

**Application of Learning Technologies to Support
Community-Based Health Care Workers and Build Capacity in
Chronic Disease Prevention in Thailand**

by

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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Health Studies and Gerontology

Waterloo, Ontario, Canada, 2009

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Thailand has faced under-nutrition and yet, paradoxically, the prevalence of diseases of over-nutrition, such as obesity and diabetes, has escalated. Since access to diabetes prevention programs is limited in Thailand, especially in rural areas, it becomes critical to develop a health information delivery system that is relevant, cost-effective and sustainable. Therefore, the main objective of this program is to build capacity for chronic disease prevention in Thailand through application of learning technologies in the education, support and accreditation of community health care workers (CHCWs).

This program stems from established partnerships among: The University of Waterloo (UW), Department of Health Studies and Gerontology; Institute of Nutrition, Mahidol University (INMU); The Office of Disease Prevention and Control 10 Chiang Mai province; Ministry of Public Health (MOPH), Thailand and UW, Centre for Teaching Excellence (CTE) .

The development of the community-based diabetes prevention education program in Chiang Mai, Thailand was informed by in-depth interviews with health care professionals (n=12) and interviews (n=8) and focus groups (n = 4 groups, 23 participants) with community volunteers, screened as at-risk for diabetes. Coded transcripts from audio-taped interviews or focus groups underwent qualitative analysis by hand and using NVivo software.

Health care professionals identified opportunities to integrate health promotion/ disease prevention into CHCWs' duties. However, they also identified potential barriers to program success as motivation for regular participation, and lack of health policy support for program sustainability. Health care professionals supported an education program for

CHCWs and recommended small-group workshops, hands-on learning activities, case studies and video presentations that bring knowledge to practice within their cultural context; CHCWs should receive a credit for continuing study. Community volunteers lacked knowledge of nutrition, diabetes risk factors and resources to access health information. They desired two-way communication with CHCWs.

A tailored diabetes prevention education program was designed based on this formative research. Learning modules were delivered over eight group classes (n=5/class) and eight self-directed E-learning sessions (www.FitThai.org). The program incorporated problem-based learning, discussion, reflection, community-based application, self-evaluation and on-line support. The frequency that students accessed on-line materials, including video-taped lectures, readings, monthly newsletters, and community resources, was documented. Participant satisfaction was assessed through three questionnaires. Knowledge was assessed through pre-post testing based on an exam that was pilot tested with 32 CHCWs from a district outside of the 5 districts in semi-urban Chiang Mai province from which the 69 participating CHCWs (35 intervention, 34 control) were randomly selected.

The program was implemented over four months. Three quarters of participants attended all eight classes and no participant attended fewer than six. Online support and materials were accessed 3 – 38 times (median 13). Participants reported that program information and activities were fun, useful, culturally relevant, and applicable to diabetes prevention in their specific communities. Participants also appreciated the innovative technology support for their work. Comfort with E-learning varied among participants. Scores on pre-post knowledge test increased from a mean (SD) of 56.5% (6.26) to 75.5% (6.01) ($P < .001$).

The effect of the program on knowledge of CHCWs was compared between intervention and control communities at baseline and the end of the program. Overall, the knowledge at baseline of both groups was not significantly different (56.5% (6.26) intervention versus 54.9% (6.98) control) and all CHCWs scored lower than 70%. The lowest scores were found in the “understanding of nutritional recommendations” section (mean score = 28% in intervention and 30% in control CHCWs). After 4 months, CHCWs in the intervention group demonstrated improvement relative to the control group (75.5% (6.01) versus 57.4% (5.59), respectively, $p < .001$, $n=69$). The percent of CHCWs achieving a total score of 70% was 77% (27/35) in intervention and 0% in control groups.

The diabetes prevention education program was effective in improving CHCWs’ health knowledge relevant diabetes prevention. The innovative learning model has potential to expand chronic disease prevention training of CHCWs to other parts of Thailand. Ultimately, prevention of chronic diseases and associated risk factors should be enhanced.

ACKNOWLEDGEMENTS

First of all, I would say that without the dedication and commitment of the research assistants involved, this research would not have been possible. The work in this thesis is most certainly not the work of only one person. I have been incredibly fortunate to have not only been supported academically by some tremendous people, but to have also made some very good friends during my time at the University of Waterloo in Canada and I extend my heartfelt gratitude to you all for your enthusiasm, inspiration and help.

I would like to thank my supervisor, Associate Professor Rhona M Hanning, for giving me a great opportunity to come to Canada, to study and join a magnificent research team, for providing great opportunities to attend international conferences, and for providing a thoroughly enjoyable environment in which to come to work. I am not only thankful for the scientific advice, analysis, and critical thinking, but I am also extremely grateful for the times of true inspiration and when your door has also been opened for non- work-related matters. I am thankful that your door is always opened and I am privileged to have learnt so much from you; not only in terms of the results that we achieved, but also in how to approach real life problems.

To my committee members, Dr. Jose Arocha, Dr. Kevin Harrigan, and Dr. Uraiporn Chittchang, thank you for your knowledge, useful advice, guidance and perpetually challenging me throughout this thesis project. I was also thankful when I first began to write. You provided volumes of support and encouragement, reading the manuscript of the thesis with critical eyes, and offering invaluable advice and suggestions. I would like to specially thank my external examiner, Dr. Katherine Gray-Donald from the School of Dietetics and Human Nutrition, Macdonald Campus of McGill University.

I extend my gratitude across the globe to former directors of the Institute of Nutrition, Mahidol University (INMU), Dr. Emorn Wasantwisut and Dr. Suttalak Smitasiri, for their

kind support of the project, and to the current director of INMU, Dr. Visith Chavasit, for facilities support during on the conduct of the project in Thailand. I am also grateful to Dr. Prapaisri P Sirichakwal for providing advice on the program development and always supporting me when I had obstacles.

In Chiang Mai province, Thailand I would like to express my thanks for the warm hospitality of the team staff of the Office of Disease Prevention and Control 10 Chiang Mai province, Ministry of Public Health, particularly Dr. Songwutt Hutamai, Dr. Saowanee Wiboolsanti and Ms. Nittaya Rawangpan. I am grateful for the friendship and warm welcome of the Chiang Mai people, including doctors, nurses, local health care staff, community health care workers and study participants during the year I worked with you. I would also like to thank the great staff team with whom I worked in the communities of six districts and my driver, Mr. Songkran, and my coordinator, Mrs. Todsawadee Khamnonkom; we met by chance. I was so lucky.

In Canada, I remember the first day I landed. I would say that here is my second home. I spent time in Canada was without homesickness, but rather, among the happiest times in my life. I would thank Dr. Rhona's family: Mrs. Norah, Dan, Jeff, Odette, Sophie, Anik, Corin, and Rheya for love, cross-cultural experiences and kind support.

I also would like to thank all my friends at the department for their relentless drive and for always being available. For all my roommates, you tried to adapt me to the Canadian graduate culture life and, in some cases, turn me into a party animal, but I was shocked.

To my family, brothers, sister, nephews, and niece, thank you all for the influences you have had on me and for your continuing support. Mom, thank you for all your support, your belief and your great love. It does not go unnoticed.

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LIST OF ABBREVIATIONS

BMI	body mass index
CHCW	community health care worker
CTE	Centre for Teaching Excellence
DPC-10	The Office of Disease Prevention and Control 10, Chiang Mai province, Thailand
IFG	impaired fasting glucose
INMU	The Institute of Nutrition, Mahidol University, Thailand
ITs	Interactive Technologies
MOPH	The Ministry of Public Health
NCD	Non-communicable disease
PHC	primary health care
Thai FBDGs	Thai Food Based Dietary Guidelines
UW	The University of Waterloo, Canada
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Rationale

Non-communicable diseases are a global public health problem affecting both developed and developing countries. Overweight and obesity increase the risk of diabetes and other non-communicable diseases. According to the World Health Organization (WHO) estimates, by 2015, 2.3 billion people, approximately one third of the global population, will be overweight (WHO, 2002). Seventy-nine percent of the deaths attributed to non-communicable diseases occur in developing countries. The rising trends are a consequence of the demographic and dietary transition, and the globalization of economic processes (WHO, 2000; 2002). Thailand is a Southeast Asian country that has gone through rapid economic and nutritional change (Kim *et al.*, 2001). Its social and economic transition over the past three decades has involved becoming more industrial and less agricultural (Kosulwat, 2002).

Even though Thailand has a food supply that is self sufficient, there are still problems of deficiencies in its diet (Smitasiri & Chotiboriboon, 2003). Low birth weight, underweight in school children (Tontisirin & Winichagoon, 1999), calcium deficiency (Piaseu *et al.*, 2002), and iron deficiency in preschool and school children (Smitasiri & Chotiboriboon, 2003; Winichagoon, 2002; Kemmer *et al.*, 2003) persist as issues of undernutrition.

Paradoxically, the global epidemic of obesity has also affected the Thai population (Popkin *et al.*, 2001). Economic development in Thailand, rapid increase in food choice, and acculturation have contributed to the increased prevalence of obesity and chronic diseases, both in urban and rural areas (Kachondham *et al.*, 1992; Wibulpolprasert, 2000, 2002, 2007). The leading cause of death in Thailand is accidents followed by cancer, diabetes, heart

disease, pneumonia, and AIDS (Wibulpolprasert, 2007). The diabetes incidence rose from 33.3 to 91.0, to 586.8 cases per 100,000 population between 1985, 1994, and 2006, respectively (Wibulpolprasert, 2007). Furthermore, the 2004 Health Examination Survey (National Health Foundation, 2004) revealed that the diabetes prevalence had risen from 2.3% in 1991 to 4.6% in 1996 and 6.9% or 3.2 million individuals in 2004. This is evidence that the prevalence of diabetes has risen; however, many people remain undiagnosed, untreated, and at risk of complications of the disease.

Some risk factors for developing diabetes such as family history, increasing age and ethnic origin are non-modifiable (Haffner, 1998). However, other risk factors such as being overweight or obese, having an adverse abdominal distribution of body fat, and following unhealthy lifestyle behaviors, including dietary pattern, smoking and physical inactivity are modifiable and need to be the focus of prevention strategies (Haffner, 1998; Manson *et al.*, 1992).

Effective strategies to address these modifiable factors require a global view, innovative models, partnerships, and accountability to all stakeholders (Vinicor, 1999). Multi-factor, multi-system, and multi-level interventions are needed (Ellis, 1998). Furthermore, linkages between scientific research and public intervention practice may help to prevent the rising prevalence of chronic diseases (Cameron *et al.*, 2001)

Successful programs to close the gap in diabetes-related health disparities in various racial and ethnic populations are built on strengthening the links between health care providers and the community members they serve (Roe & Thomas, 2002). Many health programs are turning to community health workers for their unique ability to serve as "bridges" between community members and health care services (Satterfield *et al.*, 2002).

Recognition of the roles, skills, and contributions of community health workers; support for programs, including stable funding, technical assistance, and evaluation; and continuing education are needed to respectfully and effectively integrate these workers into the health care delivery system (Witmer, 1995).

Since access to diabetes prevention programs is limited in Thailand, especially in rural areas, it becomes critical to develop a health information delivery system that is relevant, cost-effective and sustainable. Support from academic institutes and the Ministry of Public Health will ensure that the program is of high calibre and will foster knowledge transfer and sustainability.

1.2 Goal

The ultimate goal of the project is to prevent the burden of diabetes among at-risk Thai populations, through public health leadership, linkages, and innovative use of learning technologies. In order to achieve the goal, this project is to develop, with input from multiple stakeholders, an education program regarding diabetes prevention, targeting at-risk Thai populations of the north region. This program for community health care workers (CHCWs) will be informed by theory and use Interactive Technologies (ITs) to facilitate learning and provide on-going support.

1.3 Objective

1.3.1 General objective

The objective of this study was to design, implement and evaluate a community-tailored diabetes prevention education program for CHCWs in the north region of Thailand. Learning technologies were used to facilitate the acquisition of knowledge and skills by CHCWs and provide on-going support to these workers.

1.3.2 Specific objectives

1. To develop and adapt for the Thai population of the north region, a diabetes prevention training program for CHCWs using ITs that includes both an education program and ongoing support component;

2. To evaluate the process and short-term outcomes of implementing the training program for CHCWs;

2.1) to evaluate baseline knowledge of CHCWs in randomly allocated intervention and control communities;

2.2) to implement a 4 month education program for CHCWs in intervention communities;

2.3) to conduct on-going process evaluation regarding the training program (over 4 months of implementation);

2.4) to evaluate post-training knowledge of CHCWs in intervention communities (4 months) and compare with pre-intervention knowledge.

3. To evaluate the short-term effect of a four-month training program on the knowledge of CHCWs in intervention compared with non-intervention control groups.

1.4 Organization

The second chapter of this thesis is a review of the relevant literature. Chapters 3, 4, 5, and 6 are based on manuscripts that will be submitted for publication in scholarly, peer reviewed journals. These chapters have some repetition of the literature review material.

For uniformity purposes, citations and references for all thesis chapters conform to the style of the Publication Manual of the American Psychological Association, 5th edition, 2001. The references have been taken out of the each chapter. They have been included in a single references section (page 117). The details of each chapter are:

Chapter 3: Development of a Diabetes Prevention Education Program for
Community Health Care Workers in Thailand: Formative Evaluation

The content of Chapter 3 will be submitted for publication in the *Journal: Preventing Chronic Disease as:*

Kitti Sranacharoenpong, Rhona M Hanning, Nattinee Jitnarin
Formative evaluation to develop a diabetes prevention education program for
community health care workers in Thailand

Chapter 3: Addendum: Formative evaluation with at-risk community members
supports the need for a diabetes prevention education program for community health care
workers

Chapter 4: Design of a diabetes prevention education program for community health
care workers in Thailand: From theory to practice

The content of Chapter 4 will be submitted for publication in the *Journal: The International Electronic Journal of Health Education*, with authors and title as follows:

Kitti Sranacharoenpong, Rhona M Hanning, Prapaisri P Sirichakwkal, Kevin Harrigan
Design of a diabetes prevention education program for community health care
workers in Thailand: From theory to practice

Chapter 5: Process and Outcome Evaluation of a Diabetes Prevention Education Program for Community Health Care Workers in Thailand (submitted, April 1, 2009)

The content of Chapter 5 has been submitted for publication in the *Journal: Education for Health: Change in learning and practice*, with authors and title as follows:

Kitti Sranacharoenpong, Rhona M Hanning, Prapaisri P Sirichakwkal, Uraiporn Chittchang. Process and outcome evaluation of a diabetes prevention education program for community health care workers in Thailand.

Chapter 6: A Diabetes Prevention Education Program for Community Health Care Workers in Thailand: A Randomized Controlled Trial

The content of Chapter 6 will be submitted for publication in the *Journal: International Quarterly of Community Health Education*, with authors and title as follows:

Kitti Sranacharoenpong, Rhona M Hanning, Uraiporn Chittchang
A diabetes prevention education program for community health care workers in Thailand: A randomized controlled trial.

Chapter 7 provides a general discussion and interpretation of the overall study results, limitations, and future research.

CHAPTER 2

A REVIEW OF LITERATURE

2.1 Primary health care in Thailand

Health care services have been made available throughout most of Thailand. Most Thai people have access to modern health services. However, some of the remote areas and border regions of Thailand are yet to have adequate access to health care. A large number of government hospitals exist which have a well developed health services network. Practically all sub-districts are now covered by health care centers and all districts have hospitals (Ministry of Public Health, 1998). Free health services or highly subsidized health services are available, but they have not served poor people in rural areas and may not reach the economically underprivileged. The concept of primary health care (PHC) in Thailand has been developed from the country's experience in solving the health problems of underserved people in 1969 in Chiang Mai province (Ministry of Public Health, 1985; 1998). An established working mechanism for efficient delivery of PHC through participatory community involvement has been made possible through collaborative efforts of government, NGOs and the community. The concept of community participation consisted of the contribution of ideas, manpower, money, and materials by the community that was fundamental and provided the key to the success of the PHC program. To educate a community to be self-reliant or self-supportive was another basic concept that the program fostered. The Ministry of Public Health (MOPH) is aware that strength a strong of health-services delivery system and a referral system is essential to support the PHC activities.

Roles of Thai community health care workers (CHCWs), health personnel or general

practitioners for health promotion are included in the primary health care system (Wibulpolprasert, 2002). The components of the primary care system are as follows: 1) Community Health Posts. A community health post is a village level health service unit established specifically in remote areas, covering a population of 500 to 1,000, and staffed by only one CHCW (a permanent employee of Ministry of Public Health, MOPH). Services provided at this level include health promotion, disease prevention and simple curative care. 2) A health center is a sub-district or village level health service unit, covering a population of about 1,000 - 5,000 with health staff, a midwife, a technical nurse, and/or a CHCW. They provide services including health promotion, disease prevention, and curative care. Health center officers run health programs according to the standard operational procedures established by the MOPH, under the technical supervision and support of the community hospital (Wibulpolprasert, 2000, 2002).

2.2 Chiang Mai province information and diabetes situation

The city of Chiang Mai, in the province of the same name, is the largest city in the North of Thailand (**Figure 2.1**).

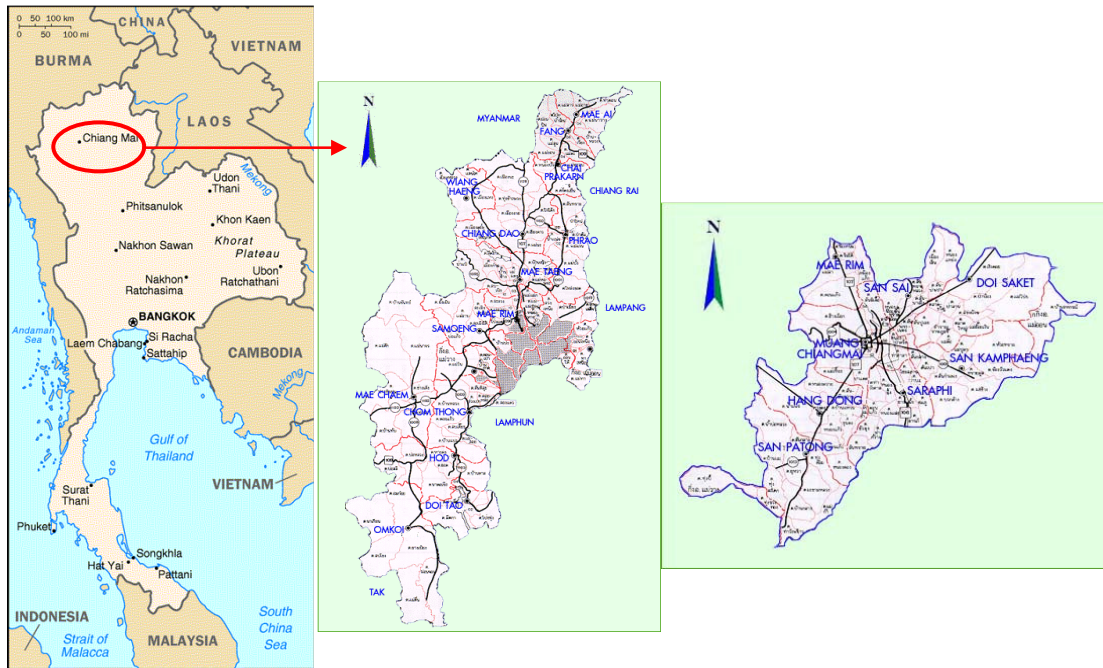


Figure 2.1: Map of Chiang Mai province, Thailand

Chiang Mai is approximately 700 kilometers from Bangkok, the capital city of Thailand. The province consists of 24 districts, 204 sub-districts, 1999 villages, and 262 health care centers (**Table 2.1**). With a population of 1.6 million, Chiang Mai is one of Thailand’s largest provinces in the North region. Eighty percent of the people in Chiang Mai are locals by birth, and speak a dialect that varies slightly from the central Thai language. The remaining 20 % is made up of Thai nationals and foreigners who have moved to Chiang Mai for working, studying, or retirement. There are many hill-tribe groups living in the mountainous districts surrounding Chiang Mai city such as Om Koi, Mae Chaem, Chiang Dao and Mae Ai.

