mahan & Escott-Stump, 2008). The cardiovascular risk imposed by both, smoking and tobacco, is magnified by the coexistence of several other coronary risk factors. However, when another risk factor is present in a smoker (i.e.; HTN, high cholesterol) the risk of CVD is further increased (Pearson et al., 2002). Use of any tobacco product also promotes atherosclerosis and fibrinogen, a blood clotting agent. Acute coronary events including thrombus formation, plaque instability and

arrhythmias are influenced by tobacco use as well (Mahan & Escott-Stump, 2008). Cigarette smoking is associated with increased levels of inflammatory markers. Inflammatory markers, such as C-reactive protein, have been shown to be both prognostic and predictive of future cardiovascular events in several populations (Bakrhu & Erlinger 2005). Second-hand smoke exposure may also increase the risk of CVD in those who are non-smokers.

Physical Activity

Low level of fitness (i.e.; physical inactivity) is an independent risk factor for CVD (Mahan & Escott-Stump, 2008). It has been shown to increase the risk of heart disease and stroke by 50%. Without exercise, atherogenesis can occur rapidly forming plaque in the arterial walls and decrease the vascularity of the myocardium. Physical inactivity also has an impact on other risk factors including HTN, triglycerides, high density lipoproteins (HDL), diabetes and obesity which when combined with lack of exercise can increase the risk of CVD (Hubert, Feinleib, McNamara, & Castelli, 1983; Kannel, 1996).

Alcohol

Alcohol consumption has been associated with a lower risk of CVD in individuals who are light to moderate drinkers (Mukamal, Chen, Rao & Breslow, 2010). By consuming two drinks a day for men and one drink a day for women, there is a significant decrease in cardiovascular risk due to alcohols ability to raise HDL and reduce fibrinogen (Mahan & Escott-Stump, 2008). Heavy drinkers, more than two drinks for men and one drink for women, have an increased risk for HTN because alcohol raises blood pressure and total triglycerides (Beulens et al., 2007).

Weight

Obesity has been shown to be an important long term predictor of CVD incidence among individuals. Obesity is a prevalent CVD risk, 65% of adults are overweight (Body Mass Index (BMI) 25- 29.9) and 31% are obese (BMI>30) (Hedley et al., 2004). In a study conducted by Hubert et al., CHF increase 2.5 to 3 fold from leanest to heaviest subjects, signifying that those who are overweight have a higher risk

when compared to leaner individuals. In addition to weight, waist to height ratio is strongly correlated with cardiovascular risk (Gruson et al., 2010). For men, a ratio between 53 and 58 predicts for an increased CVD risk. For women the ratio is 49 to 54. Android fat distribution, where weight is centered on the midsection, has a greater chance of CVD than those who carry weight around the hips (gynoid fat distribution) (Mahan & Escott-Stump, 2008). Excess adipose tissue has been associated with HTN, dyslipidemia, glucose intolerance, and endothelial dysfunction, all of which effect heart function (Hertz, Unger, McDonald, Lustik & Biddulph-Krentar, 2004). It has been argued that obesity does not convey an increased risk of CVD unless it is accompanied by elevations in such characteristics as blood pressure or blood lipids (Hubert et al., 1983). Weight loss can affect CVD. In a study conducted by Pascual et. al. metabolic syndrome participants who lost weight during the trial decreased systolic and diastolic blood pressures as well as LDL cholesterol. Further observations concluded that the impact of weight loss changes the rate of cardiovascular risk factors and reinforces the necessity to be proactive in achieving weight reduction. (Pascual et al., 2009).

Hypertension

HTN is a prevalent and powerful contributor to CVD (Kennel, 1996). HTN is classified as having an average blood pressure higher than 140 mmHg systolic or 90 mmHg diastolic. Having high blood pressure predisposes to all cardiovascular diseases including cardiac failure, coronary artery disease, and peripheral artery disease due to an increased stress on the heart and arteries (Kennel, 1996). Stress on the arteries causes microscopic tears that when healed create scar tissue that attracts plaque. Plaque formation in the arteries then eventually leads to atherosclerosis. In response to high blood pressure and an increased workload secondary to obesity, the left ventricle of the heart grows in size (Mahan & Escott-Stump, 2008). Left ventricular growth is classified as left ventricular hypertrophy, and is found to be a strong risk factor for CVD, heart failure (HF) and sudden death (Mahan & Escott-Stump, 2008). HTN is a public health problem in developed countries. HTN is defined as persistently high arterial blood pressure. It is often referred to as the “silent killer” because individuals with HTN can be asymptomatic for years and then have a fatal stroke or heart attack. There is no cure for HTN however, it is easily detected and can be managed through proper diet,

exercise and medications. HTN is caused by multiple factors including a combination of environmental and genetic components (Mahan & Escott-Stump, 2008). Environmental factors including the increase in BMI may contribute to the increase in prevalence of HTN. Older individuals have a higher prevalence of HTN. Prior to age 55 men have an increased risk of HTN greater than women, but after 55 women have the increased risk over men, regardless of race (Mahan & Escott-Stump, 2008). An increase in blood pressure is consistent with the increased risk for CVD. The higher the blood pressure, the greater the chance of left ventricular hypertrophy, CHF, stroke and kidney disease (Mahan & Escott-Stump, 2008).

Race and age also play a part. Black adults have a higher age-adjusted prevalence of HTN (37% of men; 39% of women) than non-Hispanic whites (24% of men, 23 % of women) (Mahan & Escott-Stump, 2008). Older individuals have a higher prevalence of HTN. Prior to age 55 men have an increased risk of HTN greater than women, but after 55 women have the increased risk over men, regardless of race (Mahan & Escott-Stump, 2008). An increase in blood pressure is consistent with the increased risk for CVD. The higher the blood pressure, the greater the chance of left ventricular hypertrophy, CHF, stroke and kidney disease (Mahan & Escott-Stump, 2008).

Diabetes

With improvements in the management of diabetes and CVD, evidence still suggests that CVD is the leading cause of morbidity and mortality in people with diabetes (Diabetes Mellitus, 1999). The Framingham Study demonstrated that diabetes mellitus is associated with a two to five fold increase in CVD and related death (Kannel & McGee, 1979). Individuals with diabetes lack the ability to make insulin or cannot facilitate their own insulin production and glucose becomes abundant in the blood (“ Heart disease conditions,” 2009). The abundance of glucose results from defects in insulin secretion from the β - cells or insulin action/resistance. With glucose build up, arteries become damaged perpetuating CVD. Some of the increased risk for CVD seen in diabetic individuals is attributable to the concurrent presence of other risk factors such as dyslipidemia, HTN, and obesity (Gibbons et al., 2002). Management of these risk factors has been shown to effectively reduce the incidence of major coronary events

in persons with diabetes (Gibbons et al., 2002). Additionally, due to dyslipidemia as a risk factor, LDL cholesterol in a diabetic individual needs to be at 70 mg/dL (T. A. Pearson et al., 2003). With regards to drug treatment, lowering of glucose by medications has not produced a reduction in cardiovascular events, suggesting that elevated glucose may indicate proximal pathology related to adipocyte stress and dysfunction (Mozaffarian, Wilson & Kannel, 2008).

Diet

Dietary intake high in fat and cholesterol is strongly related to an increased risk for CVD, but more specifically to the proliferation of other risk factors such as obesity, HTN and diabetes. Evidence from prospective studies have shown that dietary patterns are associated with risk and, specifically, that dietary patterns high in saturated fatty acids, cholesterol, and animal fat increase LDL cholesterol levels (Van Horn et al., 2008).

Total Fat

Total fat, while necessary in the diet, is often consumed in large amounts in the typical American diet. Total fat intake for adults 19 years of age and older is 20-35% of kilocalories. These ranges are associated with a reduced risk of CVD while providing adequate intake of essential nutrients. However, according to National Health and Nutrition Examination Survey (NHANES), the average American between the ages of 20-70 years old consumes 35% of their calories from fat. High fat diets increase postprandial lipidemia and chylomicron remnants, both of which are associated with increased risk of CVD (Mahan & Escott-Stump, 2008). Hu et al., determined in his study of dietary patterns and risk of CVD in men that those individuals who consumed high intakes of red and processed meats, refined grains, sweets, desserts, French fries and high fat dairy had an increased risk for CVD, when compared to those who consumed a high intake of vegetables, fruit, legumes, whole grains, fish and poultry. As a whole, the study demonstrated strong evidence that a diet high in vegetables, fruit, legumes, whole grains, fish and poultry and low in red and processed meats, refined grains, sweets, desserts, French fries and high fat dairy may reduce the risk of CVD (Hu et al., 2000). Focusing on dairy, diets containing high fat dairy may also be linked

to an increase in blood pressure and CVD. Consumption of high fat dairy products such as cheeses and whole milk may increase systolic blood pressure (Alonso, Zozaya, Vazquez, Martinez & Martinez-Gonalez, 2009). In the same study, high fat dairy was also shown to increase body weight compared to low fat dairy consumption. Research has also determined that there is very little evidence from prospective epidemiological studies suggesting that total fat intake, independently of dietary fat quality increases the risk of CVD (Erkkilä, de Mello, Risérus, & Laaksonen, 2008). U.S. Dietary Guideline for Americans 2010 has stated that while a recommendation is made for percent of total fat, the type of fatty acids consumed are more important in influencing CVD than the total amount of fat in the diet.