Table 2.1: Total districts, sub-districts, villages, and health care centers of Chiang Mai province in 2005¹

Ref. #	District	Total of sub-districts	Total of villages	Total health care centers	Distance from Ref #1 (Km.) ²
1	Mueang	16	74	10	-
2	Chom Thong	6	94	13	58
3	Mae Chaem	10	125	13	110
4	Chiang Dao	7	78	11	75
5	Doi Saket	14	109	14	18
6	Mae Taeng	13	116	15	40
7	Mae Rim	11	89	15	16
8	Sa Moeng	5	45	6	56
9	Fang	8	109	15	156
10	Mae Ai	7	88	10	170
11	Phrao	11	108	15	116
12	San Pa Tong	11	118	18	22
13	San Kam Phaeng	10	99	11	13
14	San Sai	12	115	14	10
15	Hang Dong	11	108	14	15
16	Hot	6	58	11	88
17	Doi Tao	6	42	8	121
18	Om Koi	6	95	8	171
19	Sa Ra Phi	12	105	11	10
20	Wiang Haeng	3	22	3	156
21	Chai Pra Kan	4	43	8	135
22	Mae Wang	5	57	7	55
23	Mae On	6	49	6	35
24	Doi Lo	4	53	6	40
	Total	204	1999	262	

¹Provincial health office, Chiang Mai, Thailand,

²Provincial transportation office, Chiang Mai, Thailand.

Note: Chiang Mai city is in Mueang.

Diabetes is a public health problem in Chiang Mai province. The prevalence of diabetes in Chiang Mai has been increasing over time as has been complications of the disease (Aekplakorn *et al.*, 2004, 2007; Rerkasem, 2008). Chiang Mai is an old city; however, it is a main city for tourists in the North of Thailand. This may be reflected in the rapid growth in economy in the last five years (UNDP, 2007; Division of International Health, Bureau of Health Policy and Planning, Office of the Permanent Secretary, Ministry of Public Health, 2000), and relatively high socioeconomic status of Chiang Mai within the Northern Region (UNDP, 2007).

2.3 Rationale for lay intervention strategy in health promotion

A challenging task for health professionals is to communicate with people at-risk for chronic diseases (Altpeter *et al.*, 1999; Milburn & Wilson, 2000). In particular, at-risk communities may be hard for health care providers to find, to meet, to talk with, and, consequently, to serve. In addition, professionals may find it difficult to hold meaningful discussions regarding health problems such as cancer, diabetes, and HIV/AIDS as a result of language and communication barriers (Barlow *et al.*, 2005; Macri & Tsiantis, 1997-1998). However, the concern here is not only a matter of being fluent in the same language, it is also important to understand the community's cultural context for health and illness as well as their history of interactions with the service delivery system (Friedman *et al.*, 2006; Williams *et al.*, 2006).

The terms of “health advisors, community health workers, health aides, natural helpers, lay health advisors, paraprofessionals, peer educators, promoters, and outreach workers” are examples of terms for those involved in peer-delivery of health promotion and disease prevention programs (Altpeter *et al.*, 1999; Baker *et al.*, 1997; O'Hara *et al.*, 1996; Satterfield *et al.*, 2002; Swider, 2002). These terms have been defined by the educational techniques or health promotion strategies used.

Lay strategies can be used as a way to reach such communities and establish meaningful linkages to the service delivery system. A community health care worker (CHCW) is one who is indigenous to his or her community and consents to be a link between community members and the service delivery system (Friedman *et al.*, 2006). CHCWs are “bridges” between health care providers and the community members they serve, especially in rural communities (Kauffman & Myers, 1997; Satterfield *et al.*, 2002, Roe & Thomas,

2002). The curriculum design and implementation of health promotion programs has benefited from workers' links to community and culture (Tregonning *et al.*, 2001). Roles of CHCWs occur across all program components, such as communicating with target populations and distributing information and materials (Katz, 2004; Kobetz *et al.*, 2005; Lewin *et al.*, 2005). Both formal meeting and informal conversation can be useful in health education of the public (Buller *et al.*, 2000; Larkey *et al.*, 1999; Williams *et al.*, 2006).

Roles of CHCWs in the health promotion literature have been to promote increasing fruit and vegetable consumption (Auslander *et al.*, 2002; Buller *et al.*, 1999, 2000; Larkey *et al.*, 1999; Lucumi *et al.*, 2006; Williams *et al.*, 2001, 2006), e.g., in those at risk of diabetes (Auslander *et al.*, 2002; Williams *et al.*, 2001, 2006) and promote healthy lifestyles (Gary *et al.*, 2003; Lorig & Gonzalez, 2000; Quinn & McNabb, 2001; Tessaro *et al.*, 2000). These studies were focused on hard-to-reach ethnic, underserved population groups, worker groups, and people with medium to low education, and/or low income.

2.4 Theoretical basis for community-based chronic disease prevention

A support framework (**Figure 2.2**) for developing and understanding the lay education process has drawn on psycho-social theories that are related to peer-delivered health promotion (Dennis, 2003; Heaney, 1998; Larkey *et al.*, 1999; Turner & Shepherd, 1999; Wright *et al.*, 2003). There are multifaceted peer interventions extending across numerous demographic variables or disease-related, illness-preventive, and health-promoting aspects. Even though there are many diverse applications of the approach, the actual provision of lay support considers personal characteristics of community health care workers, selection process, training procedures, and specific common attributes. Selection of lay

persons for health promotion, for example, can be by community members or by professionals. The CHCW roles within programs may be to deliver health promotion information, to serve as role models, and/ or to support at-risk populations.

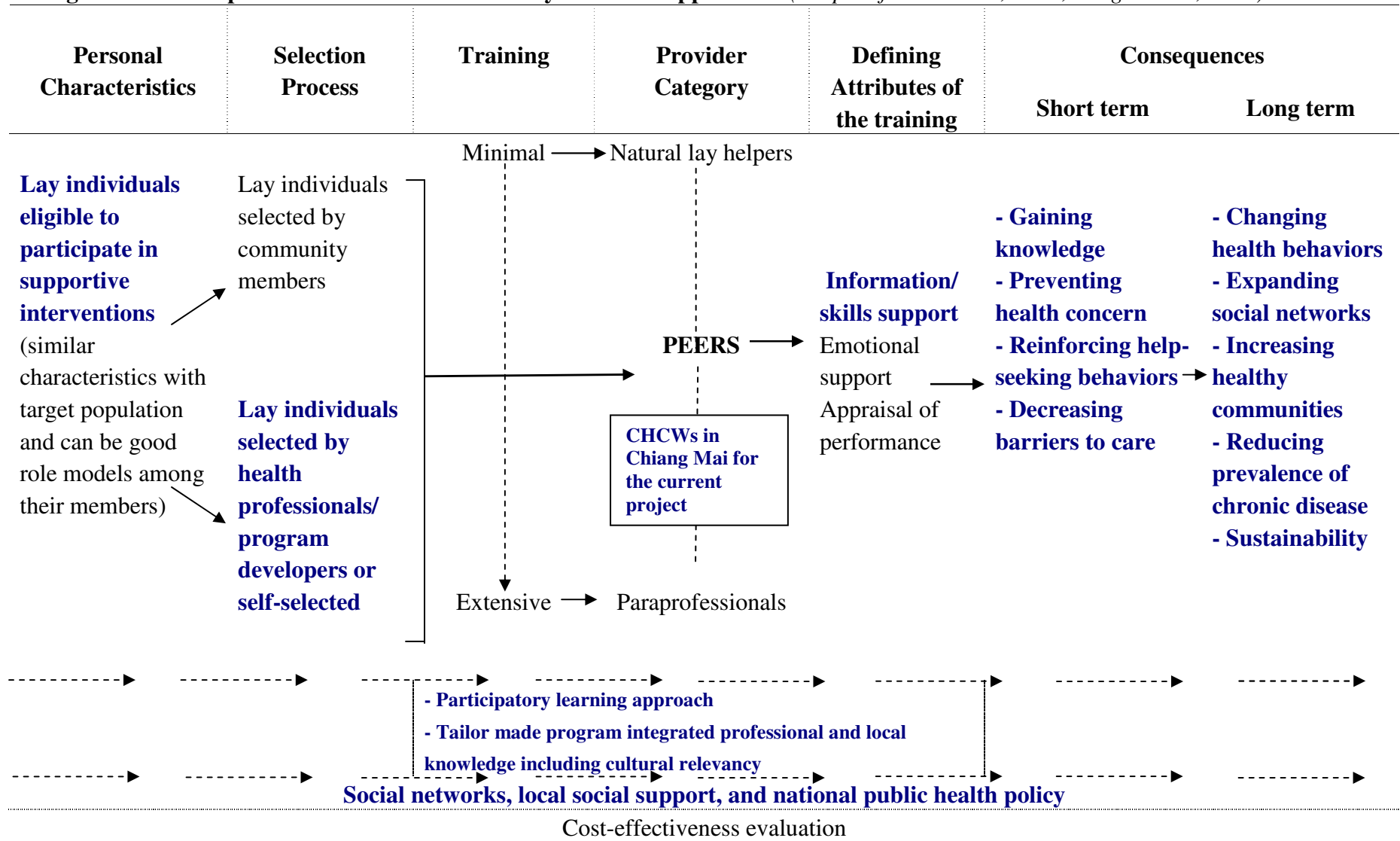
Minimal or extensive training can identify types of lay-educators. When lay persons are professionalized, their talents and accountability to the target population are shifted to the health care system and away from target groups (Eng & Smith, 1995). However, requirement of the amount of training to create paraprofessionals is based on the objectives of each implementation. The methodology of training (e.g., classrooms and communities) varies accordingly.

Within the provider categories, there is a range from natural lay helpers to paraprofessionals and the provider type will influence the social relationships. Natural lay helpers are naturally peers who can advise, provide emotional support, and /or tangible aid (Eng & Smith, 1995). Natural lay helpers, normally, live in the communities. The characteristics of natural lay helpers are; a) they do not work in professional programs or community health services, b) their experiential knowledge or personal relationships are not defining attributes of support provided, and c) they do not need to create social networks because they already know the community (Eng & Smith, 1995). Natural lay helpers are so embedded in the communities that their health-related functions are often unrecognized.

Attributes of the support training for lay educators consist of information, emotional, skills, and appraisal supports. These supports are important for lay educators in health promotion intervention programs (Eng & Smith, 1995). Information from professionals during training can support peer educators to plan and implement health promotion intervention programs. Training should integrate ongoing emotional and appraisal support to

reinforce the workers and their activities. Information support for peer educators refers to relevant knowledge, relevant and available resources, alternative courses of action, and guidance about effectiveness (Barrera *et al.*, 2006). Emotional support interactions include expressions of caring, encouragement, attentive listening, reflection, reassurance, and advice-giving (Barrera *et al.*, 2006). Emotional support can assist lay educators when they encounter problems with their abilities or career performance. Appraisal support is relevant for lay educators. The support can help lay educators' self evaluation of the knowledge gain, cognition, and behaviors. All supports for lay educators can help generate positive short term and long term outcomes and expectations. In addition, participatory learning approaches, tailor-made training programs, social networks, and national public health policy are important factors that can support sustainability of effective lay-delivered approaches.

Figure 2.2: Conceptual framework of effective lay-delivered approaches (adapted from Dennis, 2003; Wright et al., 2003)



2.5 Training programs for CHCWs and their outcomes

A systematic literature review was conducted (see comprehensive examination paper B – Sranacharoenpong K, May 22, 2007) and revealed 11 major studies in which CHCWs were used in health promotion (Auslander *et al.*, 2002; Buller *et al.*, 1999, 2000; Gary *et al.*, 2003; Larkey *et al.*, 1999; Lorig & Gonzalez, 2000; Lucumi *et al.*, 2006; Quinn & McNabb, 2001; Tessaro *et al.*, 2000; Williams *et al.*, 2001, 2006). Observations from these studies have informed the methods for the proposed research.

Buller *et al.* (2000) examined different strategies for CHCWs / peer educators to communicate 5-a-day (vegetable and fruit serving) information with the target groups. CHCWs / peer educators were trained by project staff for 16 hours pre-program over an eight-week period. This training program had presentations, group discussions, and role playing and covered four main topics about fruits and vegetables (e.g., health benefits, culture trends in dietary practices, methods of communication / motivation for behavioral change, and peer educators' roles). Responsibilities of CHCWs / peer educators included discussion with coworkers for two hours a week. In addition, CHCWs / peer educators had to initiate conversations regarding fruit and vegetables by using five different strategies for communication that they were taught. These strategies were foot-in-the door, fear appeal, benefits, peer pressure, and questioning. CHCWs / peer educators contacted daily with their target groups during the nine-month intervention. They also distributed print materials and promoted the benefits of fruit and vegetable consumption.

The outcomes of the CHCWs /peer educators' interventions were evaluated using peer contact logs for each type of influence strategy, communication strategies for dietary change, and program exposure and change in fruit and vegetable intake of the group (Buller

et al., 1999, 2000). During the nine months implementation, CHCWs / peer educators recorded a total 9,182 contacts with coworkers. They contacted coworkers most often in one-to-one contexts. Strategies that CHCWs / peer educators used were fear appeal, mention of 5-a-day, and peer appeal strategies. The researchers also found that role modeling and creating context were the most effective strategies used for group change. The encouragement and responding-to-questions strategies were more likely to be effective for individual change. Even though the current study will not specifically focus on communication strategies, these will be a component of the CHCW's education on implementing health promotion activities. Moreover the study of Buller *et al.*, (1999, 2000) enforces the need for an intensive training program.

African American lay educators without a nutrition background were trained by dietitians, social workers, and health educators over a four-month period, three half-days per week (Auslander *et al.*, 2002; Williams *et al.*, 2001, 2006). Lay educators delivered a manual-based program on dietary fat reduction through six individual and six group sessions (12 weekly sessions). Individual sessions were focused on dietary pattern changes, e.g., reducing fat intake or avoiding fat consumption. The group sessions were focused on specific skill areas, e.g., counting portions of fat in their diet, nutrition labeling knowledge, smart low-fat food shopping, adapting culturally relevant recipes to make them healthier, making healthy food choices in restaurants, and solving high fat situations. The dietitians conducted an evaluation to assess accuracy of the nutrition content delivered by the educators. Lay educators' results were assessed for two aspects: comprehensiveness of content delivered, and accuracy of nutrition information delivered (Williams *et al.*, 2001). The comprehensiveness of content delivered was determined by using recorded sessions and

content checklists. The overall percentage of content delivered for the program was 91 % of that proposed in training. The overall content delivered remained stable across the cohorts. The overall percentage of accuracy of nutrition information was delivered high (85 -90 %, by cohort). This study focused on fat reduction in short term intervention (Auslander *et al.*, 2002; Williams *et al.*, 2001, 2006). The approaches used in group sessions will be used as examples for the CHCWs in the current study. In addition, the successful content delivery by peer educators in the African American study lends support for our choice of CHCWs as the target group for the education program on diabetes prevention.

Lorig and Gonzalez (2000) broke down the content of the program on community based diabetes self-management into smaller pieces and trained peer educators in small steps over 28 hours of training conducted in Spanish. The program was structured in a way to incorporate four strategies (skills mastery, modeling, reinterpretation, and social persuasion) to increase self-efficacy. Similarly, over multiple sessions, Quinn and McNabb (2001) conducted training for lay health educators to enable them to deliver a weight loss program to a church-based group. Nine lay health educators were involved in 14 small group sessions offered on a weekly basis. Learning activities consisted of group problem-solving discussions and self administered learning activities. After the training program, the lay health educators delivered information to the target populations. Quinn and McNabb (2001) assessed lay educators in term of the degree of lay educators' accuracy of content delivery. The results showed that lay educators were 90% to 96% consistent with the scripted material pertaining to review of participants' prior progress, 95% to 100% consistent with their delivery of the instructional information in each session, 94% to 97% consistent with their delivery of the activities in each session, and 92% to 95% consistent in facilitating participants' goal setting

and behavioral contracting. This suggests that the intensive approach to training of CHCWs involving multiple sessions was highly effective.

Several studies have examined the effect of education provided by CHCWs on diabetes outcomes. Although the study of Gary and colleagues (2003) used CHCWs in the intervention phase, no formal training before the study was provided to them. CHCWs' roles were to facilitate preventive care by offering to schedule appointments and visits, along with providing education. They also monitored participant and family behavior, reinforced adherence to treatment recommendations, mobilized social support, and provided physician feedback (Gary *et al.*, 2003). Gary's study (2003) used peer educators for interventions for two years to improve behaviors of target populations with risk factors for diabetes. No significant difference in body mass index (BMI) among interventions was observed in the study. The study, however, showed that the target groups can reduce fat consumption and change their behaviors.

In designing and implementing community learning resources (e.g., media) and programs (e.g., walking clubs, cooking clubs, community gardens, education at point-of-purchase or consumption) the CHCW trainees in the proposed study will be aware of how, at a community level, one can help individuals to change their behavior. They will learn about approaches that impart knowledge as key messages (e.g., via various media). They will also recognize that multiple strategies may be needed to truly address determinants and support behavior change (Raine, 2004).

2.6 Theoretical basis for the learning program

The theoretical foundation, on which the learning program for CHCWs is based, is the T5 instructional design model of the University of Waterloo, Canada (Salter *et al.*, 2004). T5 model draws from constructivism, socially shared cognition and distributed learning theory (Moore, 1989). The underlying premise is that students learn better through opportunities for interaction, feedback, reflection and active application of concepts. By extension, CHCWs will apply adult learning principles to help their communities and community members to integrate new information, e.g., regarding food labeling, dietary guidelines and healthy eating index (Blackburn, 2005).

Designing 4 learning (D4L) is a process based on the T5 model of learner-centered course design that has been widely disseminated across Thailand and its neighbors by Leslie Richards, 2007 (**Figure 2.3**). The traditional approach to learning in Thailand is that teachers play major roles in the class. The learners are only listeners, absorbing and interpreting foundational knowledge. The starting courses with foundational knowledge/information are used for learners' remembering and understanding. Once the learners can remember and understand, teachers hope that they can move on to the higher skills of learning, such as applying, analyzing, evaluating and creating. However, the problems of the traditional approach to learning are not only that students lack motivation and engagement in mastering the foundational knowledge/information, but also that they have difficulty remembering and understanding. The D4L process places the learners within a supportive environment that motivates by engaging them in higher level applications as a way of mastering each set of primary and ancillary competencies. The focus of the diabetes prevention education program will be on engaging the learners in applications where they are asked to apply, analyze,

evaluate or create, ‘some things’ relative to the defined course competency. The ancillary foundational knowledge, which is required in mastering the primary competencies, is in turn mastered through the association of mastering the primary competencies. Technology helps to organize learning materials, assignments, and resources to promote application, integration and synthesis of course content versus memorization of information. The use of learning technology also facilitates ongoing support of learners (CHCWs).

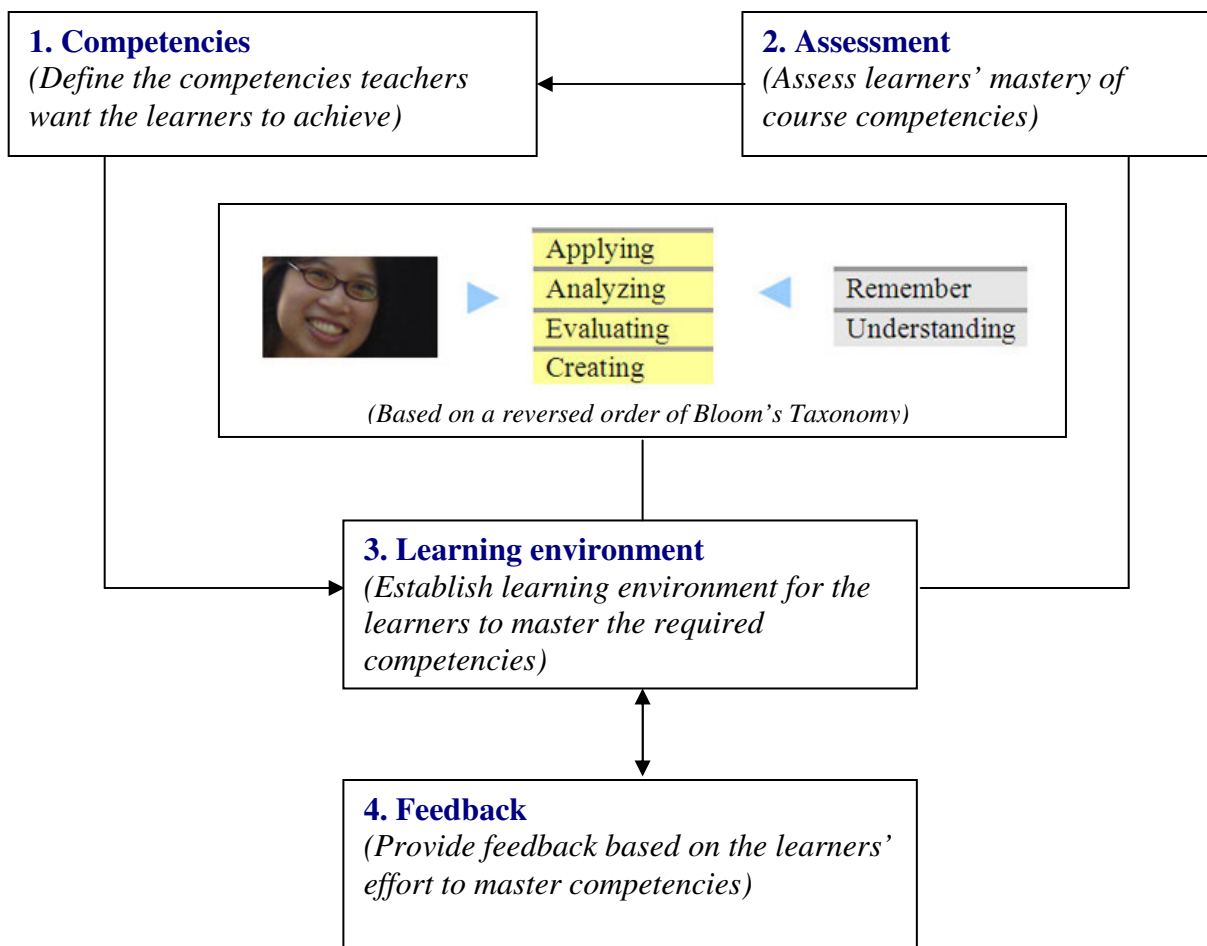


Figure 2.3: Designing 4 Learning (D4L) process based on T5 model
(Richards, 2007)

2.7 Effective approaches to support community-based lifestyle interventions in preventing type 2 diabetes

Knowledge is necessary although it is recognized as not sufficient to facilitate behavior change. The aims of most interventions to prevent or delay type 2 diabetes have been to achieve and maintain a healthy body weight through a combination of dietary measures and physical activity in individuals who already have impaired glucose tolerance, obesity, and/ or belong to a particularly high-risk group. Dietary recommendations across studies are quite similar, and focus on the reduction of fat intake and an increasing vegetable consumption with moderate calorie restriction in overweight/ obese populations. A key component of successful lifestyle intervention programs has been the focus on individual as well as group or community behavior change strategies.

2.7.1 Lifestyle modification studies that have been effective in changing behavior

‘Best practice’ population-based intervention studies to prevent type 2 diabetes were identified through a systematic review of the literature (Hanning *et al.*, 2004). From these studies, effective community-based approaches to support lifestyle behavior change were identified that might feasibility be applied in approaches to reduce the prevalence of type 2 diabetes in Thailand. Experiences from the “best practices” (The Diabetes Prevention Program, DPP, 2002) and the “promising practices” (Eriksson *et al.*, 1999; McNabb *et al.*, 1997; Miller *et al.*, 2002; Richard *et al.*, 1999; Tuomilehto *et al.*, 2001) seemed relevant and are summarized below according to key aspects of the approaches used.

2.7.2 Approaches to support behavioral change: Lessons learned from relevant studies

1. Participatory approach

Consulting and engaging people within their unique context are critical for the successful implementation of programs (Potvin *et al.*, 2005). Broad consultation was used in the development of successful programs, based on the recognition that stakeholders were more likely to accept the program if colleagues they respect have been a part of the development phase. Coalitions of community members, program participants, academicians, and practitioners, e.g., health professionals, lifestyle coaches, have helped in defining the areas of interest, the specific content and the process of dissemination (Baker & Brownson, 1998; Baker *et al.*, 2002). Successful programs engaged the target population in all stages. Local relevance is a key component of the intervention programs, and some of them incorporated culturally relevant messages, symbols, and strategies, with respect for and inclusion of traditional foods, activities, and knowledge. Individualized planning and communication between provider and participants involved tailored, written materials for participants, follow-up maintenance programs, supports for maintenance, and appropriate staff training for follow up (DPP, 2002; Glasgow *et al.*, 1999, 2002; McKay *et al.*, 2001).

2. Focusing on behavioral change

The intervention programs to prevent or delay type 2 diabetes combined diet and exercise strategies in their program (DPP, 2002; Eriksson *et al.*, 1999; Lindstrom *et al.*, 2003; McNabb *et al.*, 1997; Miller *et al.*, 2002; Richard *et al.*, 1999; Tuomilehto *et al.*, 2001). Many interventions used nutrition education and skill development that included cooking and

food preparation demonstrations, grocery store tours, and recipe exchanges. Exercise components included residential walking programs, creation of exercise facilities, gentle exercise classes, and running clubs. Even though these were community-based prevention programs, individualized behavioral counseling and follow up by experts and primary health care providers helped to support at-risk adults to improve physical activity and healthy eating (DPP, 2002; Eriksson *et al.*, 1999; McNabb *et al.*, 1997; Miller *et al.*, 2002; Richard *et al.*, 1999; Tuomilehto *et al.*, 2001). For example, the Diabetes Prevention Program (DPP, 2002) used a number of behavior change strategies. Participants kept journals noting everything they ate and all of their daily physical activity. Their entries were monitored and discussed regularly with their coaches. In addition to self-monitoring, important behavior-change strategies included setting achievable goals and monitoring progress. Facilitator's roles included motivating participants and helping participants identify barriers to change and develop strategies to address these barriers (DPP, 2002; McNabb *et al.*, 1997).

3. Providing intensive programs

With the Diabetes Prevention Program, each participant began the program with a sixteen-session curriculum, learning about nutrition, exercise, and behavioral self-management. They were taught what a calorie is, what a fat gram is, how to read labels and keep track of what all of this information means for their bodies and their overall health. Knowledge and information resources are necessary but not sufficient to facilitate behavior change. The intervention program incorporated activities to develop and practice skills. In addition, participants had an individual lifestyle coach. Most of these coaches were registered dietitians; the rest typically had a master's degree in exercise physiology, behavioral

psychology, or health education. Participants met with their coaches face-to-face at least every two months, and talked on the phone at least once between visits (DPP, 2002). The coach/ case manager assisted participants with monitoring personal goals and overcoming barriers. These intensive strategies proved to be very successful, as the lifestyle intervention resulted in a 58% reduction in the incidence rate of diabetes among high risk individuals.

4. Providing facilitator training

An additional component of successful programs was facilitator training (Briggs *et al.*, 2006; DPP, 2002; Miller *et al.*, 2002; Richard *et al.*, 1999). With the Diabetes Prevention Program, trainees were exposed to the full cycle of community program design, implementation and evaluation. Resources, both human and material, in their own language were available to provide ongoing support for trainees. All lifestyle coaches were required to attend annual, 2-day national training sessions. The annual training sections consisted of didactic presentations on the key principles and strategies of the core and maintenance curricula, update on the lifestyle intervention program, discussion of new participant materials, or motivational campaigns. Lifestyle coaches were supported through discussion of behavioral approaches to improve specific problems they had encountered with participants.

5. Ecological approach

Many studies were based on a holistic view of health, embracing spiritual, mental, emotional, and physical dimensions. An ecological perspective broadens the outlook further to include environmental interventions that may support the behavior change process (French *et al.*, 2001; Raine, 2004; Richard *et al.*, 1999; Story *et al.*, 2008). To promote lifestyle

adaptations, effective population-based approaches can identify and support protective factors within the culture/ community environment. Social support among family and community members and environmental changes can help support change among people at various points along a continuum of risk (Bryant *et al.*, 2007; Parcel *et al.*, 1988). Potential determinants of eating and physical activity behaviors need to be addressed. These determinants, as reviewed by Raine (2004), Kumanyika (2001), Flynn and colleagues (2006), Frank *et al.*, (2004), and Taylor *et al.*, (2005), are depicted in **Table 2.2**.

Table 2.2: Determinants of eating and physical activity behaviors

Category	Examples of specific determinants	Ideas of how determinants might be addressed at the community level
Physical Environment	<ul style="list-style-type: none"> - Economics (economic development of the region, cost of foods, recreation activities) - Availability, distribution, access (to safe food, community physical activity facilities, sedentary options, changes in food production, food policy) - Density and type of stores and food outlets (e.g., street vending, convenience stores, fast food) - Consumer food and nutrition environment (availability, price, promotion, nutrition information, e.g., labeling) - Built environment, urban/ rural - Schools / workplaces (food availability, recreation facilities, programs, policies) 	<ul style="list-style-type: none"> - Making local healthy foods networks availability at the villages, schools, worksites, and street vendors. - Providing and support useful food and nutrition information.
Social Environment	<ul style="list-style-type: none"> - Education of parents including families in group programs has been associated with healthier diets of children - Family meals (frequency, rules) - Foods eaten away from home - TV (during meals, exposure to advertising, as a sedentary 	<ul style="list-style-type: none"> - Guiding people make restaurant choices - Helping people to make choices based on labeling

Category	Examples of specific determinants	Ideas of how determinants might be addressed at the community level
	behavior) - Cultural norms (re desired body shape, social importance of food, ethnicity) - Social importance of food (pleasure, status)	
Interpersonal	- Influences within the family, peers (e.g., behavior modeling)	- Working with CHCWs as role models
Individual	- Self-efficacy, Motivation - Preferences - Portion sizes - Time - Health - Resources	- Setting individual goal, support and follow up. - Convenient healthy choices - Convincing people to change and confidence in making healthy choices.

The linkages between individual lifestyle behaviors and health outcomes have been well documented. Clearly, effective community-based interventions in preventing type 2 diabetes have used a broad range of strategies to support behavior change. These strategies have been developed, implemented and evaluated using participatory approaches, have focused on changing not only knowledge, but also behavior and broad individual, interpersonal, social and environmental determinants. As discussed by Egger and colleagues (2003), in order to effectively address obesity and it is ‘vector’ of excessive energy intake and inadequate expenditure in physical activity we need to combine effective approaches to deal with individual education and behavior change and broader social and physical environmental factors. Training and support of facilitators enhanced program effectiveness. These success factors provide a basis for future interventions.

So, what are the lessons learned from these studies if CHCWs are to play a meaningful role in community-based diabetes prevention in Thailand? Firstly, these studies

emphasize the importance of training and supporting program facilitators (here CHCWs). In planning the content and approaches of the training and support program, CHCWs, as well as those whose decisions influence them (e.g., other health professionals) and those who they hope to influence (e.g., at-risk community members) need to be active participants. If CHCWs are to be effective in shifting the lifestyle behaviors of community members, they will need knowledge but also skills in supporting behavior change that is relevant to their work. This is true whether that role allows for intensive individual or group counseling (and thus behavior change skills like goal setting, monitoring, motivating, and dealing with challenges in the social and physical community environment), changes in the environment (e.g., foods available in schools, setting up walking clubs) or broad determinants (e.g., influencing policy). The program needs to be structured around CHCW's needs and be flexible enough to help them deal with real-life barriers in their work in the community on an ongoing basis.

2.8 Relevance to Practice

Successful community-based training approaches to public health concerns have been addressed through coalitions of health professionals, academicians, community members, and practitioners (Baker *et al.*, 1998; Huang, 2002; Jenum *et al.*, 2006; Satterfield *et al.*, 2003). The training program was developed between a partnership of university-affiliated health professionals and trained peer educators. The social network was determined and facilitated the program (Anderson *et al.*, 2002; Larkey *et al.*, 1999; William *et al.*, 2001; Tessaro *et al.*, 2000). In order to identify problems of the target community, and tailor the training program for CHCWs, formative research was conducted in early phase of the

program (Williams *et al.*, 2001; Tessaro *et al.*, 2000). Members of community-based program have helped in defining the areas of interest, the specific content and format of materials, and process of dissemination (Baker *et al.*, 2002; Tregonning *et al.*, 2001; Wang & Chan, 2005).

The ultimate goal of the diabetes prevention education program is to support diabetes prevention in at risk populations. The objectives, as outlined on page four were to assess the short term outcomes and satisfaction within the training program. On-going research, beyond the scope of the current thesis, is assessing longer term knowledge and relevant community intervention activity of CHCWs in intervention versus control communities as well.

CHAPTER 3

Development of a Diabetes Prevention Education Program for Community Health Care Workers in Thailand: Formative Evaluation

3.1 Overview

Objective: To investigate barriers to and supports for implementing a diabetes prevention education program for community health care workers (CHCWs) in Chiang Mai province, Thailand. The study also aimed to get preliminary input into the design of a tailored diabetes prevention education program for CHCWs.

Methods: Health care professionals (n=12) were selected from health centers within one district participated in in-depth interviews. Also, community volunteers, screened as at-risk for diabetes, participated in interviews (n=8) and focus groups (n=4 groups, 23 participants). Coded transcripts from audio-taped interviews or focus groups were analyzed by hand and using NVivo software. Concept mapping illustrated findings.

Results: Health care professionals identified potential barriers to program success as motivation for regular participation, and lack of health policy support for program sustainability. Health care professionals identified opportunities to integrate health promotion/ disease prevention into CHCWs' duties. Health care professionals recommended small-group workshops, hands-on learning activities, case studies and video presentations that bring knowledge to practice within their cultural context. CHCWs should receive a credit for continuing study. Community volunteers lacked knowledge of nutrition, diabetes risk factors and resources to access health information. They desired two-way communication with CHCWs.

Conclusion: Formative research supports the need for an effective, sustainable program to

support knowledge translation to health care workers and at-risk populations in the communities they serve. Ultimately, this should support chronic disease prevention in Thailand.

Keywords: health promotion, community health care workers, diabetes prevention program, Thailand

3.2 Introduction

Thailand is a Southeast Asian country that has gone through rapid economic and nutritional change (Kim *et al.*, 2001). Its social and economic development over the past three decades has involved becoming more industrial and less agricultural (Kosulwat, 2002). In terms of nutrition, Thailand is a country in transition. It is encountering both under- and over-nutrition. Under-nutrition such as protein-energy malnutrition, vitamin A deficiency, iodine deficiency disorder, and iron deficiency anemia, have been decreasing and infectious diseases and non-communicable diseases, such as obesity, coronary heart disease, cancer, hypertension and diabetes mellitus have become leading causes of death and disability in Thailand (Wibulprasert, 2000). The prevalence of type 2 diabetes in adult in Thailand rose from 33.3 to 147.2 cases per 100,000 population between in 1985 and 1997 (Wibulprasert, 2000). Furthermore, the 1997 Health Examination Survey (National Health Foundation, 1998) revealed that out of the approximately 2.0 million Thai diabetics, only half knew that they had the disease. In Chiang Mai province, diabetes still is a public health problem. Moreover, the incidence of diabetes complications, e.g., foot problems, is worrisome (Rerkasem *et al.*, 2008).

The diabetes in Thai people has been linked to obesity, lifestyle changes, increased dietary fat intake, reduced fiber intake and physical inactivity (Kosulwat, 2002). Moreover, other factors such as low socioeconomic status, poor access to health care and the increased proportion of the population living in an urban environment (Pradeepa *et al.*, 2002) have been shown to affect health status and the increasing prevalence of diabetes in the population (Yusuf *et al.*, 2001). These modifiable risk factors for diabetes need to be the focus of prevention strategies (Haffner, 1998; Manson *et al.*, 1992).

The Thai Ministry of Public Health has developed and implemented a public health policy with the introduction of health promotion programs nationwide. Although particular health promotion programs, such as family planning or immunization services, have been successful, other such as for traffic accident prevention, smoking cessation, campaigns against liver cancer, or any chronic diseases prevention not been proved effective or sustainable (Lyttleton, 1996). In general, health promotion programs are only effective when health practitioners have to follow policy decisions or when it is financed by both government and non government organizations. (Wibulpolprasert, 2000). Some programs are also short term in practice because responsible health personnel have to turn their attention to new policies (Tassaniyom, 1997).

There is no research to guide the development of a community-based diabetes prevention program in Thailand. It may be that such an intensive program requires resources beyond the reach of most communities. The Thai health care system and its activity are not focused on diabetes prevention for the at-risk population. Health care providers are unaware of the need for diabetes prevention and of the positive outcomes of such programs. The objectives of the study were therefore to investigate barriers to and supports for

implementing a community-based diabetes prevention education program for CHCWs and to get preliminary input into program design from the perspectives of health care professionals and potential program recipients of Chiang-Mai province, Thailand.

3.3 Methods

The Office of Research Ethics at the University of Waterloo, Ontario, Canada; Mahidol University, Nakhon Pathom province, Thailand and the office of Disease Prevention and Control, Ministry of Public Health, Thailand granted permission to conduct the study.