Saturated Fat

Saturated fat has a close relationship to CVD and more specifically to its effects with cholesterol and LDL. A strong body of evidence indicates that higher intake of saturated fatty acids (SFA) are associated with higher levels of blood total cholesterol and LDL cholesterol indicating risk factors for CVD (Agriculture, 2011). SFA are found mostly in animal foods and contain three different types. SFA include myristic acid (butterfat, coconut and palm kernel oil), lauric acid (palm kernel and coconut oils), and palmitic acid. Palmitic acid is the most abundant SFA in the diet accounting for 60% of the total SFA intake of Americans (Mahan & Escott-Stump, 2008). According to the Dietary Guidelines for American 2010, consuming less than 10% of calories from SFAs and replacing them with monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) is associated with low blood cholesterol levels and therefore a lower risk for CVD (Agriculture, 2011). Further reduction of CVD risk can be done by decreasing the percentage of calories from saturated fat from 10% to 7% (Agriculture, 2011). A significant correlation between SFA intake, total cholesterol and death was found in the Seven Countries Study. Death rates were positively associated with the percentage of dietary energy from SFA. A 5% change in SFA elicited a 4.7% change in age adjusted all-cause mortality rate (Keys et al., 1986). Saturated fat intake (as percent of calories) was also positively correlated with serum cholesterol levels as well as with a five year incidence of CVD (Ferruzzi, Coulston, & Boushey, 2012). In an epidemiological study by Gordon (1995), the evidence that lowering serum

cholesterol levels by decreasing intake of saturated fatty acids reduced the risk for CVD. The analysis included six dietary trials and demonstrated that lowering serum cholesterol levels by reducing the intake of saturated fatty acids significantly decreased the incidence of CVD by 24%, a 21% decrease in coronary mortality and a 6% decrease in total mortality (Cleanthous et al., 2011). Additional research performed by the National Cholesterol Education Program (NCEP) states that for every 1% increase in kilocalories from SFA as a percent of total energy, the LDL cholesterol increases approximately 2%. Conversely, a 1% reduction in SFA will reduce cholesterol by about 2% (Gibbons et al., 2002).

Trans Fatty Acids

Trans fatty acids (TFA) are fats that contain a double bond in the trans configuration. TFA are produced through oil hydrogenation that allows hardening of the oil, but some TFA are found naturally in animal fats (Gibbons et al., 2002). Solid fat including TFA are abundant in the American diet and can lead to excess caloric intake. Solid fats account for on average 19% of total calories in the American diet (Agriculture, 2011). However, TFA are not classified as saturated fatty acids, and therefore need to be consumed in small or no quantities Similar to SFA, TFA are shown to modify blood cholesterol levels. TFA lower HDL cholesterol resulting in a worsening of total cholesterol to HDL ratio and LDL to HDL ratios, which in turn increases CVD risk (Mensinky & Katan, 1990). TFA also raises LDL cholesterol levels by increases plasma levels of lipoprotein and triglycerides while reducing endothelial function by impairing dilation (Hu & Willett, 2002). In addition, TFA adversely affect essential fatty acid metabolism and prostaglandin balance by inhibiting enzyme function (Hu & Willett, 2002). Due to TFA having a large negative impact on cholesterol and CVD, research has shown that by substituting MUFAs and PUFAs for SFA and TFA total cholesterol can be lowered (Griel & Kris- Etherton, 2006).

Cholesterol

Cholesterol can either be made in the body or consumed through food intake. Regardless of where cholesterol comes from, its purpose is for physiological and structural functions. Therefore, it is not necessary to consume dietary cholesterol

(Agriculture, 2011). With that said, the average cholesterol consumption is 256mg per day with men consuming 331mg and one-third of coming from egg intake. Even though cholesterol can be made in the bodies there are recommendations to consume less than 300mg per day due to its large impact on LDL and HDL and thus CVD (Agriculture, 2011). Dietary cholesterol has been shown to raise total cholesterol and LDL cholesterol. Diets high in saturated fat and cholesterol elevate LDL by down-regulating the LDL receptors in the liver (Mahan & Escott-Stump, 2008). With down- regulation, receptors are repressed causing less LDL to be cleared from the plasma. The abundance of LDL in the plasma allows for oxidation in the arterial walls leading to atherosclerosis. This process of LDL oxidation caused by cholesterol can vary from person to person depending on genetic factors. Cholesterol also affects total to HDL cholesterol ratio. In a meta-analysis study by Weggeman and colleagues it was determined that dietary cholesterol raises the ratio of total to HDL cholesterol adversely affecting serum cholesterol (Weggeman, Zock & Katan, 2001).

Non-modifiable Risk Factors

Age and Gender

Non-modifiable risk factors include age, gender and family history. In both men and women, as age increases there are an increase in CVD mortality rates, leading to not only gender but age as a risk factor for cardiovascular risks. The incidence of premature CVD in men age 35 to 44 is three times as high as the incidence of women of the same age (Mahan & Escott-Stump, 2008). Therefore, the increase in absolute risk with aging becomes clinically significant for men in their mid-40's and women at about the same time as menopause (Gibbons et al., 2002). As gender plays a risk factor role, The Framingham Heart Study has shown that the differences in absolute CVD risk between genders cannot be explained by standard risk factors.

Family History/Ethnicity

Family history of CVD is a non-modifiable risk factor. A family history is considered to be positive when a MI or sudden death occurs before the age of 55 years in a male first degree relative or the age of 65 in a first degree female relative (Mahan

& Escott-Stump, 2008). The risk for CVD can greatly increase when heredity is combined with unhealthy lifestyle choices such as smoking, physical inactivity and consuming a poor diet. Ethnicity may play a role as a non-modifiable risk factor. In a study conducted by Thomas et al., focusing on ethnicity, income and CVD, black men had lower cholesterol levels and high blood pressure than white men. Fewer black men were also classified as being at low or intermediate risk for CVD compared to white men but, more black men were classified as high or very high risk for CVD. In summary, the study determined black men have a greater tendency to develop CVD risk factors versus white men over time.

Literature Review

Altering risk factors associated with CVD can prevent onset of the disease. To achieve an increase in CVD prevention, lifestyle modification is necessary. The AHA has defined a construct of ideal cardiovascular health, which is defined as 1) the simultaneous presence of four favorable health behaviors (absence from smoking within the last year, ideal BMI, physical activity and consumption of a dietary pattern that promotes cardiovascular health); 2) the simultaneous presence of four favorable health factors (absence from smoking within the last year, untreated total cholesterol <200 mg/dL, untreated blood pressure < 120/ < 80 mmHg and the absence of diabetes mellitus); and (Keys et al., 1986) the absence of clinical CVD (including CHD, stroke, and heart failure). Given the importance of abstinence from smoking and smoking cessation to health promotion, smoking appears in both lists of health factors and health behaviors. To meet ideal cardiovascular health, all of the constructs need to be satisfied. A large preventative measure in CVD is diet. Many foods and food compounds can have a direct impact on CVD contributors such as HTN and arthrosclerosis. Without correct dietary habits and lifestyle modifications CVD is inevitable.

Monounsaturated fatty acids (MUFAs) are fatty acids that have only one double bond present making it an unsaturated fatty acid. Sources of MUFAs include olive oil, canola oil, peanut oil and tree nuts. Recommendations from the Dietary Guidelines for Healthy Americans 2010 states that SFA should be replaced with MUFA and PUFA in order to decrease CVD risk as well as lower blood LDL and triglycerides (Mahan &

Escott-Stump, 2008; Pearson et. al., 2002). With replacement of SFA with MUFA, evidence has been shown that MUFA intake has an inverse association with death from CVD (Lunn & Theobald, 2006). Similarly, de Lorgeri et al. reported that subjects who consumed a Mediterranean type diet high in MUFAs had a significant reduction in the risk of death from CVD cause or non-fatal acute MI, as well as cardiac mortality and total mortality (deLorgeril et al., 1994). Diets high in MUFAs and total fat do not show a beneficial effect with CVD. When total fat and MUFA consumption is high, HDL cholesterol has not been shown to change thus, hindering the cholesterol lowering effects of HDL (Ferruzzi, Coulston, & Boushey, 2012).