3.3.1 Study setting

This phase of the study was conducted in San Sai district in Chiang Mai province, Thailand. San Sai district is a semi-urban area which is not far from the city of Chiang Mai (around 15 minutes by driving). People of the community are mainly laborers at factories or companies. The area has less than 50% agricultural households. The incidence of obesity and new cases of diabetic patients have been increasing over time (unpublished data from Mueng Va health care center, San Sai district, August, 2008).

3.3.2 Study design

The formative phase comprised 1) a-10 day observation at one health care center; 2) in-depth interviews with health care professionals; and 3) in-depth interviews and focus groups with people with diabetes risk factors.

3.3.2.1 Observation

The observation was conducted for 10 days during working time of health care staff at health care center (from 9.00AM-4.00PM). The purpose of the observation was to gather health care information and understand the diabetes prevention and health promotion situation at the community level information from the observations and informal talk with health care staff, were noted, such as the role of each health care staff member (3-4 staff), routine work, activities, and home visiting. The information was used to develop in-depth interview and focus group guidelines (**Appendix A**).

3.3.2.2 Health professionals

In-depth interviews were run for health care professionals (doctors and nurses) and CHCWs who worked at the health care centers. A purposive selection strategy was employed to identify key informant participants for in-depth interviews. The twelve health care professionals from San Sai district were all invited to participate in in-depth interviews.

An in-depth interview was run with health care professionals to explore the attitudes, awareness, and experiences towards diabetes prevention and related risk factors in the community. Interviews were used to gather information on demographics of participants, prominent health concerns, gaps in services, experience with current training, support service needs, and perceived support for an innovative training program suited for the Thai health care system.

3.3.2.3 At-risk people for diabetes

The in-depth interviews and focus groups of people with diabetes risk factors were conducted to understand their behaviors, beliefs, practices and knowledge of health promotion and disease prevention. A mix of approaches was used in case people might be

more forthcoming in an individual versus group setting. The desire was to select adult men and women who were at risk for diabetes but did not yet have diabetes based on Aekplakorn's criteria (2006). Purposive sampling involved four health care centers and their at-risk community members. Health care professionals and researchers worked together for at-risk member selection. The sample of at-risk community members from San Sai district was recruited from the diabetes screening database. Community members were systematically screened by health care staff at the community health care centers for eligibility via the diabetes risk score for Thais (Aekplakorn *et al.*, 2006). The risk factors for screening were age, sex, body mass index (BMI), waist circumference, hypertension and history of diabetes in a parent or sibling. Older individuals, males, those with higher BMI, waist circumference, and blood pressure and those with a few were at greater risk. A cut off point of the risk score for predicting high 5-year risk of diabetes in Thais was six (Aekplakorn *et al.*, 2006). A score below six indicates low risk of diabetes. All at-risk community members did not yet score as diabetic patients and did not take drugs to control their blood sugar. Of the potential 200 people in each center who would be at-risk, only enough people for one focus group (5-9) and two interviews were desired to get a sense of broad themes. The health care staff identified people known to the center who they felt would be able and willing to participate and would provide a broader perspective.

An initial contact with at-risk members was made through community health care centers. Community health care centers provided appointments. Thirty-five at-risk purposive selected volunteers participated in four focus groups, with 5 to 7 participants per group and eight participants (4 males, and 4 females) for in-depth interviews at four health care centers. They were contacted by invitation letter. The details of the study, objectives of interviewing

and consent letters were sent to the participants prior to the interview and focus group discussions (**Appendix B**).

The researchers explored the attitudes, beliefs, practices, gaps in health care service, barriers to and opportunities for health promotion with at-risk community members without diabetes towards the prevention of type 2 diabetes. Eight in-depth interviews and four focus groups were conducted with at-risk community members.

3.3.3 Data collection

Interview and focus group guidelines were developed from the health center observation to elicit information from participants. The interview guidelines were translated into both English and Thai language. Thai interview guidelines were discussed among provincial health care professionals prior to implementing. Minor changes were made to the interview guide to ensure that the questions worked in an open-ended format. The guidelines included an introduction that explained the purpose of the interview and requested permission to audiotape the interview (**Appendix B**).

A researcher (K.S.) and assistant together conducted all interviews and focus groups at health care centers in the communities. Interviews and focus groups averaged 50 minutes in length (range 40 to 60 minutes), and all were taped-recorded with the consent of the participants. Then, participants were asked a series of open-ended questions and encouraged to share their perspectives. All interviews and focus groups were conducted face to face in an informal manner. The interviews preceded the focus group in each community. The interviewer probed participants to obtain additional information on interesting topics that

emerged and to clarify ambiguous comments (Berg, 2001; Morse & Field, 1995). The research assistant took notes during the focus groups.

Each participant received an incentive gift and was personally thanked for his/her attendance. Refreshments were provided during the interviews and focus groups. The data were collected during September to December, 2007.

3.3.4 Data analysis

A team of Thai research assistants fluent in the local language transcribed in-depth interview and focus group discussions from audiotape. The data sources for the analysis were transcripts of interview tapes and a synthesis of the interviewers' debriefing notes made during the interviews/focus groups, including expanded summary notes made immediately following each interview/ focus group. A sample of four translations was independently checked for accuracy. Both the transcripts and field notes were organized by hand and using NVivo version 7 (QSR International Pty Ltd., 2006) and the content analyzed thematically by Sranacharoenpong K (Berg, 2001). A blended coding scheme was used, consistent with the pre-identified interview questions, and with the categories and themes emerging from the data during an initial process of open coding (Berg, 2001; Morse & Field, 1995). To increase reliability, the themes were confirmed by a second independent researcher (Jitnarin N) with MSc training and work experience in qualitative methods through the Institute of Nutrition, Mahidol University (INMU). She reviewed transcripts from two interviews (one professional, one community volunteer) and two focus groups. Only minor differences in interpretation were found and consensus acquired through discussion. Codes were

constructed based on frequency, intensity, clarity and consistency of participants' supporting statements. The units of analysis were sentences or phrases.

Themes and sub-themes were identified and inter-relationships depicted using concept maps (**Figures 3.1, 3.2**). The concept maps helped the researchers to understanding barriers, opportunities, and needs regarding diabetes prevention at the community level. The concept maps also helped to frame and inform the diabetes prevention education program for CHCWs.

3.4 Results

3.4.1 Participants

The average age of the professionals was 45 years old and 83 % of them had more than 10 years of work experience in public health (**Table 3.1**).

Table 3.1: General information of professionals for in-depth interviews (N = 12)

Male (n, (%)).....	2 (17)
Female (n, (%)).....	10 (83)
Education (n, (%))	
- Less than Bachelor degree.....	3 (25)
- Bachelor degree.....	9 (75)
Occupation (n, (%))	
- Doctor.....	2 (17)
- Nurses.....	5 (41.5)
- Public health staff.....	5 (41.5)
Age, years (Mean \pm SD).....	44.5 \pm 3.48
Work experience, year (n, (%))	
- Less than 10 years.....	2 (17)
- More than 10 years.....	10 (83)

Thirty-one at-risk community members (participation rate = 89%) participated in interview (n = 8) and focus groups (n = 4 groups, 23 participants) (**Table 3.2**). The average age was 52 years and 84% of them had graduated from grade 4 level. Half of them were

laborers in this semi-urban community. Those selected had average diabetes risk scores of 11. More than 80 % of them had a family history of type 2 diabetes.

Table 3.2: General information of at-risk population (N = 31)

Male (n, (%)).....	14 (45)
Female (n, (%)).....	17 (55)
Education (n, (%))	
- Grade 4.....	26 (84)
- More than grade 4.....	5 (16)
Occupation (n, (%))	
- Agriculture.....	8 (26)
- Laborer.....	14 (45)
- Own business.....	4 (13)
- Government staff.....	1 (3)
- House wife.....	4 (13)
Age, years (mean \pm SD).....	52.2 \pm 5.6
BMI	
- Overweight (≥ 23 - ≤ 27.5) (n, (%))*.....	14 (45)
- Obesity (≥ 27.5) (n, (%)).....	10 (32)
Waist Circumference	
- Male (≥ 90 cm.).....	4 (13)
- Female (≥ 80 cm.).....	13 (42)
Hypertension (n, (%)).....	22 (71)
Family history of type 2 diabetes (n, (%)).....	25 (81)
Diabetes risk score	
- median (min, max).....	11 (6, 17)
- mean \pm SD	11.35 \pm 2.76

* WHO expert consultation (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet, 157-163.

Thematic analysis of the transcripts from the combined interviews and focus groups from both the health care professionals and at-risk community participants yielded a range of input that are captured in the hurricane diagram (**Figure 3.1**). The findings of health care professionals and at-risk community members overlapped and were interrelated.

The following sections are narrative of the findings. Figure 3.2 shows a concept map that identifies major themes and positions them in a modified strengths, weaknesses,

opportunities, and threats / barriers (SWOT) analysis for a diabetes prevention education program for CHCWs in Chiang Mai province, Thailand.

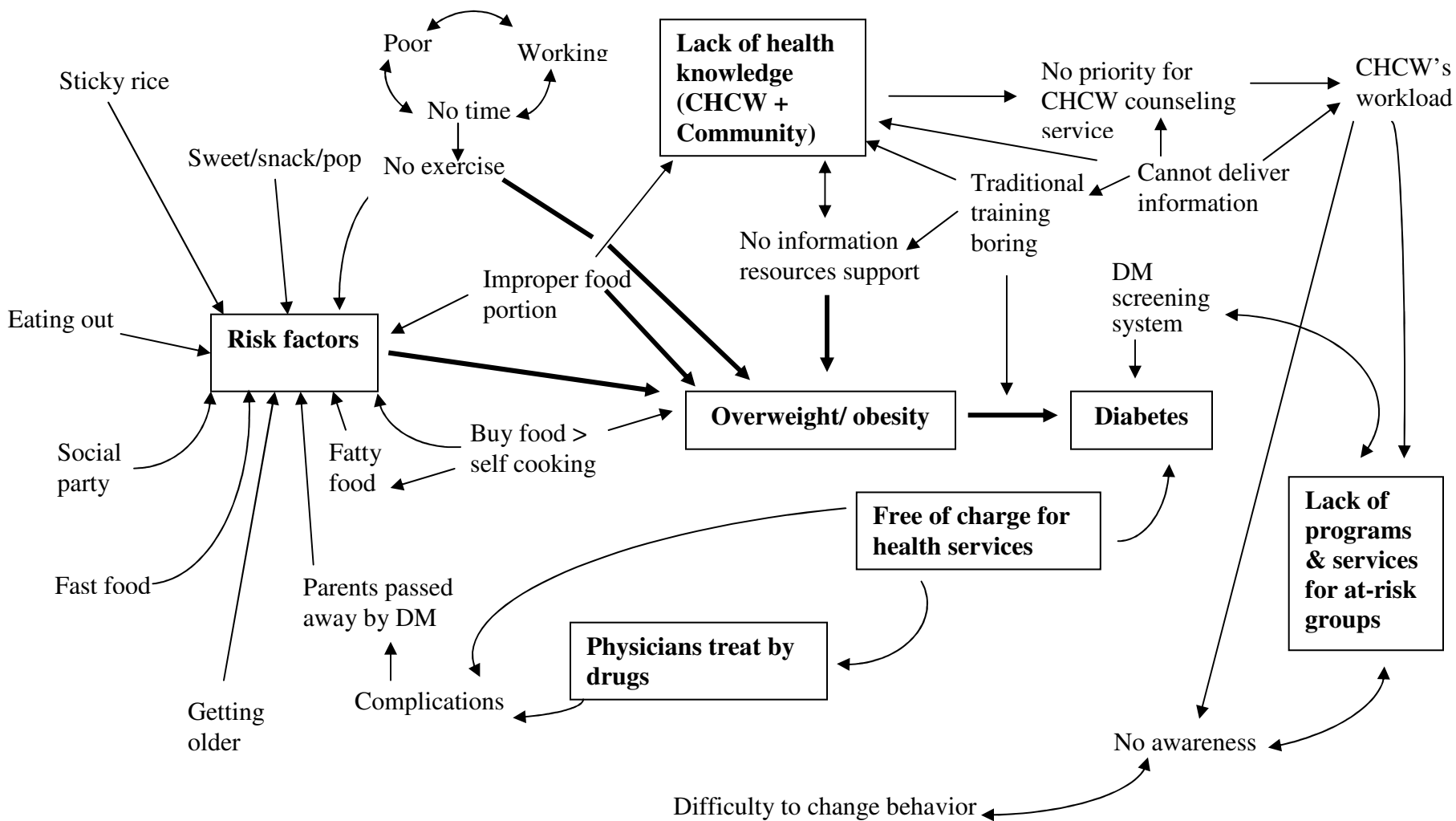


Figure 3.1: Hurricane diagram generated from input from health care professionals, CHCWs and at-risk community people

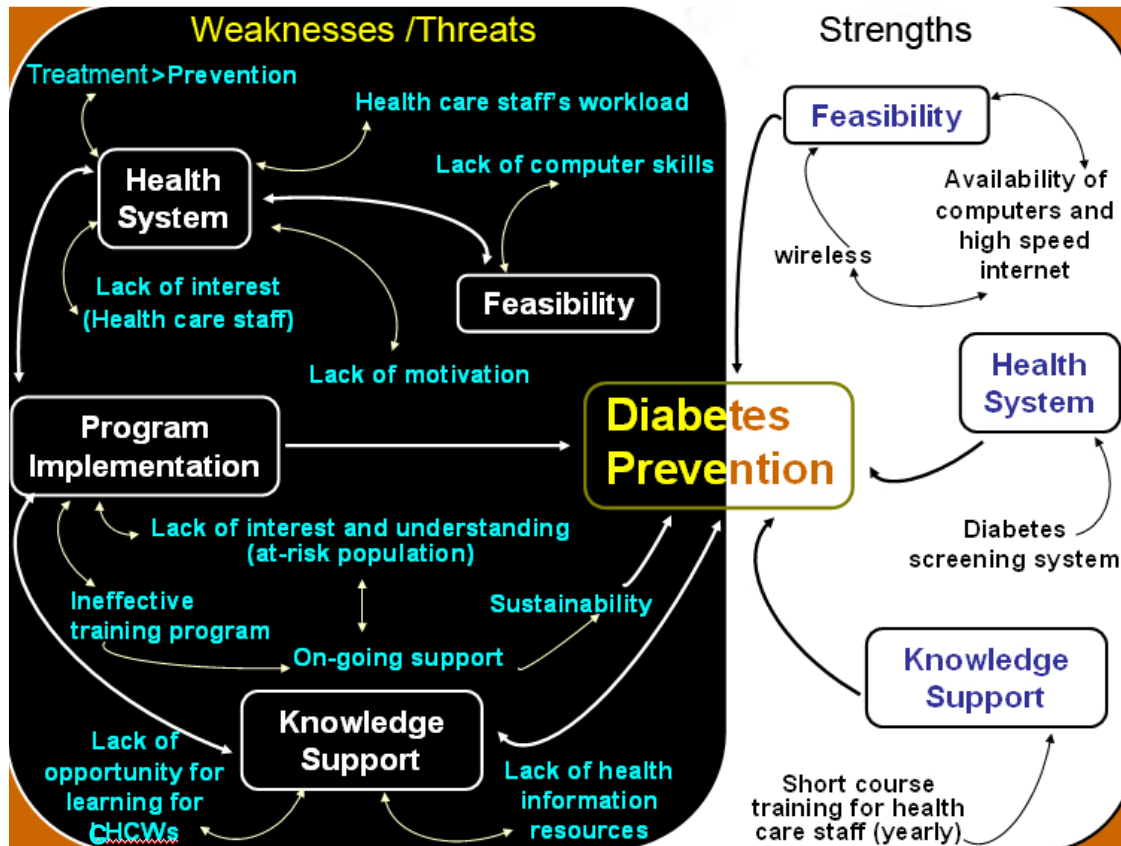


Figure 3.2: A concept map of barriers to and support for a diabetes prevention education program for CHCWs in Chiang Mai province, Thailand

3.4.2 Health care system

The concept of diabetes prevention and health promotion had not yet been a concern in the health care system even though the diabetes prevalence in Chiang Mai province has been increasing over time. Health professionals have had many responsibilities, focusing on treatment and their routine screening reports. They agreed that their work load did not allow them much time to focus on people with diabetes risk factors even though they have annual screening for risk factors. All health professionals agreed that they did not take any actions when they knew who at-risk people with diabetes are. They were focused on new diabetes patients and treatment. One nurse mentioned:

“I think it is hard to educate people to take care of themselves because the government provides free of charge medicine.” (In-depth interview health care staff # 5).

Screening for diabetes and other risk factors of chronic diseases are routine work for CHCWs and staff at the health care centers. They normally monitor once a year. CHCWs and staff screened for factors affecting diabetes according to a standard format from the Ministry of Public Health (MOPH), Thailand. The minimum rate of screening was 60% of the total population aged more than 35 years reported to the MOPH annually. This activity has been included in the national health promotion policy of Thailand for the last five years. Unfortunately, the ministry has only service support for patients with diabetes and chronic diseases. At-risk members with diabetes have no activities to help them concerning the disease. Community volunteers mentioned that they did not understand the screening, including the meaning of some of the factors and the normal range of their screening data. CHCWs and staff did not explain in more detail to the at-risk community members because of time constraints when they did the screening. Health care staff described that:

“Yes, we have screening for diabetes with all people, aged 35 years old, but diabetes patients are increasing every day, I don’t know how to prevent this problem.” (In-depth interview health care staff # 3).

3.4.3 Knowledge support

Lack of learning opportunities for CHCWs and lack of health information resources for both CHCWs and members of the public came out clearly under the “knowledge support”

theme. Although the MOPH and provincial hospitals provided many training courses a year, some of the health care staff have no opportunity to attend the training. When we asked about training on diabetes prevention respondents said, the provincial hospital provided some lectures to health care staff, e.g., a one day symposium made up of traditional lectures. A recurring theme was that CHCWs at the health care centers had received limited education and support on health promotion and type 2 diabetes prevention. They felt that not only did their information/ knowledge provide them with an inadequate understanding and skill base, but also that it failed to prepare them for working with at-risk persons with chronic diseases including diabetes in the communities. One participant made this statement:

“the hospitals set training for us at least one time a year...I don’t like the training...I fall sleep almost the day. Nothing is new.” (In-depth interview health care staff # 12).

“Speakers talk a lot and I have no chance to ask or contact them when I didn’t understand. I fear to ask them in the room. There are many various staff from many districts. My question may be stupid to ask in the public.” (In-depth interview health care staff (nurse) # 2).

Health care professionals were asked how they found/accessed information when they needed more knowledge about health, disease prevention, nutrition, and diet-related disease. They mentioned that they received some support materials from the center/district hospitals. Some pamphlets, books, guidelines, and posters were delivered by or requested from the health offices in the province. However, some materials took long time to arrive. A participant commented:

“Well, we got materials supported from the health office in Chiang Mai, but they came when we didn’t need it and some information were not fit for us” (In-depth interview health care staff # 6).

CHCWs appeared to have a general knowledge that obesity, diet, and exercise are all related to developing diabetes, and some changes in lifestyle behaviors could help prevent diabetes. CHCWs often identified categories of healthy factors, but they required prompting to describe specific factors with these categories, such as avoiding sweet, salty and oily foods. They spoke broadly about nutrition, physical activities and possibly spirituality as influencing health.

“I tell people got risk factors for diabetes avoiding salt, sweet, and fat food....especially sticky rice (a staple food for the north people), it will increase their blood sugar. I don’t know why sticky rice can cause.” (In-depth interview health care staff # 4).

“Thai Flag Food Based Dietary Guidelines....I have ever seen as I remember they suggested eating a lot of vegetables and meats” (Focus group with at-risk community members, group # 4).

When asked about the potential for technology as a health information resource, CHCWs responded that they seldom searched for information of the Internet. Some of them had searched for nutrition information and about diet-related diseases. They, however, were not sure of the truthfulness of information sources. All of them did not prefer to search and read information in the English language. As they stated;

“I think to make my own posters about diet and diabetes prevention, so I use the Google for searching. If these information look good, I copy them.” (In-depth interview health care staff # 1).

3.4.4 Feasibility of a diabetes prevention education program for CHCWs

Computer skill of CHCWs emerged as a potential problem although computer is not a new technology in Thailand. All health care centers at the sub-district level have computers, hi-speed internet access and/or wireless. Health care staff have only basic computer skill. Some of them have no individual e-mail addresses, do not understand about learning technology, or any key words related to computer, for example, MSN, upload-download, Chat room, SKYPE and conference call. Most of health professionals who were more than 40 years of age felt that using computers was a difficult skill for them. If they needed to start to learn, they need more time and step by step support from an instructor. However, they did want, not only to know how the computer can work, but also they did want to practice. Hence, health professionals, including CHCWs, wanted to learn to use new technology and were open to the use of learning technology in a training program to support their work and to prevent diabetes for at-risk people.

“I seldom used computer to send e-mail. I have an assistant... Anong (her assistant's name) can help me any things about computer. She is a technology girl.” (In-depth interview health care staff # 6).

“No, I don't know how to chat. I just saw the chat icon, but I don't know how to use it. I have no time to chat.” (In-depth interview health care staff # 3).

3.4.5 Diabetes prevention program implementation

A barrier to prevent chronic disease with at-risk community members was lack of interest, motivation and understanding of disease prevention. One main reason is the Thai health policy and health care system because the government provides, free of charge, any medicine for all, even though they set health promotion as one of the policies (see health system theme).

At-risk community members did not feel concerned about food, nutrition and exercise. They mentioned that knowledge of nutrition, diet related diseases and diabetes was generally provided by relative's experience, friends, health care staff at the provincial hospitals and media. Most participants recognized that personal lifestyle choices including diet (especially sugar, salt and fat), excess bodyweight, and physical inactivity contributed to the development of diabetes. They saw that the condition was at least partially preventable through lifestyle change. Some believed that sticky rice, a staple food of the northern Thai people, could cause diabetes. They did not understand an appropriate portion size of foods in each food group as recommended by Thai Flag Food Based Dietary Guidelines (Sirichakwal & Sranacharoenpong, 2008).

“When I go to the hospital, nurses tell me how many portions of rice that I should eat, but I do not understand. When I want to ask more information, nurse cannot tell me and they have no time to chat.” (Focus group with at-risk community members, group #1).

“I do not understand how many portion sizes of rice that I should eat per day, no one tell me.” (In-depth interview at-risk community member # 4).

“Yes, I know that I should avoid sweet, salty and fatty food, but it is yummy.” (In-depth interview at-risk community member # 5).

“ Last year, we set an aerobic club and met three times a week at health care center....now, I don’t know what is going on.” “We are laborers and work every day why we need to have an aerobic club.” (Focus group with at-risk community members, group # 2).

Participants suggested suitable types of implementation programs for them that can integrate with the ways of their life in the community. Their statements included, “We do need an exercise program or other methods that we can know we are fit and healthy,” “We want a health staff that can tell there are foods we should eat and foods we shouldn’t eat,” and “Set this program from a small group of people interested.”

Health care professionals mentioned that a variety of health training programs, such as HIV/AIDS, tuberculosis, and accident prevention that were available but were ineffective. Training programs on diabetes are offered on a service basis to reinforce knowledge for health care staff every year by the MOPH and provincial hospitals. Health care professionals and some CHCWs attend the intensive training program at least one time a year. The format of this training was similar to previous training, for example, a one day meeting at a hotel with speakers and their presentations or a small group workshop, not on-going support and any contacts between speakers and participants.

“In late every September, the ending of annual budget report, we have a lot of training program that want us to participate. Well, it is good if the training organizers can prepare effective training programs. I feel waste time and budget compared with the quality of knowledge I get from the training.” (In-depth interview health care staff # 12).

After health care staff were supported through training by the MOPH or provincial hospitals each year, they were expected to deliver knowledge or apply knowledge with people in their communities through “diabetes education camps” consisting of lectures and

demonstrations. However, they did not do this as part of their regular work because of time constraints, budget, knowledge support, and lack of interest of target people.

3.4.6 A tailored diabetes prevention program

Other important themes revealed from the formative research were used to inform overall diabetes education program development. Some health care professional and CHCWs appeared to lack basic knowledge regarding health and healthy eating, and understanding of risk factor related to diabetes. When the researcher interviewed health care professionals about the format of training that can support CHCW work, they recommended small-group workshops, hands-on learning activities, case studies and video presentations that bring knowledge to practice within their cultural context. They also informed the researcher that Thai translation of the training materials was important. In the same way, community volunteers lacked knowledge of nutrition, diabetes risk factors and resources to access health information. When they visited the hospitals or health care centers, they desired two-way communication with CHCWs. When the researcher asked what needed to be in place for the program to be successful, some health care professionals suggested that the researchers might pay for CHCWs' time and contributions. However, others suggested that CHCWs should receive a credit for continuing study.

3.5 Discussion

This research study brought together information from community health care professionals, at-risk community members with diabetes risk factors and university researchers to investigate the potential barriers and supports to implementing a training program for CHCWs in the semi-urban areas in Chiang Mai province, Thailand. This study

explored via interview and focus groups the perspectives of health care professionals, CHCWs, and community members with diabetes risk factors. The findings were important and, based on data saturation, suggested that these reflect the dominant concerns of participants about diabetes prevention and the need for education. The interviews and focus group discussions generated a picture of diabetes prevention in Thailand and the potential for programs to support the continuing education of CHCWs and in turn the public. The study revealed four main barriers and three supports for a diabetes prevention education program for CHCWs. Together, these suggest an opportunity to build on strengths and overcome weaknesses. The incidence and prevalence of diabetes patients in Chiang Mai province has been increased over time. It seems critical that CHCWs' education about disease prevention and health promotion must be addressed. CHCWs expressed lack of knowledge and confidence in their ability to provide relevant advice on lifestyle.

Moreover, the results can serve as a guide for the learning approach, materials, and course curriculum that will support successful implementation. Diabetes prevention education programs delivered in community gathering places may reach CHCWs who have not been normally received health information/ education. The use of appropriate learning approaches that serve CHCWs' needs may increase the relevance and acceptance of the program.

One program to develop health technology assessment (Corabian *et al.*, 2005) recommended working with key stakeholders to identify actionable steps by a Strength, Weakness, Opportunity, and Threats analysis. Indeed, effective interventions assess the community strengths, prioritize area of need, and develop interventions that use community strengths (Baker & Brownson, 1998). This study found opportunities that will benefit

program implementation. Technology and computers are widely used at the health care centers at the community level. Technology can facilitate the development of tailored health education materials that have been proven to be more effective than general health education materials elsewhere (Brug *et al.*, 1999; Matthew *et al.*, 2000). Tailored health education materials were changed health-related behaviors in individuals such as smoking, diet, physical activity, cancer and cholesterol screening, and can enhance participation in health promotion programs (Brennan *et al.*, 1998; Brug *et al.*, 1996, 1998; Prochaska *et al.*, 1993; Skinner *et al.*, 1994). Furthermore, tailored materials can be applied specifically to participants (Brug *et al.*, 1996, 1998; Kreuter, 1997). Tailored materials may overcome the “barrier” of the annual lecture-based approach to health promotion education that was identified through this study.

Clearly, at this point in time in Thailand, the health policy and infrastructure support for CHCW health promotion education is not in place. It is the hope that the strong formative research conducted through this thesis can be used to demonstrate the feasibility and effectiveness of a diabetes prevention education program for CHCWs. It may then be possible to better support the CHCWs, for example, through credit from the nursing council and faculty of nursing, Mahidol University for the course and for support of CHCW health promotion education through MOPH policy and provision of paid CHCW time for training.

Consulting and engaging people within their unique context are critical for the successful implementation of programs (Potvin *et al.*, 2005). Broad consultation was used in the development of the program, based on the recognition that stakeholders are more likely to accept a program if they, or colleagues they respect, have been a part of the development phase. Successful community-based approaches to public health concerns have been

addressed through coalitions of community members, academicians, and practitioners (Baker & Brownson, 1998). Moreover, local relevance is a key component of any program. Our process was built on the experience of Baker and colleagues (2002) in which members of community-based programs, including health professionals, and program participants helped in defining the areas of interest, the specific content, and the process of dissemination.

3.6 Competing interests

The authors declare that they do not have any competing interests.

3.7 Authors contributions

Sranacharoenpong K wrote the manuscript based on KS's PhD thesis. Hanning RH is the supervisor. Jitnarin N reviewed the transcripts and thematic analysis. All authors read, provided feedback, and approved the final manuscript.

3.8 Acknowledgements

This research was supported by the grants from the Nestlé Foundation, Switzerland. The authors acknowledge the team staff of the health care offices at six districts where are Hangdong, Maetang, Sankampang, Sanpatong, Sansai, and Saraphe in Chiang Mai province in Thailand. The authors particularly thank for Dr. Saowanee Wiboolsanti, Ms. Nittaya Rawangpan, and team staff of The Office of Disease Prevention and Control 10 Chiang Mai province, Ministry of Public Health for their facilities and hospitality.

CHAPTER 3: Addendum

Formative Evaluation with At-risk Community Members Supports the Need for a Diabetes Prevention Education Program for Community Health Care Workers

3.1-A Introduction

A component of the formative evaluation for the diabetes prevention education program for CHCWs, which was not included in the draft chapter 3 manuscript, was a study of at-risk community members in Chiang Mai province. There have been few studies in developing countries that have shown successful intervention in improving awareness and lifestyle at the community level. Health education of CHCWs is one part of a strategy to prevent type 2 diabetes, with the assumption that the learning will be disseminated at the community level. It was therefore important to understand needs from the perspective of community stakeholders and conduct a baseline assessment. The purpose of this formative assessment of 987 community members, who were at-risk for diabetes based on community diabetes screening results, was to identify their current 1) knowledge of type 2 diabetes, 2) knowledge of nutrition and awareness, and 3) understanding of key words related to healthy eating. Assessment will be repeated in the same people, nine months following the completion of the CHCW education program to assess changes in intervention versus control communities.

3.2-A Methods and results

The methods and preliminary results are presented in Appendix C.

3.3-A Discussion

The results of the baseline community assessment show that community members who were, for the most part, at risk for diabetes had poor knowledge or understanding of type 2 diabetes risk factors, understanding of nutritional knowledge, and understanding of healthy eating key words.

Since CHCWs are one of the main sources of information reported by these individuals, the findings add further support to the need for a diabetes prevention education program for CHCWs. The findings further indentify areas of confusion regarding diabetes and nutrition concepts that CHCWs can potentially clarify. The findings also direct CHCWs to potential media and other sources for disseminating their health information.

CHAPTER 4

Design of a Diabetes Prevention Education Program for Community Health Care Workers in Thailand: From Theory to Practice

4.1 Overview

Objective: The objective of this paper was to describe the design of a community-based program to facilitate the learning and skill development of community health care workers (CHCWs) in Thailand regarding prevention of type 2 diabetes.

Methods: The diabetes prevention education program was developed based on formative evaluation and a theoretical framework to support learning achievement. Learning approaches that were incorporated included: problem-based case studies, reflection, building on prior knowledge, skill development, and self assessment. Pretesting of some materials used for the program was administered as a paper survey with 20 volunteer health workers from one district in Chiang Mai province.

Results: Learning objectives, tasks, approaches and materials were developed for a 4-month program that involved in-class discussion and online support through the E-learning website (www.FitThai.org). The program included information and resources related to type 2 diabetes prevention for CHCWs to apply with at-risk populations in their communities. Pretesting of materials (e.g., newsletter and lecture video) yielded a high level of acceptability. Respondents also felt that the sample video- taped lecture was helpful for them to teach at-risk people (65%). However, participants suggested that the font size for newsletter was small (55%).

Conclusions: An innovative diabetes prevention education program was designed for Thai CHCWs. The training program is an opportunity for CHCWs to expand their knowledge of

diabetes prevention by using varied learning approaches. The ultimate goal of the training is to prevent type 2 diabetes and its risk factors for people in Thailand.

Keywords: Learning approach, Diabetes prevention education program, Community health care worker, Thailand.

4.2 Introduction

Thailand has faced under-nutrition and yet, paradoxically, the prevalence of diseases of over-nutrition, such as obesity and diabetes, has escalated (Tontisirin & Winichagoon, 1999; Winichagoon, 2002; Smitasiri & Chotiboriboon, 2003). Some strategies have been promoted as means to prevent the development of diabetes (Manson *et al.*, 1992; Haffner, 1998) or complications for those who are already obese or have diabetes (Swinburn & Egger, 2002; Schulz *et al.*, 2005). One approach to alleviating the chronic disease burden is to expand knowledge at the community level. Sustained community education by community health care workers (CHCWs) is one approach as these workers have a unique ability to serve as “bridges” between community members and the health care system (Satterfield *et al.*, 2002).

Health training programs have been available for health care staff and CHCWs in Thailand for topics such as, infection control, advanced cardiac life support, and HIV/AIDS prevention (Boonmak *et al.*, 2004; Picheansatian *et al.*, 2005). These have been organized regularly every year by the Ministry of Public Health, provincial hospitals, and universities to reinforce knowledge and increase CHCWs’ ability to provide quality of care (Wacharasin & Theinpichet, 2008). Recently, short symposia relating to diabetes have been added. The

traditional approach to training in Thailand has been a teacher driven didactic approach. A problem of the traditional approach to learning was not only that students lacked motivation and engagement in mastering the foundational knowledge/information, but also that they had difficulty remembering and understanding (Anantaphruti, *et al.*, 2008; Winangnon, *et.al.*, 2007). Students have felt unprepared to adapt the information for community application.

The objective of the current program was to facilitate the learning and skill development of CHCWs about community-based prevention of type 2 diabetes. The course curriculum was designed to prepare CHCWs with a strong background to support activities aimed at prevention of diabetes for at-risk people, e.g., those who are overweight or obese. In addition, it supported the role of CHCWs as communicators at the community level through skill development and resource templates. This paper describes the design of the diabetes prevention education program for CHCWs from theory to practice.

4.3 Theoretical background and framework for the diabetes prevention education program

To help foster the role of CHCWs as change agents and effectively integrate their work into the health system, a thorough review of learning theory was conducted to define a framework for the curriculum development. The diabetes prevention education program was developed based on a model known to support learning achievement, the “Design for learning process (D4L)” (Richards, 2007) (**Figure 4.1**). The program was also designed to bridge the gap of traditional methods of training. The course would include foundational knowledge/ information about diabetes prevention (Mensing *et al.*, 2006) that was necessary for learners to remember and understand. Once the learners can remember and understand,

teachers hope that they can move on to the higher skills of learning, such as applying, analyzing, evaluating and creating (Forehand, 2005). The learning process placed the learners within a supportive environment that motivated them by engaging them in higher level applications as a way of mastering each set of competencies.

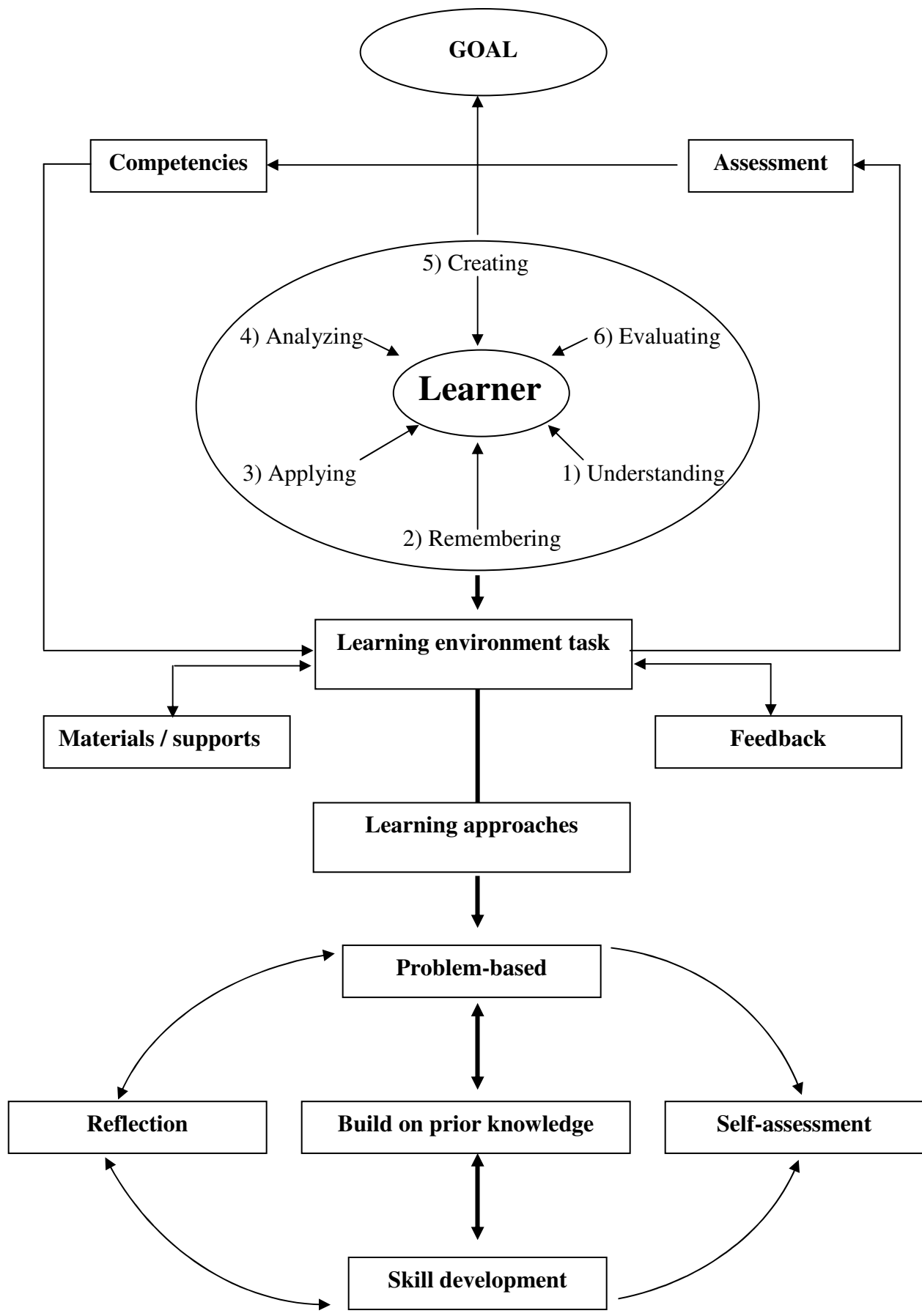


Figure 4.1: Framework of achievement learning (Applied from D4L, Richards, 2007)

Teaching adults has moved away from “educating” toward “facilitating” learning (Edmunds *et al.*, 2002). An underlying premise is that students learn better through opportunities for interaction, feedback, reflection and active application of concepts (Salter *et al.*, 2004). Optimal outcomes in adult learning have been achieved through engaging learners and creating a fun environment. By extension, the diabetes education prevention program for CHCWs applied these adult learning approaches to help the participants integrate new information (Blackburn, 2005). Specifically, five learning principles that respect the roles, skills and contributions of the community CHCWs were selected to guide the development: problem-based case study, reflection, building on prior knowledge, skill development through practice, and self assessment.