Polyunsaturated fatty acids (PUFAs), just like MUFAs, PUFAs need to have a double bond in the fatty acid chain but PUFAs must contain more than one double bond. There are two forms of PUFAs: Omega- 6 polyunsaturated fatty acid (linoleic acid) and Omega-3 polyunsaturated fatty acid (linolenic acid), both of which are essential fatty acids. Omega- 6 PUFAs are found mainly in flaxseed, canola oil, hemp oil, pumpkin seeds, sunflower seeds, and meats. Omega-3 PUFAs are traditionally found in cold water fish and nut oils. Both Omega- 6 and Omega- 3 have been shown to have beneficial effects with regards to CVD. In the Nurses' Health Study, consumption of fish was associated with a decreased risk of cardiovascular events and death from CVD (Hu & Willett, 2002). Omega- 3 PUFA consumption was also linked to an inverse effect on blood pressure. Thirty-one controlled trials showed that intakes of Omega-3 higher than three grams of fish oil per day were needed in order to observe a significant reduction in blood pressure (3.0 mmHg systolic and 1.5 mmHg diastolic) in HTN individuals (Morris, Sacks, & Rosner 1993). Protection from CVD through fish consumption has been linked to docosanhexaneoic acid (DHA) and eicosapentaenoic acid (EPA). DHA and EPA are made in the body with the presence of Omega-3 and are needed for developmental growth and may be a preventative in the areas of heart disease, rheumatoid arthritis and hypertension (Harris, 1997). The mechanism behind PUFA protective qualities are not known with confidence but may be related to an antithrombogenic effect, retarding the growth of atherosclerotic plaque, an anti-inflammatory effect, and being mildly hypotensive. (Kris-Etherton, Harris & Appel, 2003).

Fiber has been shown to decrease CVD. Dietary fiber is found in fruits, vegetables, whole grains and legumes. Research has shown that dietary fiber (from cereal) is associated with a reduced risk of fatal and non-fatal MI (Rimm et al., 1996). Soluble fiber, including oat bran, psyllium, guar gum and pectin has been shown to reduce CVD risk though its action on lipids, lipoprotein and glucose metabolism (Ferruzzi, Coulston, & Boushey, 2012). Likewise, fiber has also demonstrated an effect on lowering glucose and insulin levels in non-diabetics and increasing insulin sensitivity in those with diabetes (Ferruzzi, Coulston, & Boushey, 2012). Fiber has also been shown to decrease cholesterol by binding to bile acid, which lowers serum cholesterol, as it depletes the bile acid pool (Mahan & Escott-Stump, 2008). When bound, bacteria in the colon ferment the fiber and produce acetate, propionate and butyrate, which inhibit cholesterol synthesis (Mahan & Escott-Stump, 2008). Comparing soluble fiber to insoluble fiber, soluble fiber may have a greater effect on blood pressure than insoluble fiber (Lazarou & Kouta, 2008). In a population of type two diabetics, soluble plant fibers were added to a diet recommended by the AHA for individuals at high risk or those who have been diagnosed with CVD. When following the diet, those who consumed the soluble fibers decreased their systolic blood pressure by 9.4 mmHg (6.9%) when compared to the control group who received wheat plant fibers (Vuksan et al., 1999). C- reactive protein, which is a sensitive marker for inflammation, is an independent predictor of future CVD. In a study conducted by North, Venter and Jerling, weight loss, modified saturated fat, MUFA and PUFA intake and an increase in fiber consumption significantly lowered C- reactive protein concentrations (25-54%). For the benefit of fiber recommendations are 25 to 30 grams per day with six to ten grams being soluble fiber.

Protein foods include animal (seafood, meat, poultry, and eggs) and plant based sources (beans, peas, nuts, seeds). Milk and milk products also contain protein. Fat is prevalent with protein foods. Fat found in meat, poultry and eggs are considered saturated fat and have been shown to increase CVD risk. Fat found in nuts and seeds are considered oils and contain MUFA and PUFA, which have been proven to be beneficial in decreasing CVD risk. NHANES data suggests that on average men between the ages of 20-29 consume 105.3 grams of protein per day, 30-39 years old, 101.6 grams per day, 40-49 years old, 104.7 grams per day and for 50-59, 101.1 grams

per day. According to Dietary Guidelines for Americans, protein consumption should be 56 grams per day for males ages 19 to 51 and older (Agriculture, 2011). As for proteins effect on CVD, NCEP states that it has little effect on serum LDL cholesterol level or other lipoproteins (Gibbons et al., 2002). Further research indicates an increased consumption of protein or MUFA decreases blood pressure when linked to other multiple dietary factors such as fruit, vegetable, and low fat dairy products (Appel, 2001). Much research has also been conducted in the area of CVD and plant protein sources. Soy protein compromising more than half of daily protein intake has been shown to lower LDL cholesterol levels by a few percentage point when it replaces dairy protein or a mixture of animal protein (Lichtenstein et al., 2002). Findings have therefore indicated that plant protein sources have decreased levels of saturated and trans fat, while an increase in fiber the LDL lowering PUFA which may decrease CVD risk.

Sodium is consumed in abundance in the average American diet. New sodium guidelines placed by the Dietary Guidelines for Americans recommend less than 2,300 mg per day for men ages 19-51 and older (Agriculture, 2011). On average men between 20-59 years of age consume 4,254 mg of sodium per day. Much sodium is found in prepackaged convenience food and meals, to which a large majority of Americans are purchasing and eating. Abiding by the new guidelines may be difficult due to the abundant availability of high-sodium foods and the currently high levels of sodium consumption however, advocating for lower sodium foods and abstaining from convenience meals is advisable (Lichtenstein et al., 2002).

Consuming high qualities of sodium has been shown to increase blood pressure and potentially cause HTN (Mahan & Escott-Stump, 2008). Over consumption of sodium allows for fluid retention in the body, placing added pressure on the arterial walls increasing both systolic and diastolic pressure.

Strong evidence has linked CVD risk and sodium consumption. In a study following the benefits of the Dietary Approaches to Stop Hypertension (DASH) diet subjects were placed in three sodium level categories high, moderate and low (Sacks et al., 2001). Subjects followed the DASH diet in addition to their prescribed sodium amounts. Results determined that reducing sodium from the high to moderate group reduced systolic blood pressure by 1.3 mmHg. Moderate to low sodium reduction

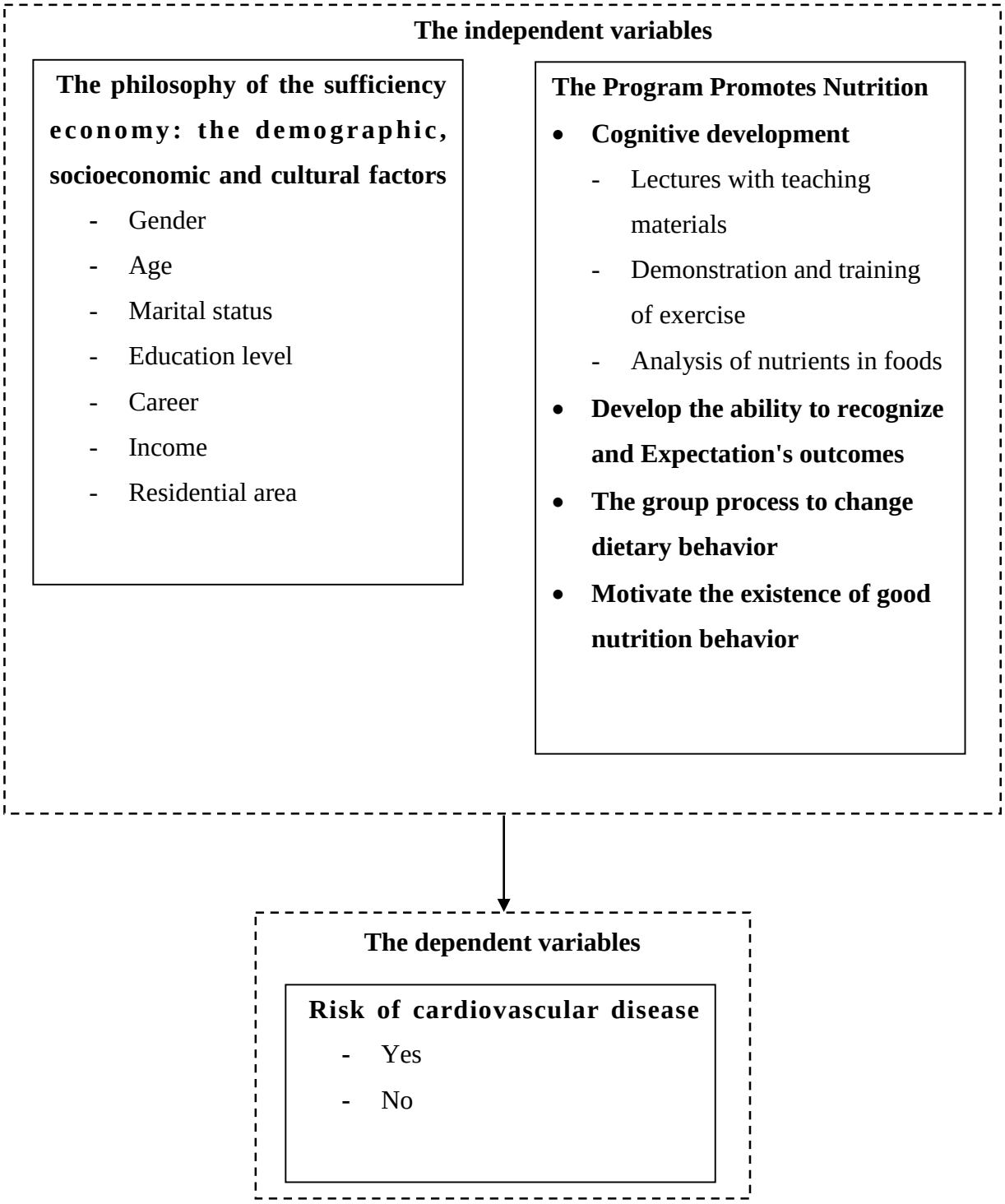
further decreased systolic pressure to 1.7 mmHg. Results were observed in both those with and without preexisting high blood pressure. Subjects who also followed the DASH diet were associated with a significantly lower systolic blood pressure (Sacks et al., 2001). A reduced sodium intake can also prevent hypertension in non-hypertensive individuals, can lower blood pressure in the setting of antihypertensive medication, and can facilitate hypertension control (Lichtenstein et al., 2002). Overall, research has demonstrated a decreased sodium intake related to blood pressure was greater in African Americans, middle and older-aged individuals, and those with HTN, diabetes, or chronic kidney disease (Lichtenstein et al., 2002).

The evidence for a role of potassium in lowering blood pressure is consistent across study types and is biologically plausible. Potassium is found in numerous fruits and vegetables including: bananas, cantaloupe, avocados, potatoes, tomatoes and spinach. Recommendations from the Dietary Guidelines for Americans state that potassium consumptions should be 4,700 mg/day for men 19 to 51 and older (Agriculture, 2011). On average however, men are not receiving the recommendations. Men ages 20-29 are consuming 2,939 mg per day, 30-39 years old increase to 3,080, 40-49 are at 3,162 and men 50-59 years old intake 3,169 mg per day, much lower than the recommended (U.S. Department of Agriculture, 2010). Would it be possible to state that men are at an increased risk for CVD due low potassium intake? Recent studies have determined the inverse relationship between high potassium intakes and low blood pressures. In a study by Appel (2001), administration of 60‑120 mmol/day of potassium supplements decreased, systolic and diastolic pressure at 4.4 and 2.5 mmHg in individuals with high blood pressure. Individuals without high blood pressure decreased by 1.8 and 1.0 mmHg (Appel, 2001). Consistent results were found in further studies providing support to use potassium as a reduction and prevention of high blood pressure and thus a decrease in CVD.

Caffeine is consumed through a wide variety of beverages such as coffee, tea, pop and energy drinks or though oral supplements such as those taken to increase energy prior to intense physical activity. Biomechanically caffeine works as a central nervous stimulant, diuretic and vasodilator. If consumed prior to exercise it has been shown to increase endurance in strenuous aerobic exercise and improve intensity of shorter duration exercise performance (McArdle, Katch & Katch, 2007). Between the

ages of 20 and 59, men consume on average 139.6 - 273.4 mg of caffeine daily. Recommendations for caffeine consumption vary depending on the individual, but studies suggest 100-200 mg/day. Caffeine with relation to blood pressure and CVD has displayed conflicting results due to individual's tolerance. Kellawan and colleagues looked at caffeine's effect during fire combat. The study demonstrated that caffeine increases physiological strain as a result of increased gastrointestinal temperature during exercise conditions such as firefighting. An increase in physiological strain increases the need for air but due to the caffeine intake rate of perceived exertion was decreased. As a result, caffeine could increase body temperature, increasing risk for heat related injuries (Kellawan, Stewart-Hill, & Petersen, 2009). Caffeine has also shown an effect on blood pressure in individuals with pre-existing hypertension. When consuming 200-300 mg of caffeine an increase in both systolic and diastolic blood pressure may result (Mesas, Leon-Munoz, Rodriguez-Artalejo, & Lopez-Garcia, 2011).

Research Concept



Chapter 3
Research Methodology

The study is a quantitative study using data from the survey of public health Center of Tambon Ban Kluai, Amphoe Chon Daen, Phetchabun year 2555 to study the behavior and the factors that were associated with risk of cardiovascular disease and stroke in the elderly.

Population and Samples

A total samples aged >35 years derived from questionnaires in the fourth part contained data on health condition, health behaviors and yearly income. Among these samples, cases studies were at risk to cardiovascular diseases while all cases were not. Self-reported by the samples on whether a person had the diseases or not, was used as a method for assessment the risk of having cardiovascular diseases. The diseases should be indicated or diagnosed by a physician or public health officers. They are hypertension, diabetes mellitus, and high lipid/cholesterol. If a sample had at least one of these diseases or symptoms, he/she was considered to be at risk of having cardiovascular diseases. Data were analyzed by using percentage, chi-square test and logistic regression.

Data Collection

A total of samples aged 35-59 years derived from questionnaires in the fourth part contained data on health condition, health behaviors and yearly income. Among these samples, cases studies were at risk to cardiovascular diseases while all cases were not. Self-reported by the samples on whether a person had the diseases or not, was used as a method for assessment the risk of having cardiovascular diseases. The diseases should be indicated or diagnosed by a physician or public health officers. They are hypertension, diabetes mellitus, and high lipid/cholesterol. If a sample had at least one of these diseases or symptoms, he/she was considered to be at risk of having

cardiovascular diseases. Data were analyzed by using percentage, chi-square test and logistic regression.

Variables and Measurement

The variables measured were: firstly, health risk of cardiovascular diseases, this variable was measured and divided into 3 levels: low, moderate and high. The “low” risk was described as having no risk or 1 risk factor of the following behaviors: consumption of high-fat foods; drinking of alcoholic beverages at the over criterion amount; practicing physical exercise less than 3 times a week and less than 30 minutes a time or not exercise at all; Body Mass Index ≥25 or the lower waist line was higher than the normal criterion, longer than 35 inches for males and longer than 32 inches for females. The “moderate” risk was described as having 2 and more of aforementioned risk factors while the descriptions of a “high” risk were: having 3 and more of aforementioned risk factors; having high blood cholesterol; high blood pressure or BP≥/170/100 mmHg or diabetes for more than 10 years or continuous uncontrollable diabetes; kidney problem; and having direct relatives with cardiovascular diseases or stroke. Secondly, intention to change behavior, which was measured by using ratio and ordinal scales. The independent variables of this study were: personal characteristics which included age, position, educational level, adequacy of income and job characteristics. These variables were measured by using the ordinal scale and group level. For the protection motivation factors, which included perceived severity (noxiousness), perceived probability, perceived self-efficacy, and response efficacy, were measured by using rating and ordinal scales.

Data Analysis

This study was a quasi-experimental, pretest - posttest two groups design. Of the all sample, 50% were in the experimental group and the remaining sample in the comparison group. Before intervention, the data were collected by questionnaires and the nutrition statuses were assessed. Then the experiment group was exposed to 9 times of the nutrition promotion program, 8 times for intervention once a week and 1 time

after 10 weeks organized by the researcher. The program lasted for 12 weeks. The program of 9 times intervention in a small group of 10-11 persons included lecture, discussion, presentation of positive model and hand book, exercise demonstration and record training. After the ninth time intervention group discussion were organized to share knowledge, ideas and experience on problem solving and correction. The comparison group received only hand book. At the eighth and twelfth week, the subject data were collected. Paired t-test, Independent t-test and ANOVA were used for the data analysis.

The descriptive data of population characteristics in regard to age were analyzed by computing frequency, percentage, and arithmetic means while position, educational level, adequacy of income, and job characteristics were analyzed by computing frequency and percentage. The difference analysis of health risk levels and population characteristics and the relationship between personal characteristics and behavioral change intention were made by using Chi-square test, at the significant level of 0.05. Pearson product moment correlation was used to test the relationship between perceived protection motivation and behavioral change intention, at the significant level of 0.05.