The teaching method for the CHCWs allowed learners to express their opinions, to discuss among peers, to challenge new learning concepts, and to respect opinions of others. Students learned from the life-experience perceptions of others. In planning the course, it was recognized that social support may also have considerable effects on learning. It was also recognized that physical limitations, such as changes in vision, response time to stimuli, memory, and energy level may all affect learning, especially learning new computer skills and technology. Opportunities for interaction and feedback were important for creating a good learning environment for the students.

4.4 Process

The Office of Research Ethics at the University of Waterloo, Ontario, Canada; Mahidol University, Nakhon Pathom province, Thailand and the office of Disease Prevention and Control, Ministry of Public Health, Thailand granted permission to conduct the study.

4.4.1 Course overview

The training course was developed based on formative research that was conducted by Sranacharoenpong K in Chiang Mai province in 2007 and involved stakeholders representing health care professionals, nurses, CHCWs, and at-risk community people in Chiang Mai province (see Chapter 3). The curriculum targeted CHCWs who worked in their communities with populations at-risk with diabetes and those who had public health background (Love *et al.*, 1997; Lorig *et al.*, 1999; Vinicor, 1999). The curriculum was also developed closely with professors at the University of Waterloo, Canada, two professors at the Institute of Nutrition, Mahidol University, Thailand, and health care professors in Chiang Mai province in Thailand.

The diabetes education prevention training course was designed initially for CHCWs in Chiang Mai province, Thailand. It was to facilitate the learning and skill development of CHCWs about community-based prevention of type 2 diabetes. This training course served as a basis of health education for workers; however, it was also encompass key health messages for the population about diet, physical activity, and risk factors of type 2 diabetes. The key components of the proposed program content were: Diabetes and Lifestyle, Nutrition, and Fitness.

4.4.2 Learning objectives

The diabetes education prevention program consisted of eight modules. By the time CHCWs had completed the diabetes education prevention training, they should have attained the learning objectives outlined in **Table 4.1**.

Table 4.1: Learning objectives

Module	Topic	Learning objectives: By the end of the module
1	Introduction and overview of the training program and pre-test	<p>1. Prior Learning Assessment: Participants will have completed a baseline evaluation designed to test their knowledge of key diabetes-related concepts. They will have discussed their confidence in performing specific activities/skills related to diabetes prevention/ public health programming in their communities.</p> <p>2. Participants will identify their personal goals for participation. They will also identify specific learning priorities and interests through ranking various curriculum sub-topics, skills and other course components. They will identify if they already feel that they have sufficient knowledge or skill in any of these areas.</p> <p>3. Participants will be aware of the overall course objectives, curriculum and expectations for participation and evaluation. They will have received a binder with written documentation of the course objectives and curriculum.</p> <p>4. Participants will gain familiarity with some of the approaches that will be used in class, e.g., small group activities, sharing and discussion.</p> <p>5. By the end of the post-class: Module 1 assignment, participants will have demonstrated that they know how to log on to the course web site, access materials, submit assignments and use web-based communication strategies.</p>
2	The role of the CHCWs to prevent diabetes, community awareness and promotion and evaluation	<p>1. Participants will be able to use local survey data to identify specific sub-populations at increased or decreased risk for type 2 diabetes.</p> <p>2. Participants will be able to accurately measure height, weight and waist circumference. They will appraise values against recognized criteria.</p> <p>3. Participants will be able to examine a one- day dietary record and modify the foods to reflect dietary recommendations for healthy eating.</p> <p>4. Participants will be able to examine a food frequently questionnaire to understand dietary food patterns of at-risk population members.</p>
3/4	An overview of the good healthy eating guide based on Thai food based dietary guidelines	<p>1. Participants will identify the components of a healthy diet; an overview of the good healthy eating guide (Thai FBDGs), an explanation of five food groups concept and their impacts on body weight and diabetes.</p> <p>2. Participants will describe the benefits of healthy eating and identify factors influencing eating habits. They will also identify strategies to overcome barriers/support healthy eating in their communities.</p>

Module	Topic	Learning objectives: By the end of the module
3/4	(cont')	<p>3. Participants will be able to instruct groups on healthy portion sizes for each food group.</p> <p>4. Participants will gain familiarity with the design and implementation of some community learning resources (e.g., eating tips, menu planning) that will be demonstrated in the class.</p> <p>5. Participants will gain familiarity with some of the learning objects; a flexible meal planning tool to educate individuals and groups about improving eating habits that will be demonstrated in the class.</p> <p>6. Participants will gain familiarity with adapting existing resources for education (e.g., menu planning) to the local context, e.g., local foods, northern Thai foods</p>
5/6	Food products / supplements, nutrition labeling and social food	<p>1. Participants will be able to understand the importance and necessity of some food products/supplements.</p> <p>2. Participants will be able to read and explain the importance nutritional labeling and the meaning of key messages of the labeling.</p> <p>3. Participants will be able to understand social factors that might affect at-risk people's health, e.g., party/social food and local food when they have special events in their community.</p>
7	An overview of benefits and barriers to physical activity and tips to stay active	<p>1. Participants will be able to discuss barriers to physical activity. Participants will be able to describe the benefits of being active, physical activity guidelines, tips on how to get active and strategies to stay active.</p> <p>2. Participants will be able to discuss and identify ways to cue physical activity (e.g., post an activity graph, physical activity resources)</p> <p>3. Participants will be able to recommend physical activities that may be done at home.</p> <p>4. Participants will identify ways to motivate at-risk populations.</p>
8	Encouraging and supporting participants in the future for their responsibilities and post-test	<p>1. Participants will have reviewed all modules and had their questions answered.</p> <p>2. Participants will feel more confident in working with communities to prevent type 2.</p>

4.4.3 Learning approaches

Learning objectives were clearly identified with the aims of CHCW gain in knowledge and skills. Learning environment tasks, learning approaches, and materials/supports were determined (**Table 4.2**). Learning approaches were applied for each module and learning objective. These five principles were problem-based, reflection, building on prior knowledge, skill development, and self assessment.

Problem-based: The problem-based approach was designed to motivate students by engaging them in the application of information and fostering their skill in problem solving. The diabetes prevention education program was based on problems or cases that are of interest to students and related to real situations. The problem of food portion size estimation was an example using the problem-based learning approach. CHCWs mentioned their real problems of estimating food portion size, e.g., when people asked them how many portions of rice are appropriate for a woman, aged 45 years old who worked at a garment factory in Chiang Mai province.

An online quiz of food portion estimation was provided, that learners were encouraged to finish before the discussion section in the class. Learners brought difficult issues of food recording and unclear points regarding local food portions to discuss in the class. Learners could learn to simply estimate energy intake based on Thai Food Based Dietary Guidelines.

Reflection: Reflection is a process that challenges students to use critical thinking to examine presented information and processes and draw conclusions based on the resulting ideas (Ewell, 1997). Effective learning situations require time for thinking. Students also reflect on themselves as learners when they evaluate the thinking processes they used to

determine which strategies worked best. They can then apply that information about how they learned as they approach learning in the future.

When students learned food portion estimation for each food group, they had to record a three-day dietary record of themselves and for a person at-risk for diabetes. They reflected on how challenging it is to follow healthy eating guidelines.

Building on prior knowledge: Learners learn more effectively when they already know something about a content area and when concepts in those areas have meaning to them and to their particular background and culture (Kujawa & Huske, 1995). Building on prior knowledge was an approach used to link new knowledge and prior knowledge and everyday experiences.

CHCWs learned and remembered new information about diabetes risk scoring when it was linked to their relevant prior knowledge of diabetes screening, which is part of their regular responsibility. In the class, activities built on CHCWs' familiarity with diabetes screening data and enabled CHCWs to connect to the new knowledge of diabetes risk score and its application.

Skill development: The training program intervened at several levels of the learning process to help CHCWs develop their learning and health promotion skills. The training program incorporated skill development in class and provided opportunities to practice learning skills in the community context through assignments. For example, weight, height, and waist circumference measurements were practiced in the class after students had reviewed and discussed related information. In addition, the training used interactive technology to support CHCWs' learning. Their computer skills were practiced along all sections of the training program. CHCWs learned to access and use the E-learning website.

Self-assessment: Self-assessment was also used to support CHCWs' learning. The self-assessment enabled CHCWs to monitor their progress related to the learning process and their individual needs. For example, the training program included sets of multiple choice questions for CHCWs to reinforce their content knowledge after they had finished in-class discussions. CHCWs could compare their responses with correct answers.

4.4.4 Contents

The national standards for diabetes education were incorporated, as relevant (Mensing *et al.*, 2006). The academic content of the course was based on accepted concepts of diabetes risk, healthy eating, and activity (e.g., Thai FBDGs) (Sirichakwkal & Sranacharoenpong, 2008) and was reviewed with faculty from the Institute of Nutrition, Mahidol University, Thailand, and University of Waterloo, Canada (**Appendix D**).

Table 4.2: Example of learning objectives, learning environment tasks, learning principles, and materials / supports

<p>Learning objectives- By the end of the course</p>	<p>Learning environment tasks</p>	<p>Learning approaches</p>	<p>Materials/ Supports</p>
<p>1. Participants will be able to use local survey data to identify specific sub-populations at increased or decreased risk for type 2 diabetes.</p>	<ul style="list-style-type: none"> - Participants discussed risk factors of diabetes that were found in their communities. - Participants understood Thai diabetes risk score and could use it correctly. 	<ul style="list-style-type: none"> - Problem-based - Build on prior knowledge 	<ul style="list-style-type: none"> - Video clip of diabetes risk factors - Each CHCWs screening data - Diabetes risk score calculation form and interpretations - Monthly newsletter
<p>2. Participants will be able to accurately measure height, weight and waist circumference and interpret values against recognized criteria.</p>	<ul style="list-style-type: none"> - Participants discussed problem-based case related to weight, height, BMI, and waist circumference. - Participants practiced measuring weight, height, and waist circumference correctly. 	<ul style="list-style-type: none"> - Problem-based - Skill development through practices 	<ul style="list-style-type: none"> - Case study on the website - Lecture notes - Power Point with lecture audio - BMI ruler for interpretation - BMI calculation form - Monthly newsletter
<p>3. Participants will be able to examine three day dietary records (short form) and modify the foods to reflect dietary recommendations for healthy eating.</p>	<ul style="list-style-type: none"> - Participants discussed foods, appropriate energy, protein, fat, and carbohydrate for different age groups, energy needs and gender. - Participants recorded three day dietary intakes with an at-risk member. (Appendix D) 	<ul style="list-style-type: none"> - Build on prior knowledge - Skill development through practice - Problem-based 	<ul style="list-style-type: none"> - Lecture notes - Thai FBDGs power point with audio - Modify food record form for three days (assignment) - Monthly newsletter

Learning objectives- By the end of the course	Learning environment tasks	Learning approaches	Materials/ Supports
	- Participants brought their challenges to discuss in the class.		
4. Participants will be able to identify the components of a healthy diet; an overview of the good healthy eating guide (Thai food based dietary guidelines), an explanation of five food groups concept and their impacts on body weight and diabetes.	- Participants discussed about food portion size of each food group. - Participants related food portion estimation concepts to their local foods and discussed challenges.	- Reflection - Self assessment - Problem-based	- Lecture notes - Thai FBDGs power point with audio - Online quiz of food portion estimation - Monthly newsletter
5. Participants will be able to describe the benefits of healthy eating and identify factors influencing eating habits. They will also identify strategies to overcome barriers/support healthy eating in their communities.	- Problem-based case studies were set from participants' questions about healthy food on the web board and brought to discuss in the class.	- Problem-based - Build on prior knowledge	- Lecture notes - Thai FBDGs power point with lecture sound - Video clip - In class quiz - Monthly newsletter
6. Participants will gain familiarity in adapting existing resources for education (e.g., menu planning) to the local context, e.g., local foods, northern Thai foods.	- Participants exchanged their ideas about activities for at-risk populations. - Participants established teams in each district to start program implementation with existing resources and knowledge gain.	- Build on prior knowledge	- Lecture notes - Printable posters to educate at-risk persons with diabetes - Monthly newsletter - Resource persons and their contacts

4.4.5 Format

The current structure of website and lesson plans accounted for the characteristics of the potential users (CHCWs) and their time constraints. The eight learning modules each consisted of an in-class and an on-line component (total course = 37- 40 hours). The program was delivered by instructor-facilitated classes over 2.5 - 3 hours every other week for 4 months. During alternate weeks, self-learning activities and support were facilitated online through the E-learning website (www.FitThai.org) and CD-ROM. On-going support will be provided for an additional six months.

Learning technology was used for course management. The web site included a course syllabus, class content materials, assignments, quizzes, newsletters, as well as course lecture notes in power point with audio (lecturers' voice) and, in some cases, video clips. Since it was anticipated that CHCWs would learn much better through opportunities for interaction, feedback, reflection and active application of concepts, the online learning approach included problem-based modules, assignments and opportunities for reflection. On-line support was provided by the instructor and on-line activities informed class discussions. Learning activities were designed to work with the least advanced computer system in Chiang Mai community health care centers (e.g., Microsoft XP, speed of internet 56 K, high speed internet, or wireless).

4.4.6 Pretesting

Several materials were developed specifically for the program. The materials were developed in Thai language and evaluated for content and face validity by two nutrition professionals at the Institute of Nutrition, Mahidol University in Thailand. Pretests of some materials were administered as paper-and-pencil surveys. The materials were evaluated for

content, clarity and readability by CHCWs, nurses and a physician in a district in Chiang Mai province that was not involved in the program. Pretesting data were analyzed using descriptive statistics.

4.5 Pretest results

Twenty volunteers participated in pretesting a sample newsletter and a sample video clip for acceptability. The characteristics of these volunteers are presented in **Table 4.3**.

Table 4.3: General information

Total participants:	20
Gender, total (percent):	
Female.....	18 (90)
Male.....	2 (10)
Age (years), total (percent):	
25- 34.....	4 (20)
35-44.....	6 (30)
45-54.....	9 (45)
55-64.....	1 (5)
Education background, total (percent):	
Diploma.....	1 (5)
Bachelor's degree	16 (80)
Master's degree.....	3 (15)
Professional job, total (percent):	
Physician.....	1 (5)
Nurse.....	13 (65)
CHCWs.....	6 (30)

The pretest included two parts for the newsletters and the video clips. The test took around one hour. Participants completed paper based evaluations appraising 11 criteria for the newsletters and six criteria for the video clips. In addition, they were encouraged to

include open-ended comments. The results are summarized in **Table 4.4**. Overall, participants agreed that the newsletter was useful (90%). The newsletter attracted them by the title (85%), format (85%), usefulness of information (100%), and understandable presentation of information (85%). However, some of respondents suggested that the font size (16) was small for them (75%). Newsletter availability through free download from the website was acceptable to most (90%). However, some participants preferred to receive newsletters by mail. Most participants were willing to print the newsletter and distribute them to at-risk individuals or groups in their communities (80%).

The test video clip, which represented a lecture on risk factors of diabetes, was interesting to participants (80%) and perceived to be useful (80%). The length of clip (~ 10 minute) was not considered too long (65%). The picture and sound were acceptably clear for most (75%). The participants agreed that the video clip could be helpful for them to learn themselves (80%) and also to use for teaching at-risk population groups (65%).

Table 4.4: Acceptability of newsletter and video clip

Questions	<i>% of respondents (N = 20)</i>				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Newsletter:					
1. Title attracted you to read.	20	65	5	10	0
2. Fonts were small.	35	20	15	30	0
3. Format was interesting.	20	65	10	5	0
4. Pictures were too many.	5	10	20	65	0
5. Information was useful	45	55	0	0	0
6. Information was understandable.	25	60	15	0	0
7. Use of technical terms was appropriate.	15	65	10	10	0

Questions	<i>% of respondents (N = 20)</i>				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
8. Newsletter availability is desirable as a free download.	35	55	10	0	0
9. CHCWs could print the newsletter to distribute to at-risk populations.	25	55	0	20	0
10. The newsletter was too short.	5	10	15	70	0
11. Overall, the newsletter was useful.	15	75	10	0	0
Video clip:					
11. Information in the video was interesting to you.	25	70	5	0	0
12. The video clip was too long (~ 10 -15 min).	0	15	20	65	0
13. The quality of the picture and sound was acceptable.	0	75	10	15	0
14. The video clip was helpful for you to learn by yourself.	5	75	0	20	0
15. You could use the video to teach at-risk people.	20	45	10	25	0
16. Overall, the video clip was useful.	5	75	10	10	0

4.6 Conclusions and discussion

An innovative training program for Thai CHCWs who work with populations at-risk of type 2 diabetes in urban areas of Thailand has been developed. This training program provides an opportunity for CHCWs to achieve knowledge and skills relevant to diabetes prevention by using a variety of learning approaches. The program thereby fills a gap in the

traditional training in Thailand which has not been emphasized. The program was also designed to help foster the role of CHCWs as change agents and effectively integrate their health promotion work into the health system. The ultimate goal of the training is to prevent type 2 diabetes and its factors for at-risk people in Thailand.

Continuing education that respects the roles, skills and contributions of the community CHCWs is essential. The diabetes prevention education program incorporated fundamental learning principles to support CHCW's thinking and application of knowledge to practice. The program approach was interactive and included in-class discussion, E-learning technology, community-based assignments and development and application of culturally tailored materials.

Learning is a process that learners should be enjoyable when a program is effective (Bruner, 1996). When the program can be facilitated appropriately, it should enable learners to understand many of the phenomena that may be encountered in the field and to transfer the skills they have learned.

The instructional design of the current program could be a model for other learning, training and education initiatives involving CHCWs. In addition, the public health/ community/ university collaboration achieved through the development process may be relevant to other chronic disease prevention work. It also provides the opportunity for future public health professionals to gain real life experiences through service learning opportunities.

4.7 Competing interests

The authors declare that they do not have any competing interests.

4.8 Authors contributions

Sranacharoenpong K wrote the manuscript based on KS's PhD thesis. Hanning RH is the supervisor. All authors (Sranacharoenpong K, Hanning RH, Sirichakwkal PP, Harrigan K) read, provided feedback, and approved the final manuscript.

4.9 Acknowledgements

This research was supported by the grants from the Nestlé Foundation, Switzerland. The authors acknowledge the team staff of the health care offices at six districts: Hangdong, Maetang, Sankampang, Sanpatong, Sansai, and Saraphe in Chiang Mai province in Thailand. The authors particularly thank Dr. Saowanee Wiboolsanti, Ms. Nittaya Rawangpan, and team staff of The Office of Disease Prevention and Control 10 Chiang Mai province, Ministry of Public Health for their facilities and hospitality.