Chapter 4
Results

Risk of Having Cardiovascular Diseases of the Ageing

Self-reported data of the ageing who had chronic diseases for at least three months that were diagnosed by a physician or public health officers were used to analyze risk of having cardiovascular diseases among ageing population. These chronic diseases included hypertension, diabetes mellitus and high cholesterol. If one of these diseases was found, it meant a sample was at risk. The results presented that most of the ageing (91.4%) had no risk of having cardiovascular diseases while the rest of them (8.6%) did. The disease which was found the most was hypertension (65.7%), followed by diabetes mellitus (20.8%).

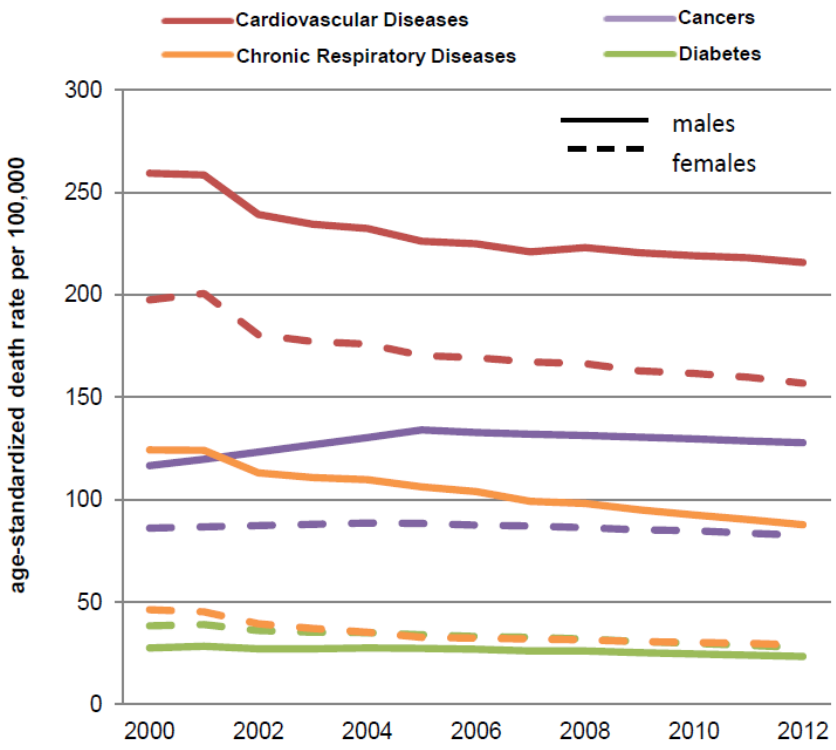


Figure 4.1 Age-standardized death rates of Thailand (available from: http://www.who.int/nmh/countries/tha_en.pdf [cited 10/Dec/15])

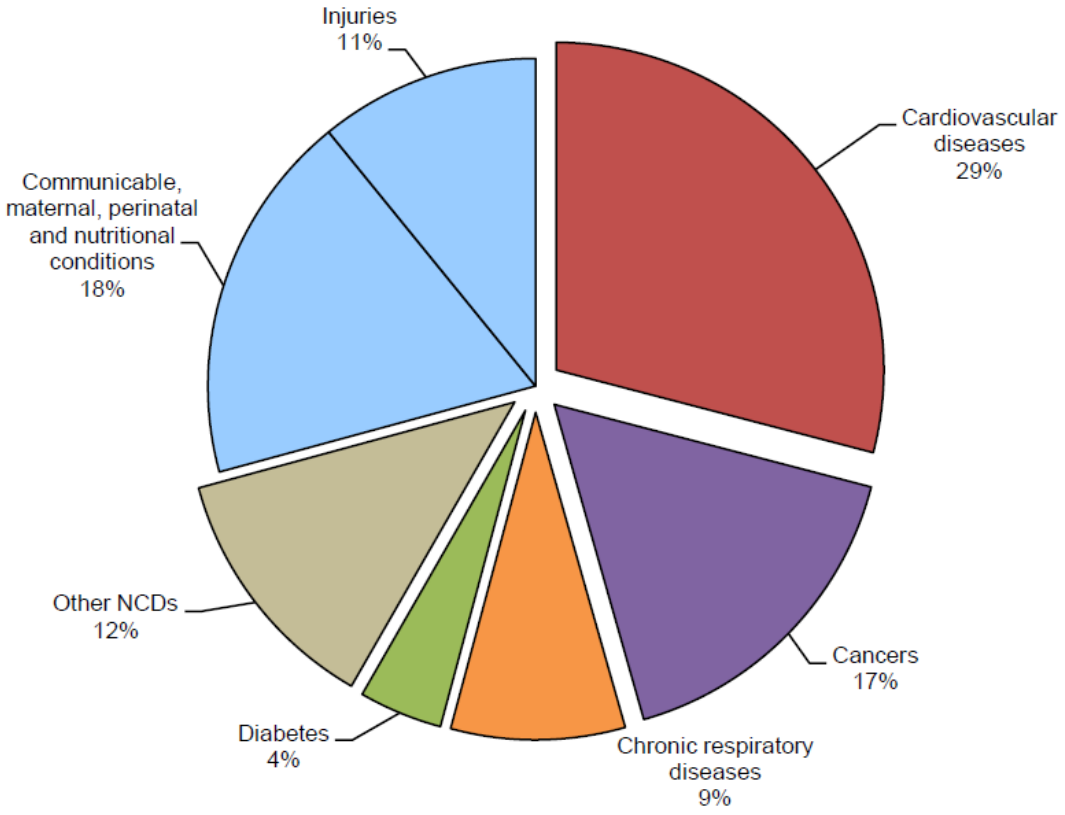


Figure 4.2 Proportional mortality (% of total deaths, all ages, both sexes) of Thailand (available from: http://www.who.int/nmh/countries/tha_en.pdf [cited 10/Dec/15])

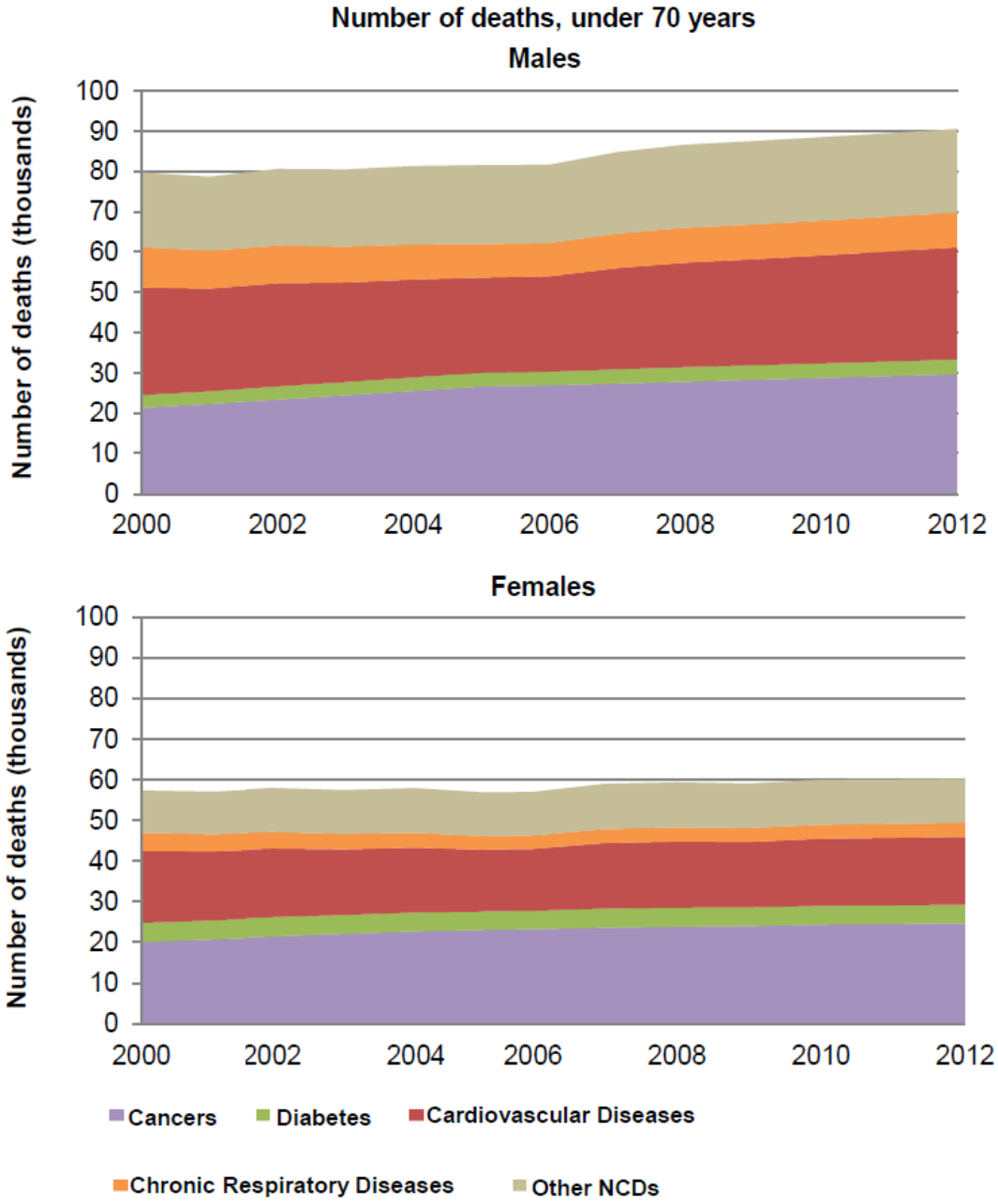


Figure 4.3 The probability of dying between ages 30 and 70 years from the 4 main NCDs is 16% of Thailand (available from: http://www.who.int/nmh/countries/tha_en.pdf [cited 10/Dec/15])

Table 4.1 Thailand adult risk factors of mortality

Risk Factors	Gender		Total
	Males (%)	Females (%)	(%)
Current tobacco smoking (2011)	46	3	24
Total alcohol per capita consumption, in liters of pure alcohol (2010)	13.8	0.8	7.1
Raised blood pressure (2008)	24.1	20.7	22.3
Obesity (2008)	5.0	12.2	8.8

(Available from: http://www.who.int/nmh/coun tries/tha_en.pdf [cited 10/Dec/15])

The Relationships between demographic and socio-economic Factors, health behavior factors and risk of having cardiovascular diseases among ageing population

The results showed associations between independent variables such as gender, age, educational level, occupations, income, residential area, BMI, Regular consumption of fruits, regularly exercising, drinking alcohol and smoking and dependent variable or risk of having cardiovascular diseases. However, marital status, consuming salty, sweet, and greasy food, and Regular consumption of vegetables were not related to risking of having cardiovascular diseases. Details are as follows:

A**ge:** it showed that age was significantly related to risk of having cardiovascular diseases among the ageing ($p<0.001$). It conformed to the study of previous studies which indicated that age was associated with health risk in regard to cardiovascular diseases among nurses. Besides, previous studies found that government officials with older age had more risk of having cardiovascular diseases than those with younger age.

Gender: among the ageing samples, there was a significant relationship between gender and risk of having cardiovascular diseases ($p<0.001$). It was conformable to other studies which supported that gender was related to risk of having cardiovascular diseases, health life style and other risk behavior.

Educational Level: among the ageing samples, it showed that educational level was significantly related to risk of having cardiovascular diseases ($p<0.05$). In contrast to the study of previous studies it indicated that the nurses with different educational levels had risk of cardiovascular diseases indifferently. The study of previous studies also presented that there was no relationship between education and risk of having cardiovascular diseases among government officials. The different findings may be due to different sample groups. The samples of other studies that used to compare with this study were the officials. These officials may have chances to get health information very slightly differently although they had different educational level. This may lead them to get risk of cardiovascular diseases indifferently.

Occupations: it was found that occupations was significantly related to risk of having cardiovascular diseases ($p<0.001$). Likewise, the study of previous studies indicated that administrative-level officials had higher risk of having cardiovascular diseases than skill-level officials or technical-level officials.

Income: the result showed that income was significantly related to risk of having cardiovascular diseases ($P<0.001$). It was in contrast to the study of previous studies which revealed that nurses with different sufficient incomes had no different risk of having cardiovascular diseases. The study of previous studies also presented that there was no relationship between income and risk of having this disease. The different results may be caused by the different sample groups of study.

Residential Area: the result revealed that residential area of the aging population was related to risk of having cardiovascular diseases significantly ($p< 0.05$). It was agreeable with the survey on Thai Health Condition using the third round of physical exam in the year 2003- 2004 which showed that incidences of hypertension, diabetes mellitus, high cholesterol in urban area were higher than in rural area.

Body Mass Index (BMI): among the ageing, the results showed that BMI was significantly related to risk of having cardiovascular diseases ($p<.001$). The obesity

caused high blood cholesterol, LDL and triglyceride while low HDL. It also caused hypertension. The result conformed to the study of previous studies which supported that overweight was related to health risk among nursing personnel.

Table 4.2 Dietary behavior of exercising, drinking alcohol and smoking of the ageing by gender

Dietary behavior	Gender		Total (%)
	Female (%)	Male (%)	
Exercising			
Not exercise	93.5	90.5	92
Occasionally	0.8	1.4	1.1
Regularly	5.7	8.1	6.9
Total	100	100	100
Drinking alcohol			
Not drink	66.2	18.7	42.3
Occasionally	24.7	39.3	32.1
Regularly	9.1	42	25.6
Total	100	100	100
Smoking			
Not smoke	82.8	20.9	51.7
Occasionally	1.1	2.6	1.8
Regularly	16.1	76.5	38.3
Total	100	100	8.2

Regular consumption of fruits: there was a significant relationship between Regular consumption of fruits and risk of having cardiovascular diseases ($P<0.05$). The result differed from other studies. It may be possibly due to the limitations of using secondary data of this study. Only numbers of day that the samples consumed fruits were available in the study. There was no data on amount of fruits. In addition, the influence of other variables may have some effects on the relationship.

Exercising: it was found that there was a significant relationship between exercising and risk of having cardiovascular diseases ($p<0.05$). The samples who did exercise not less than 30 minutes regularly had most risk of having cardiovascular diseases. It was in contrast to body of knowledge. This may be because of the influence of other variables. Also, this study focused only on exercising which excluded any movement during working. It is evident that not only formal exercise but also informal or unpatterned exercise such as movement in every activities (work, housework, traveling) or physical activities that can enhance healthy condition and disease prevention.

Drinking Alcohol: there was a significant relationship between drinking alcohol and risk of having cardiovascular diseases ($p<0.001$). It was in contrast with body of knowledge and other studies in some aspects. It may be because this study had no data regarding amount of alcohol consumption per day or per time. Only data on number of days that the samples consumed such drink were available, then the calculation for the amount of alcohol per day (grams) cannot be possible. It may be possibly caused by influences of other variables as well.

Smoking: it showed statistically significant relationship between smoking and risk of having cardiovascular diseases ($p<0.001$). However, some findings in this study were different from other studies. It found that those who regularly smoked had the least risk of having cardiovascular diseases. It may be probably due to the non-diagnosis of the male ageing. Although 62.5% of the male ageing in this study regularly smoked cigarette, Health System Research Institute found that around 60.2% to 82.1% of male ageing (45-59 years) have not been diagnosed the symptoms of hypertension, diabetes mellitus, high cholesterol that are assessed to be the risk of cardiovascular disease. In addition, it may be because the influences of other variables which distorted the results and supported that those who regularly smoked had the least risk of having cardiovascular diseases and made the results so different from body of knowledge and other studies.

Distribution of cardiovascular disease risk factor of the ageing by gender

Table 4.3 Percentage distribution of cardiovascular disease risk factor of the ageing by gender

Cardiovascular disease risk factor	Gender		Total (%)
	Female (%)	Male (%)	
Have risk	11.3	6	8.6
No risk	88.7	94	91.4
Total	100	100	100
Have risk due to disease or chronic conditions			
1. Hypertension	46.1	19.6	65.7
2. Diabetes	11.3	9.5	20.8
3. High blood cholesterol	1.7	1.9	3.6
4. Hypertension + diabetes	4.5	3.3	7.8
5. Hypertension + high blood cholesterol	1.0	0.5	1.5
6. Diabetes + high blood cholesterol	0.0	0.2	0.2
7. Hypertension + diabetes +high blood cholesterol	0.2	0.2	0.4
Total	64.8	35.2	100

The Relationships between gender, the span of age, marital status and risk of having cardiovascular diseases among ageing population

Table 4.4 Percentage distribution of the relationships between gender, the span of age, marital status and risk of having cardiovascular diseases among ageing population

Characteristics	risk of having cardiovascular diseases		Total (%)	χ^2
	Have risk (%)	No risk (%)		
Gender				40.100***
Male	6.0	94.0	100	
Female	11.3	88.7	100	
Total	8.6	91.4	100	
The span of age(years)				90.224***
40-49	5.8	4.2	100	
50-59	13.9	86.1	100	
Total	8.6	91.4	100	
Marital status				4.772
Single	7.4	92.6	100	
Marry	8.4	91.6	100	
Divorce/ Widowed	10.6	89.4	100	
Total	8.6	91.4	100	

* $p< 0.05$, ** $p< 0.01$, *** $p< 0.001$

The Relationships between Education Level, Occupations, Residential Area, Income and Risk of Having Cardiovascular Diseases among Ageing Population