CHAPTER 5

Process and Outcome Evaluation of a Diabetes Prevention Education Program for Community Health Care Workers in Thailand

5.1 Overview

Objective: To describe the development, process and outcome evaluation of a culturally tailored diabetes prevention education program for community health care workers (CHCWs) in Thailand

Methods: A tailored diabetes prevention education program was designed based on formative research and implemented with 35 CHCWs in semi-urban areas in Chiang Mai province, Thailand. Modules were delivered over eight group classes (n=5/class) and eight self-directed E-learning sessions (www.FitThai.org). The program incorporated problem-based learning, discussion, reflection, community-based application, self-evaluation and on-line support. The frequency that students accessed on-line materials, including video-taped lectures, readings, monthly newsletters, and community resources, was documented.

Participant satisfaction was assessed through three questionnaires. Knowledge was assessed through pre-post testing.

Results: Three quarters of participants attended all eight classes and no participant attended fewer than six. Online support and materials were accessed 3 – 38 times (median 13).

Participants reported that program information and activities were fun, useful, culturally relevant, and applicable to diabetes prevention in their specific communities. Participants also appreciated the innovative technology support for their work. Comfort with E-learning varied among participants. Scores on pre-post knowledge test increased from a mean (SD) of 56.5% (6.26) to 75.5% (6.01) ($P < .001$).

Conclusions: An innovative diabetes prevention education program was developed for CHCWs in Thailand. Interactive classroom modules and self-directed E-learning were generally well received and supported knowledge gain. Ongoing access to web-based materials and expert support may help sustain learning.

Keywords: diabetes prevention education program, community health care worker, community-based application, Thailand

5.2 Introduction

Type 2 diabetes and impaired fasting glucose (IFG) have increasingly become a public health concern for Thailand (Aekplakorn *et al.*, 2007). Recognizing the growing burden and related risk factors, the Ministry of Public Health launched a nationwide program, Healthy Thailand, in 2004. This program included media to promote healthier lifestyles (physical activity and diet) and set a target that 60% of Thai people aged 40 years and over to be screened for body mass index (BMI), IFG and now often diabetes every year (Wibulpolprasert & Pengpaibon, 2000; Wibulpolprasert, 2002; Aekplakorn *et al.*, 2007). The monitoring at the community level is ongoing. However, there has been minimal continuing education from the Ministry of Public Health (MOPH) to help CHCWs to prevent diabetes and chronic diseases in their communities. The prevalence of diabetes has not been decreasing in either rural or urban areas. Moreover, the distribution of health resources, such as medical doctors, nurses and budgets has not risen as much as this demand (Wibulpolprasert, 2002; Aekplakorn *et al.*, 2007).

Type 2 diabetes and obesity have mainly been addressed at the treatment level and the success of such interventions has been poor (Glenny *et al.*, 1997). Prevention is more effective than intervention for those who are already obese or have diabetes (Schulz *et al.*, 2005; Swinburn & Egger, 2002). Moreover, the need for preventive action at community, interpersonal, family, organizational, regional and societal levels has never been greater as countries, like Thailand, face the near-epidemic rise of these conditions. The intervention channel must include the population level. One approach to alleviating the chronic disease burden is to expand the knowledge at the grass-root level. Sustained community education by CHCWs is needed.

Health promotion in Thailand has benefitted from CHCWs who serve as “bridges” between health care providers and the community members they serve, especially in rural communities (Kauffman & Mayers, 1997; Roe & Thomas, 2002; Satterfield *et al.*, 2002). Although CHCWs have established roles in aspects of community health promotion, such as prenatal and breastfeeding support, they have been less involved in chronic disease prevention. Moreover, their access to formal education on chronic disease prevention has been limited, especially in underserved communities (Brown *et al.*, 2002; Rhee *et al.*, 2005). Studies which have supported the effectiveness of CHCWs in health promotion emphasized the importance of training (Lewin *et al.*, 2005). Formative research with health promotion workers in Thailand identified their desire for further CHCWs training in chronic disease prevention (Chongsuvivatwong *et al.*, 1996; Senarak *et al.*, 2006). Therefore, the objectives of this study were 1) to describe briefly the development of a culturally tailored diabetes prevention education program for CHCWs in Thailand, 2) to document the process

evaluation by CHCWs over three times points during the 4-month implementation of the program, and 3) to assess pre-post program changes in CHCWs knowledge.

5.3 Methods

5.3.1 Development of course curriculum

Course objectives: The diabetes training course was designed to facilitate learning about prevention of type 2 diabetes as well as skill development to support activities aimed at primary prevention of diabetes at the community level. This training course served as a basis of health education for CHCWs; however, it also encompassed key health messages for the population about diet, physical activities, and risk factors related to type 2 diabetes.

Curriculum: The training course was developed based on formative research that was conducted by Sranacharoenpong K in Chiang Mai province in 2007 and involved stakeholders representing health care professionals, nurses, CHCWs, at-risk community people in Chiang Mai province (Love *et al.*, 1997; Lorig *et al.*, 1999; Vinicor, 1999). The formative research supported the need for an effective, sustainable program for knowledge translation to CHCWs and at-risk populations in communities they served (Chapter 3: Formative evaluation to develop a diabetes prevention education program for community health care workers in Thailand).

Course content: The main principles and content of the initial program were designed on the basis of the literature and the Thai researcher team's experiences in training various health providers at the Institute of Nutrition, Mahidol University in Thailand. The key components of the proposed program content were Diabetes and Lifestyle, Nutrition, and

Fitness (Sirichakwal & Sranacharoenpong, 2008). The topics and focus of the eight modules are presented in Table 5.1.

Table 5.1: Diabetes prevention education program

Module	Topics	Focus
1	Introduction and overview of the training program and pre-test	Objectives of training, benefits and expectations
2	Risk factors related to diabetes	Importance of factors related to diabetes including importance of prevention
3/4	The role of the CHCWs to prevent diabetes, community awareness and promotion and evaluation	Role, expectation, support and team work at the community level
5/6	Eat right, find the way	Importance of food and nutrition for healthy people based on Thai Food Based Dietary Guidelines (Thai-FBDGs)
7	Food products/supplements, nutritional labeling and party/ social foods and exercise	- Advantages and disadvantages of food products; - Benefits of nutritional labeling - Importance of exercise
8	What next, challenge yourself and post-test	- On-going support and challenges for CHCWs

The eight modules were delivered in any order. They were designed to complement each other. CHCWs could choose to work through the modules in a fragmented fashion. Each part of a module had a clear introduction and closure, allowing learners to divide each module into several shorter lessons, or to incorporate the content of different modules in a given learning session.

Course process: The theoretical foundation on which the learning program for CHCWs was based, was the T5 instructional design model of the University of Waterloo,

Canada (Salter *et al.*, 2004). The T5 model draws from constructivism, socially shared cognition and distributed learning theory (Salter *et al.*, 2004). The underlying premise was that students learn better through opportunities for interaction, feedback, reflection and active application of concepts. By extension, CHCWs applied adult learning principles to help their communities and community members to integrate new information, e.g., regarding food labeling, dietary guidelines and risk factors related diabetes. Implementation of the learning benefitted from CHCWs links to their specific communities and culture (Tregonning *et al.*, 2001) and drew on their experiences in other aspects of community health promotion.

In designing the modules, creativity, fun and experiential learning were incorporated. The eight modules might traditionally have been delivered over 16 class sessions of 2.5 hour each. However, a mix of classroom and E-learning approaches was used, based on the formative evaluation. The teaching and learning strategies incorporated in both the classroom sessions and E-learning activities included discussions, problem-based learning, community-based application assignments, self evaluations, and on-line supports.

An E-learning website was developed by using Moodle software, a course management system for learning and effective environment (Dougiamas, 2009). Moodle is an open-source web application that e- learning developers can use to create effective online learning websites. Instructors can also track student responses to quizzes and access to the online materials. The contents on the website (www.FitThai.org, **Figure 5.1**) included lecture materials, quizzes, assignments, newsletters, and community resources. Video-taped lectures were provided in Thai language that were created originally by Sranacharoenpong K, Sirichakwal PP, and Chittchang U. All lectures in PowerPoint with added voice-over narration were developed. For example, a video-taped lecture on fat by Sirichakwal PP and

Sranacharoenpong K was posted on the 'youtube' website (**Figure 5.2**) for CHCWs access. In addition, lectures were copied on CD-ROM for each CHCW to learn by themselves. The length of each video and PowerPoint was 6 – 17 minutes (**Appendix E**). The quizzes were integrated into the online materials to ensure that learners were focusing on the key concepts, and guiding CHCWs through some problem-based questions before they attended the classroom sections. Newsletters were provided online monthly. Each registered CHCWs had his/her account and password to access the E-learning website anytime and anywhere. When the learners accessed the website and download any materials, the website recorded all data and saved it automatically (**Figure 5.3**).

The total man hours for development of all materials including web-based learning were 1,696 hours (212 days x 8 hours). The software used were; Acrobat Captivate V.3.0, Photoshop CS2, Window Movie Maker, Sound Editing, Macromedia Flash V.8.0, Camtasia Studio V.4.0, and Microsoft Office Publisher 2003.

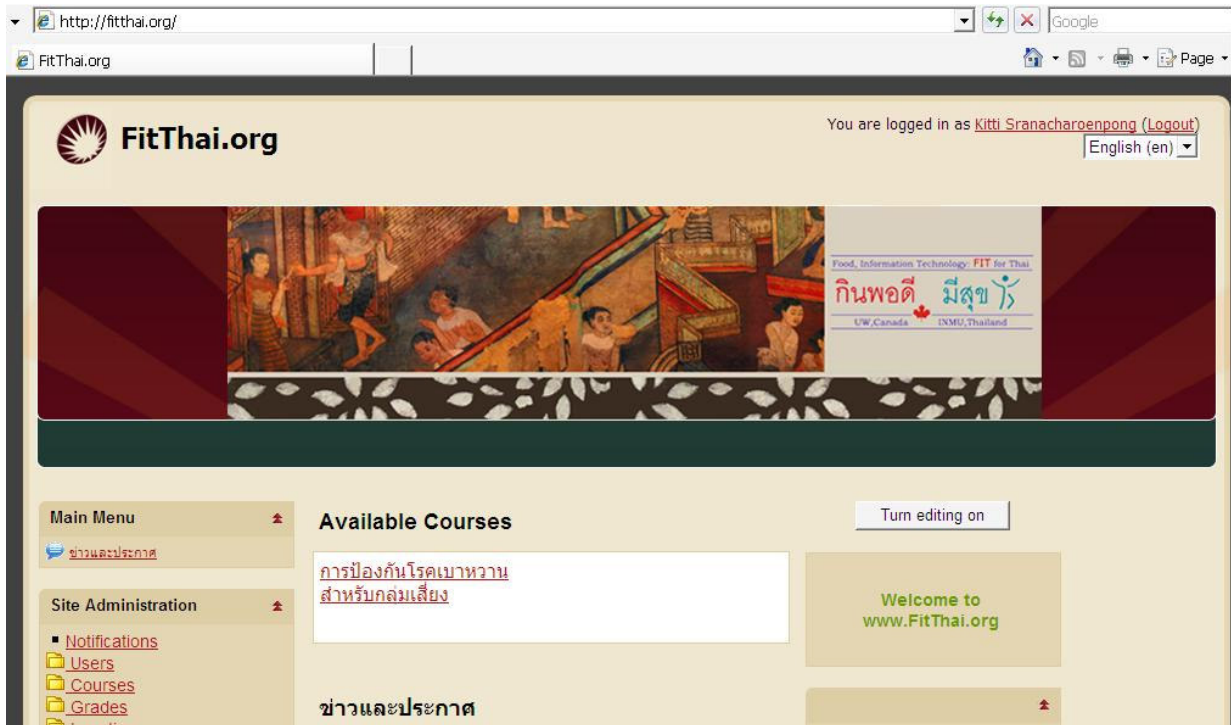


Figure 5.1: The first screen of the E-learning website (www.FitThai.org)



Figure 5.2: The example of fat video lecture (<http://www.youtube.com/watch?v=Hud2qz1HRik>)

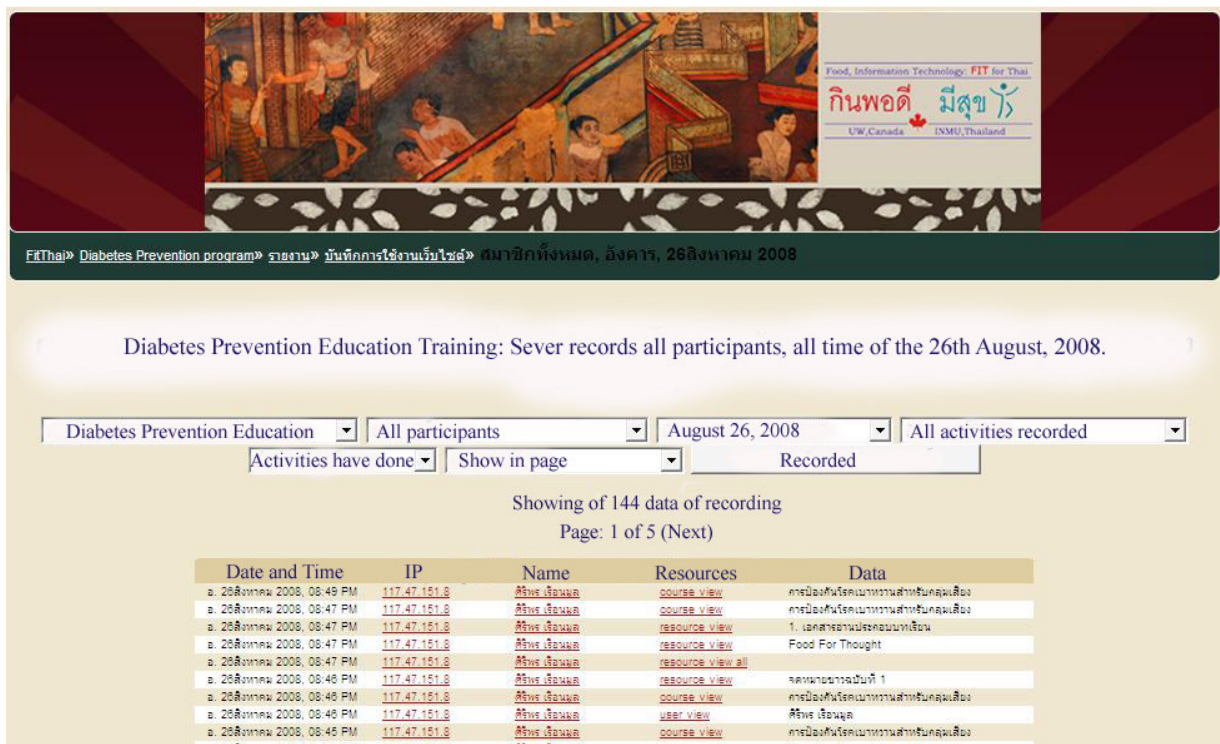


Figure 5.3: A screen showing a record of access to the website

5.3.2 Study sample

The CHCWs who participated in the training program were recruited from five districts in Chiang Mai province in Thailand. The total eligible 69 CHCWs were from 69 health care centers at the community level. CHCWs were persons within each center who worked on chronic disease prevention. The Office of Research Ethics at the University of Waterloo, Ontario, Canada; Mahidol University, Nakhon Pathom province, Thailand and the office of Disease Prevention and Control, Ministry of Public Health, Thailand granted permission to conduct the study.

We randomly selected 35 of 69 CHCWs to participate in the training program. The remaining 34 CHCWs served as control groups for the next phase of the research reported in Chapter 5. We operated and planned for implementation with the Head of the Chronic

Disease Prevention section in each district. The participants were contacted by invitation letter.

We introduced the training objectives and potential benefits that CHCWs might gain from participation in the training program. The training schedule was planned with CHCWs and agreed upon by CHCWs in each district. The in-class discussions took place in five districts and were held twice a month. The participants were not paid for training and their time. However, three awards were provided for the students whose knowledge improved the most after the training. We also presented a certificate for all successful participants.

5.3.3 Implementation

The thirty-five CHCWs participated in diabetes education prevention training over a four-month period. The program was delivered over eight in-classroom discussions and eight online learning sessions. CHCWs met for classes in small groups of five to nine participants in each district at the health care office. The classroom discussions took 2.5 to 3 hours each time. Sranacharoenpong K was the facilitator and organized informal discussions and motivations. In addition, he provided support by telephone or e-mail, when participants needed it during the four month training program. Peer support also contributed to the class.

Online learning materials were posted and updated at least once a week. Online quizzes were completed at the end of each module. The answers of each online quiz were discussed in the class. All CHCWs had to finish assignments on schedule before they attended the classroom discussions.

5.3.4 Evaluation

All CHCWs were tested for knowledge before the start of the training program and after the four months by questionnaire. The knowledge questionnaire consisted of four parts; understanding of nutritional terms, understanding of nutritional recommendations, knowledge of food sources related to the advice, and nutrition knowledge and general risk factors related diabetes. There were 27 questions. The total score was 100.

Content validity and reliability of pre-post test questionnaire were assessed. Content validity was reviewed by two Thai experts at the Institute of Nutrition, Mahidol University. The experts provided comments on the clarity and appropriateness of the content and style of each question. Reliability of the knowledge questionnaire was tested in CHCW volunteers' responses by how consistently the questions within each section corresponded to overall knowledge score measured using Cronbach's alpha statistic. The acceptable score is generally 0.7 or above (Hair *et al.*, 1998.). A sample of 30 CHCWs was needed to ensure that appropriate test confidence limits could be generated (Baumgartner & Chung, 2001).

Thirty-two CHCWs volunteered to complete the questionnaire for the reliability test. They were from one district in Chiang Mai province, Thailand that did not participate in the training program. Cronbach's alpha coefficients for the knowledge questionnaire averaged 0.775 (range 0.727 – 0.786). Therefore, all questions were retained. The quizzes were completed in class.

Participant satisfaction was assessed through three different short questionnaires (Griffin *et al.*, 1999). The questionnaires were completed after the in-class training session. The questionnaires consisted of both ranking of satisfaction with various aspects of the program and opened-end questions.

5.3.5 Data analysis

The study examined the group of CHWCs using pre-post study design. Data from participants were entered into and analyzed by SPSS Version 13.0 for Window (Levesque, 2007). Descriptive statistics were used to describe participants' characteristics and Student's Paired t-test, two-tailed, was used for comparing scores of knowledge gain. The correlation among post knowledge score and frequency of accessing the website was performed using the Pearson correlation, two-tailed. Significance was set at $p < 0.05$. Participant's responses to satisfaction and opened-ended questions for the process evaluation were described.

5.4 Results

5.4.1 General information

Thirty-five CHCWs attended the diabetes prevention education training program. CHCWs worked at the health care centers in semi-urban communities in Chiang Mai province. The mean (SD) age of CHCWs was 39.5 (± 4.77) years (**Table 5.2**). Eighty-nine percent had graduated with a Bachelor's degree in Nursing (78%) or Public Health (11%). They had worked in public health for an average of 18.4 (± 4.97) years.