Table 4.5 Percentage distribution of the relationships between education level, occupations, residential area, income and risk of having cardiovascular diseases among ageing population

Demographic and socio-economic characteristics	risk of having cardiovascular diseases		Total (%)	χ^2
	Have risk (%)	No risk (%)		
Education level				8.058*
Uneducated	8.2	91.8	100	
Primary	8.2	91.8	100	
Secondary	10.5	89.5	100	
Bachelor/Higher	11.4	88.6	100	
Total	8.6	91.4	100	
Occupations				12.514***
Agriculture	10.0	92.9	100	
Nonagricultural	7.1	90.0	100	
Total	8.6	91.4	100	
The residential area				91.154***
Municipality	10.7	89.3	100	
Outside municipality	8.2	91.8	100	
Total	8.6	91.4	100	
Income (baht/year)				37.828***
≤ 25,000	8.3	91.7	100	
25,000-99,999	6.8	93.2	100	
≥100,000	13.0	87.0	100	
Total	8.6	91.4	100	

* $p< 0.05$, ** $p< 0.01$, *** $p< 0.001$

The Relationships between Food Consumption and Risk of Having Cardiovascular Diseases among Ageing Population

Table 4.6 Percentage distribution of the relationships between food consumption and risk of having cardiovascular diseases among ageing population

Health behavior factors (Consumption)		risk of having cardiovascular diseases		Total (%)	χ^2
		Have risk (%)	No risk (%)		
Salty food					0.209
Yes		8.4	91.6	100	
No		8.8	91.2	100	
	Total	8.6	91.4	100	
Sweet food					0.000
Yes		8.6	91.4	100	
No		8.6	91.4	100	
	Total	8.6	91.4	100	
Greasy food					0.987
Yes		7.7	92.3	100	
No		8.8	91.2	100	
	Total	8.6	91.4	100	
Regular vegetable					0.235
Yes		8.7	91.3	100	
No		8.3	91.7	100	
	Total	8.6	91.4	100	
Regular fruit					5.116*
Yes		10.3	89.7	100	
No		8.1	91.9	100	
	Total	8.6	91.4	100	

* $p< 0.05$, ** $p< 0.01$, *** $p< 0.001$

The Relationships between Exercising, Drinking Alcohol, Smoking and Risk of Having Cardiovascular Diseases among Ageing Population

Table 4.7 Percentage distribution of the relationships between exercising, drinking alcohol, smoking and risk of having cardiovascular diseases among ageing population

Health behavior factors (Consumption)		risk of having cardiovascular diseases		Total (%)	χ^2
		Have risk (%)	No risk (%)		
Exercising					7.989*
Not exercise		8.3	91.7	100	
Occasionally		11.1	88.9	100	
Regularly		12.7	87.4	100	
	Total	8.6	91.4	100	
Drinking alcohol					91.145***
Not drink		12.4	87.6	100	
Occasionally		5.7	94.3	100	
Regularly		8.2	91.8	100	
	Total	8.6	91.4	100	
Smoking					79.088***
Not smoke		11	89	100	
Occasionally		11.2	88.8	100	
Regularly		9	91	100	
	Total	8.6	91.4	100	

* $p< 0.05$, ** $p< 0.01$, *** $p< 0.001$

The Covariates Factors Influencing Risk of Having Cardiovascular Diseases among the Ageing

The analyses in this part were conducted with an aim to test the set hypotheses by considering demographic characteristics, economics, social factors and health behaviors. Logistic regression statistics was applied to indicate which independent variable was related to risk of having cardiovascular diseases among ageing when controlling other variables.

The results indicated that the demographic, socioeconomic factors which relating to risk of having cardiovascular diseases were gender, age, and BMI. The unrelated factors included marital status, educational level, income, occupations, and residential area. The details of analyses were as the followings. When controlling other variables, the male ageing had 0.4 times less likely to have risk of cardiovascular diseases compared to female significantly ($p<0.01$). It rejected the set hypothesis. The ageing aged 40-49 years had 0.6 times less likely to have risk of cardiovascular diseases compared to those in age group of 50-59 years. When controlling other variables, those ageing with body mass index (BMI) equal to 25 kg/m2 or more had 1.7 times more likely to have risk of this diseases compared to those with BMI less than 25 kg/m2 significantly ($p<0.001$). It supports the set hypothesis.

The research results above showed that the male ageing had less risk of having cardiovascular diseases than female although they had more risk behaviors such as consuming and smoking than their female counterpart. The finding was not conformable to other studies. . This may be because this study used the secondary data which had no supported laboratory results, only data obtained from self-reported that were diagnosed by a physician or public health officers were used. Therefore, some diseases may not be diagnosed. Similar to the Thai Health Condition Survey at the third round of physical examination, it indicated that there was a high incidence of hypertension among population both male and female aged 45-59 years. However, they had never been diagnosed by a physician of a special field. The findings also showed that males were not diagnosed the hypertension higher than females (74.2% and 58.9%). Besides, males were not diagnosed the diabetes mellitus by physicians higher than females (60.2% and 42.4%) (Health System Research Institute, 2006). In addition,

it may be because female ageing had overweight which probably lead to more risk of having cardiovascular diseases than their male counterpart. Then the result showed higher risk of cardiovascular disease among females than males.

For age, it showed that the ageing aged 40-49 years had less risk of having cardiovascular diseases than those aged of 50-59 years. It was similar to the study of previous studies which showed that the increase in age each year will have influence in having cardiovascular diseases among government officials. The study of Previous studies also supported that nursing personnel aged 50-59 years had higher risk of having cardiovascular diseases than those whose aged 40-49 years and those whose aged lesser than 40 years.

Likewise, it was found that the ageing with BMI more than or equal to 25 kg/m2 had higher risk of this diseases than those with BMI less than 25 kg/m2. It was conformable to the study of previous studies which revealed that BMI was negatively related to HDL- cholesterol level while positively related to diastolic blood pressure and drinking behaviors. Moreover, the study of previous studies indicated that those who were overweight or obesity had higher risk of having cardiovascular diseases than those who had normal weight.

The health behaviors influencing risk of having cardiovascular diseases were drinking alcohol and smoking. On the other hand, food consuming behavior, and exercising were not related to risk of having cardiovascular diseases. The details of analyses are as the followings. The ageing who seldom drank alcohol had 0.5 times less likely to have risk of cardiovascular diseases than those who did not drink significantly ($p<0.001$). It was conformable to the set hypothesis and the study of previous studies which indicated that drinking alcohol at moderate amount or less than 60 grams/day would have incidence of cardiovascular diseases less than those who had never drunk or drink alcohol in a large amount. However, it was also found that the ageing who drank alcohol regularly had 0.6 time less likely to have risk of cardiovascular diseases than those who did not drink ($p<0.001$). It may be because there was no data regarding amount of alcohol consumption. Only data on number of drinking days was available. Such limited data could not calculate the amount of alcohol consumption (grams) per day which was the effective indicators to assess the harmfulness of alcohol to health of consumer.

The previous studies evidently showed that smoking is the serious risk factor causing people to have cardiovascular diseases. This study, however, found that the ageing who used to smoke but currently stopped, were more likely to have cardiovascular diseases 0.8 times than those who do not smoke at significant level of 0.01. This conforms to the set hypothesis. The analysis of the same data set supported that38.3% of those who quit smoking was caused by their unhealthy condition. Thus, the ageing who already stopped smoking had higher risk of cardiovascular disease than the ageing who was non-smoking.

Chapter 5
Conclusions, Discussion and Suggestions

Conclusions

Comparison of the differences at before, after the experiment and follow up in the experiment and the comparison groups, showed that the practice for prevention physiological risk of CVD, exercise, fiber, vegetable, fruit, soy protein and isoflavones of the experiment group continuously increased after the experiment and follow up, significantly (p value < 0.001). The energy of food consumption, percent of energy from fat and cholesterol in food consumed found to decrease significantly (p-value < 0.001), except the decrease of the energy expenditure of daily activity that was not significantly (p value = 0.125) at before, after the experiment and follow up. It also found that the BMI and waist circumference continuously decrease after the experiment and the follow up (p-value < 0.001). The study showed differences in the comparison group was not significant except the percent of energy from fat and cholesterol in food consumed that found to increase significantly (p-value < 0.001 and 0.014 respectively). The vegetable and fruit consumption was found to decrease significantly (p-value = 0.024 and < 0.001 respectively). Absolutely food consumption patterns and physical activities of the comparison group including BMI and waist circumference were found to continuously increase after the experiment and the follow up (p-value = 0.026, 0.025 and 0.129 respectively).

The differences at before, after the experiment and follow up between the experiment group and the comparison group, showed continuous increase in the practice for prevention physiological risk of CVD, exercise, fiber, vegetable, fruit, soy protein and isoflavones in the experiment group after the experiment and follow up higher than the comparison group. The energy of food consumption, percent of energy from fat and total cholesterol in the experiment group found to decrease significantly than the comparison group (p-value = 0.025, < 0.001 and < 0.001 respectively). However the energy expenditure of daily activity between experiment group and comparison group found to be not significant (p-value = 0.272). It also found that the

BMI and waist circumference decrease higher than comparison group significantly (p-value = 0.011 and 0.013) at after the experiment and follow up (p-value < 0.001).

The highest percent of the samples had a “low” level of perceived severity of perceived severity of cardiovascular diseases while 38.4 percent and 19.6 percent had a “moderate” and “low” level respectively. Higher than 60 percent of the samples agreed with the severity of cardiovascular diseases but higher than 30 percent disagreed with some statements in the scales as follows: “sudden death may occur if a person has cardiovascular disease” (45.2%); “It will be very sad and suffering if a person had cardiovascular disease” and “The patient will be a burden of the family if he/she had cardiovascular disease”, (37.9% and 36.5% respectively). In regard to perceived probability of getting cardiovascular disease, 6.9 percent had a “moderate” level of perceived probability while 22.8 percent and 13.2 percent had a “low” and “high “level respectively, especially the risk factors in regard to consumption of high-fat diet and physical exercise, as the following statement: “I never think about the chance to get cardiovascular disease even though I have consumed high-fat diet or the foods that were cooked with coconut milk” and “I never think about the chance to get cardiovascular disease even though I did not exercise” 81.3 percent and 80.3 percent respectively. In regard to the relationship of perceived severity and behavioral change intention, it was found that there was no significant relationship between perceived severity and behavioral change intention. Higher than 30 percent of the samples disagreed with some statements showing perceived severity and perceived probability, for example, being a burden of family members for taking care, suffering from the illness, or even fatal danger. According to the research results, the findings were not congruent with the concepts of the Protection Motivation Theory that perceived severity and perceived probability of getting illness which are in the perception process of assessing health threat that can lead to the changes of attitude and behavior. This finding should be due to the fact that most of the respondents were nurses and nurse aids and their risks were found to be at a “moderate to high” level However, these respondents had background and knowledge about the development of caring patients with cardiovascular diseases as well as being able to cope with problems, to provide the care

and to delay the severity of this disease. At present, the screening and diagnosis of cardiovascular diseases have been progressed a lot, for example, examination by using ECG, cardiac enzyme testing, Exercise ECG testing, cardiac cauterization, including medication treatment. Thus, the respondents' perceived severity of the illness did not relate significantly with intention but they were ready to perform desirable behaviors instead.

The high percentage of the respondents had a "moderate" level (73.6%) while 18.3 percent and 9.1 percent had a "low" and "high" level of response efficacy respectively. Higher than 80 percent agreed with the statements in regard to response efficacy especially the statement about "Consumption of high-fiber diet, cereals, vegetables, and fruits regularly can lower the chance to get cardiovascular diseases (92.2%). Other statement that was agreed by 86.7 percent of respondents was: "Adequate physical exercise should be done at least 3 times a week and at least 30 minutes a time or until sweating". In regard to the relationship between response efficacy and behavioral change intention, significant positive relationship was found between response efficacy and behavioral change intention ($r = 0.153$, $p = 0.023$). This finding was congruent with the concept of Protection Motivation Theory that the high behavioral change intention can be possible when a person realizes that the behavior is beneficial and can be put into practice. A high level of both self-efficacy and perceived benefits of the behavior will increase the level of behavioral change intention. There were 58.0 percent of the respondents who had a "moderate" level of perceived self-efficacy while 32.8 percent and 9.1 percent had a "low" and "high" level of perceived self-efficacy, respectively. Higher than 70.0 percent of the samples were confident to practice in order to lower the risk of having cardiovascular diseases while some of them (higher than 50%) were not confident to take care of themselves especially physical exercise and avoidance of high-fat diet. In regard to the relationship of self-efficacy and behavioral change intention, significant positive relationship was found between self-efficacy and behavioral change intention ($R = 0.406$, $p < 0.001$). This finding was agreed with the concept of the Protection Motivation Theory as has been explained in the part on response efficacy. However, there were some limitations of this research project: 1) the criteria used for assessing risks of cardiovascular diseases

did not cover the factor of stress which is on cause of this disease. The criteria used in this study were recognized as the criteria for primary assessment of risk factors of cardiovascular diseases whereby the assessment was done through general information, medical history and health behaviors. And 2) since this study was carried out in a private hospital, with the personnel in the Nursing Unit, thus health-related data collected from those personnel cannot reflect general condition of health status of personnel in other units of the hospital.

Discussion

The experiment group received learning activities, group process and reminding during the study. The activities were found to increase the knowledge of menopause perceived self-efficacy, outcome expectation and practice for prevention of cardiovascular disease. The activities were arranged 45-60 minutes once a week, for eight weeks and repeated again after ten weeks. There were about 11 same persons in each group during the study period. Group process created good environment and trust among members that helped to achieve the objective of the activities. During group activities, the members had a chance to discuss, to share ideas, to observe positive model and also to exchange knowledge and experience practice for menopause preparation as well as food consumption pattern and physical activities for protection of CVD. The practice provided group members new ideas for problem solving. Moreover, they were also provided lecture and hand book about preparation for menopause, present positive model, exercise demonstration and training, as well as group meeting at conference room of school. The experiment group gained more understanding and knowledge, perceived self-efficacy, outcome expectation, and practice for prevention physiological risk of CVD for self-menopause preparation. Since the experiment group received group process, knowledge, perceived self-efficacy, outcome expectation, and practice for prevention physiological risk of CVD were increased as well as menopause preparation. For exercise, the experiment group was provided aerobic exercise 2 day/week, 45-60 minutes each time were needs to remind them the exercise technique. The mean of exercise energy expenditure was around 400 kilocalories and heart rate 70-85 % of maximum heart rate or 120-150

beat/minute that is considered good for health. Regarding nutrition, consumption of soy protein 25 gram rich in 50 milligrams of Isoflavones, low saturated fatty acid and cholesterol can help decrease risk of CVD. Isoflavones are plants compounds with estrogen like properties help decrease LDL cholesterol concentrations, triglycerides, lipoprotein and increase HDL cholesterol concentrations. After the experiment, the experiment group increase soy protein consumption.

Suggestions

1. A qualitative study should be carried out in regard to physical exercise and food consumption especially high-fat foods including other risk factors affecting cardiovascular diseases. The results of this study should be useful for modifying and developing quality of life of the personnel in the Nursing Unit effectively.

2. This type of study should be done continuously with the same group whose health risks have been assessed in order to evaluate the progress of both level of health status and behavioral change intention.

3. Different behavioral change models should be studied in order to find the appropriate and effective model for hospital personnel.

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APPENDICES

APPENDIX A

Pictures of Research in Lower Northern Thailand


Everton

Biography

Project Leader

Name	Wanpiti Tamsri
Work Position	Instructor, Faculty of Science and Technology, Suan Dusit University
Educational Attainment	M.Sc.(Agricultural Resources and Environment), Khon Kaen University B.Sc.(Fisheries) , Khon Kaen University
Research Interests	Analytical Chemistry and Advanced Instrumental Analysis

Researcher 1

Name	Yutthana Phimthong-Ngam
Work Position	Instructor, Physics Education Program, Faculty of Science and Technology, Suan Dusit University
Educational Attainment	Ph.D. (Medical Engineering), Thammasat University M.Sc.(Materials Science), Chulalongkorn University B.Sc. (Physics), Kasetsart University
Research Interests	Physiological Modeling and Simulation, Bioinformatics, Pattern Recognition, Artificial Intelligence, Medical Sensors And Signal Processing, Embedded Systems

Researcher 2

Name	Kanokporn Sae-Wong
Work Position	Chemist, Thai KK Industry Co., Ltd., Phetchabun, Bang Sao Thong, Samut Prakarn
Educational Attainment	B.Sc.(Chemistry), Thaksin University

Research Interests	Design of Experimental, Investigation and Data Analysis by Statistical Software

Researcher 3

Name	Duankhae Kunnga
Work Position	Nurse, Phetchabun Hospital, Phetchabun
Educational Attainment	B.N.S.(Nursing), Naresuan University
Research Interests	Adult Nursing

Researcher 4

Name	Neeracha Yimklum
Work Position	Public Health Laboratory, Bang Phai Health Center, Bang Phai, Bang Mun Nak, Phichit
Educational Attainment	B.P.H. (Public health), Naresuan University
Research Interests	Public Health

Researcher 5

Name	Narumon Phimthong-Ngam
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Research Interests	Public Health