Table 5.2: General information

Total participants:	35
Gender, total (percent):	
Female.....	34 (97)
Male.....	1 (3)
Age (years), total (percent):	
25- 34.....	6 (17)
35-44.....	22 (63)
45-54.....	7 (20)
Mean \pm SD.....	39.5 \pm 4.77
Work experiences (years), total (percent):	
< 10.....	1 (3)
11-15.....	13 (37)
16-20.....	7 (20)
> 20.....	14 (40)
Mean \pm SD.....	18.4 \pm 4.97
Education background, total (percent):	
Diploma.....	2 (5.7)
Bachelor's degree	31 (88.6)
Master degree.....	2 (5.7)

The eight classroom-based sessions were held at the health care office in each of five districts over a four-month period. Sixty-six percent of CHCWs (n = 23) attended all eight times (**Table 5.3**). The main reason of CHCWs who were absent for the class was their workloads and many responsibilities.

Table 5.3: Attendance (N =35)

Attending the class (times)	# of students (Percent)
6	1 (3)
7	11 (31)
8	23 (66)
Total	35 (100)

The frequency of accessing on-line materials was recorded during the program, from August 13 to November 20, 2008. The median frequency of access to the website was 13 (range 3 – 38 times) (Table 5.4).

Table 5.4: Frequency of accessing the E-learning website (*www.FitThai.org*)

Age group	# of times (mean \pm SD)	Median (Min, Max)
25-34	12.5 \pm 6.47	12 (6,23)
35-44	17.3 \pm 8.51	16 (5,38)
45-54	11.6 \pm 6.32	13 (3, 21)
Total	15.3 \pm 8.05	13 (3,38)

($P > .171$)

5.4.2 Learning outcomes

A significant knowledge gain in all four topics was observed from baseline to after training ($P < .001$) (Table 5.5). The understanding of nutritional recommendation at the baseline scored lowest compared with other topics. In addition, the total scores of knowledge improved significantly ($P < .001$). The mean total score post training was 75.5 (± 6.01) % while the pre-test score was 56.6 (± 6.26)%. The passing score was set at $\geq 70\%$. At the

baseline, no one could pass the criteria while 77% of total CHCWs (n = 27) passed the criteria after the training.

Table 5.5: Pre-post test scores (N = 35)

	Pre-test (mean ± SD)	Post-test (mean ± SD)	p value
1. Understanding of nutritional terms (total score = 18) (% of total score of each topic)	9.4±2.87 (52)	11.6±2.24 (64)	< .001
2. Understanding of nutritional recommendations (total score = 25) (% of total score of each topic)	7.1±3.25 (28)	17.1±3.60 (68)	< .001
3. Knowledge of food sources related to advice (total score = 36) (% of total score of each topic)	26.3±3.19 (73)	29.4±1.94 (82)	< .001
4. Knowledge of diet-diseases association (total score = 21) (% of total score of each topic)	13.8±1.44 (66)	16.4±1.96 (78)	< .001
Total (total score = 100) (% of total score)	56.5±6.26 (56.5)	75.5±6.01 (75.5)	< .001

The figure 5.4 shows the correlation of post-test score according to frequency of accessing course materials on the website. No significance was found between frequency of accessing the website and post-test scores (P > .068).

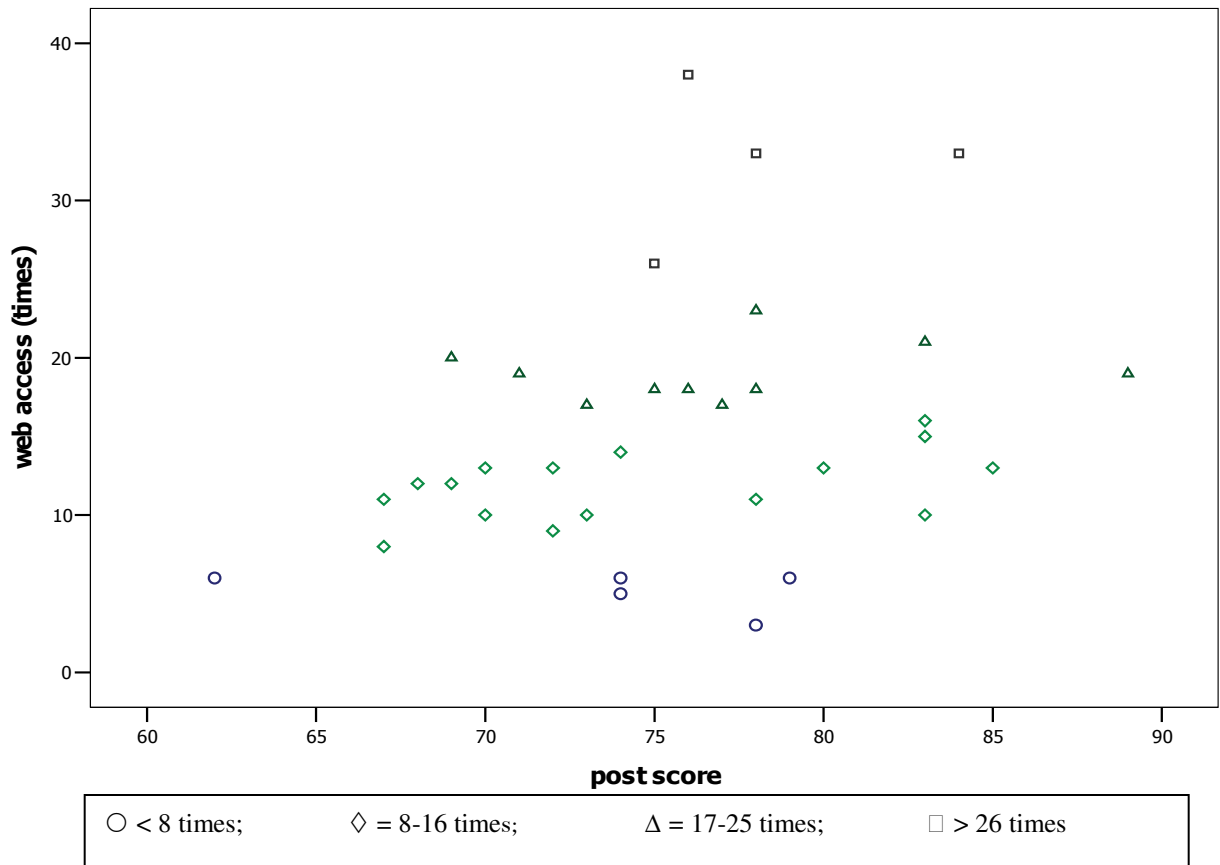


Figure 5.4: Correlation of post-test score according to frequency of accessing course materials on the website

5.4.3 Outcome evaluations

The satisfaction evaluation indicated a high score of approval with the training. Eighty-three percent of participants liked the methods of classroom discussion and E-learning (Q1) (Table 5.6). Moreover, fifty-four percent of them felt computer skills were easy to learn (Q9). The length of a training program was four months and more than 70% thought the program was not too long (Q10). The motivations that participants had to attend the training were; they learned new contents (68%: Q2), they could apply the program content for their jobs (97%: Q3), and all materials provided in this training were helpful (80%: Q7). In addition, assignments were useful for them (91%:Q4) and they liked to do

(77%: Q5). After participants completed the training program, they thought they could adapt the program knowledge to their communities (91%: Q6). They also felt more confident to teach at-risk populations about diabetes prevention (54%:Q8).

Table 5.6: Process evaluation of the training program (N = 35)

Questions	Response (% of respondents)			
	Disagree	Agree	Strongly agree	Average* (0 to 10) (SD)
Q1. You liked the methods of this training program	0	17	83	8.7 (1.36)
Q2. You learned new content from this training.	3	29	68	8.1 (1.82)
Q3. Program content was useful for your job.	0	3	97	9.3 (0.89)
Q4. Assignments were useful.	0	9	91	9.0 (1.14)
Q5. You liked to do assignments.	3	20	77	8.3 (1.53)
Q6. You could adapt program knowledge to your community work with at-risk members.	0	9	91	9.1 (1.01)
Q7. All materials (e.g., CD-ROM, E-learning, Newsletters) helped you to learn.	0	20	80	8.6 (1.21)
Q8. You felt more confident to teach at-risk populations in your community about preventing diabetes after you completed this training program.	6	40	54	7.7 (1.69)
Q9. Computer skills were easy to learn.**	29	17	54	6.7 (3.31)
Q10. The length of the training program was not too long.**	11	17	72	8.0 (2.65)

* Responses on a ten-point Likert scale; < 4 = Disagree; 5-7 = Agree; 8-10 = Strongly agree

** Original questions (Q9. Computer skills were difficult to learn; Q10. The length of the training program was too long.) have been changed, so the scale is similar for all questions.

The opened-end questions indicated specific barriers to transferring knowledge gained through the training program to at-risk populations. CHCWs mentioned that their heavy workload and lack of time were limitations to starting health promotion activity with at-risk populations. However, some of the CHCWs were able to start activities, for example home visiting of at-risk community members, distribution of newsletters and information, and nutrition counseling of at-risk individuals at their health care centers. CHCWs needed on-going support after the training and they suggested some health topics that they wanted to learn more about, e.g., supplementary food, herbs and benefits of local food and prevention of diseases, best ways to reduce weight, and child obesity.

5.5 Conclusions and discussion

CHCWs have become increasingly and effectively used for for disease prevention and health promotion with hard-to-reach populations (Altpeter *et al.*, 1999; Baker *et al.*, 1997; O'Hara *et al.*, 1996; Satterfield *et al.*, 2002; Swider, 2002). This research aimed to evaluate a training program for CHCWs in Chiang Mai province. Formative evaluation had indicated the need for the program. Once approved, formative input assisted in developing a unique tailored program, consistent with recommended practices for program development (Green & Lewis, 1986). The current training program was feasible, enjoyable and improved diabetes knowledge. However, the program could not have been initiated without support of decision-makers, which meant orienting them to the importance of health promotion to the whole chronic disease care mandate. Although the structure of the training (e.g., interactive versus didactic) was different from participants' former training experiences, process evaluation indicated their positive responses to the approach. The positive response to the

training program indicated that it was fun, culturally relevant, and applicable to diabetes prevention. Testimony, to the success of the program was 100% recruitment and near perfect attendance of CHCWs in spite of receiving no payment to participate.

At the baseline, CHCWs' knowledge score of "understanding of nutritional recommendations" was lowest. The improvement of CHCWs' knowledge from baseline to the end of the four months of training met a-priori criteria for success. The results, however, did not show a significant impact of class attendance and the frequency of website access on post-test knowledge scores. It is likely that the sample had insufficient power to determine which strategies or materials had the most impact on the knowledge improvement.

Outcome evaluation reflected the success of the training program for CHCWs. The feedback and suggestions will be useful for future revisions to the program (Glasgow *et al.*, 2003). Some CHCWs needed support for computer skills that might help them feel more comfortable. In addition, homework and assignments were important for CHCWs to feel more confident to teach at-risk populations in their communities about preventing diabetes after they have completed this training program. Future research may help to find the best balance between homework/assignments, CHCWs' workload, and CHCWs' needs for improved learning.

Long-term retention of knowledge, application through community programs, continuing support needs, as well as, delivery of key messages to at-risk populations will be tested in the next phase of this research. The current study supports the benefits of the CHCWs' training program regarding short-term satisfaction and knowledge gain. Application of the teaching strategies, course content, format, and materials in this initiative has potential benefit for other CHCWs in Thailand. Teaching strategies and materials may need to be

adapted to different geographical locations, cultures, and values (Cameron *et al.*, 2001; Henrich *et al.*, 2003). Nevertheless, the long-term sustainability of the program and participation of CHCWs in health promotion depends on the cooperation of district, provincial and national levels of government and their commitment to include disease prevention within the health care strategy.

5.6 Competing interests

The authors declare that they do not have any competing interests.

5.7 Authors contributions

Sranacharoenpong K wrote the manuscript based on KS's PhD thesis. Hanning RH is the supervisor. Chittchang U served as a committee member. All authors (Sranacharoenpong K, Hanning RH, Sirichakwkal PP, Chittchang U) read, provided feedback, and approved the final manuscript.

5.8 Acknowledgements

This research was supported by the grants from the Nestlé Foundation, Switzerland. The authors acknowledge the team staff of the health care offices at six districts where are Hangdong, Maetang, Sankampang, Sanpatong, Sansai, and Saraphe in Chiang Mai province in Thailand. The authors particularly thank Dr. Saowanee Wiboolsanti, Ms. Nittaya Rawangpan, and team staff of The Office of Disease Prevention and Control 10 Chiang Mai province, Ministry of Public Health for their facilities and hospitality.

CHAPTER 6

A Diabetes Prevention Education Program for Community Health Care Workers in Thailand: A Randomized Controlled Trial

6.1 Overview

Objective: to evaluate the short-term outcome of a four-month training program on the knowledge of community health care workers (CHCWs) in intervention and control groups in Chiang Mai province, Thailand.

Methods: The study had a randomized controlled design. Thirty-five CHCWs were assigned to the intervention group and 34 CHCWs to the control group. All CHCWs were assessed for knowledge at baseline and 4 months at similar times. The intervention group participated in an innovative diabetes prevention education program over the intervening four month period. Assessment was based on a pretested examination.

Results: Overall, the knowledge at baseline of both groups was not significantly different and all CHCWs scored lower than 70%. The lowest scores were found in the “understanding of nutritional recommendations” section (a mean score of 28% in intervention and 30% in control CHCWs). After 4 months, CHCWs in the intervention group demonstrated improvement from baseline ($75.5\% \pm 6.01$ versus $56.5\% \pm 6.26$, mean \pm SD, respectively) and relative to the control group ($75.5\% \pm 6.01$ versus $57.4\% \pm 5.59$, respectively) $p < .001$. The percent of CHCWs achieving a total score of 70% was 77% (27/35) in intervention and 0% in control CHCWs.

Conclusions: The diabetes prevention education program was effective in improving CHCWs’ health knowledge relevant to diabetes prevention. The innovative learning model

has potential to expand chronic disease prevention training of CHCWs to other parts of Thailand.

Key words: diabetes prevention education program, randomized controlled trial, Thailand, community health care workers

6.2 Introduction

Type 2 diabetes and its complications have become a major health burden in Thailand as a result of rapid economic, lifestyle and nutritional change in recent decades (Kim *et al.*, 2001; Aekplakorn *et al.*, 2007). Research evidence indicates that type 2 diabetes can be delayed or prevented with lifestyle modification (Bjaras *et al.*, 2001; Daniel *et al.*, 1999; Diabetes Prevention Program Group, 2002; Knowler *et al.*, 2002). Type 2 diabetes and obesity have mainly been treated at the individual level and the success of such interventions has been poor (Glenny *et al.*, 1997). Prevention is more effective than intervention for those who already have diabetes (Schulz *et al.*, 2005; Swinburn & Egger, 2002).

One effective approach to health promotion is to use community health care workers (CHCWs) as connectors to bring health information directly to the target populations (Witmer *et al.*, 1995; Hill *et al.*, 1996; Satterfield *et al.*, 2002). CHCWs are community members who serve in their community settings. They also reach underserved populations to promote good health and prevent chronic diseases (Daniel *et al.*, 1999; Mau *et al.*, 2001; Rowley *et al.*, 2000). The interventions involving CHCWs can have a positive impact on the prevention and outcome for type 2 diabetes (Swider, 2002; Norris *et al.*, 2006)

The effectiveness of CHCWs is enhanced through training (Chongsuvivatwong *et al.*,

1996; Senarak *et al.*, 2006). However, their access to formal education on chronic disease prevention has been limited, especially in underserved communities (Brown *et al.*, 2002; Rhee *et al.*, 2005). To support the activities of CHCWs in Thailand in preventing type 2 diabetes through their communities, a tailored training program was designed. The objective of this study was to evaluate the short-term impact of the four month training program on the knowledge of CHCWs in intervention compared to control groups in Chiang Mai province, Thailand.

6.3 Methods

6.3.1 Setting and recruitment

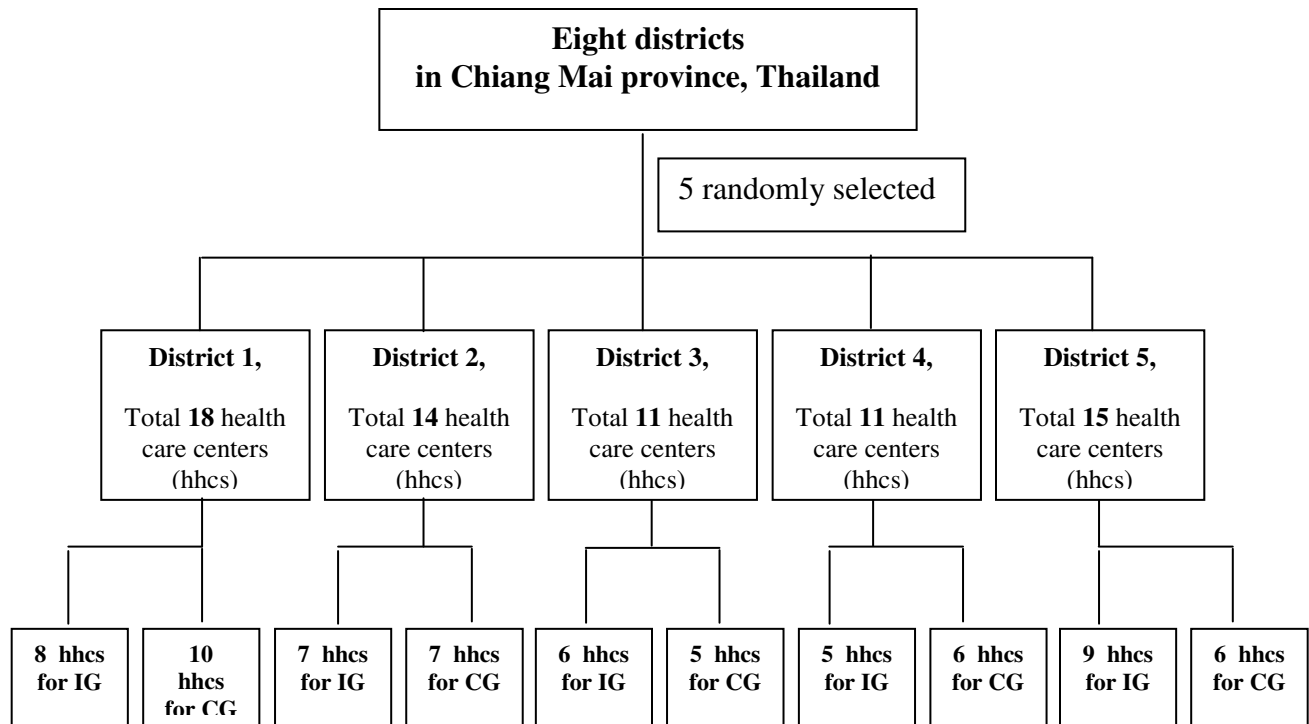
The implementation phase of the study was conducted in Chiang Mai province in Thailand where diabetes is a public health problem. The prevalence of diabetes and obesity in Chiang Mai has been increasing over time as has been complications of the disease (Aekplakorn *et al.*, 2007; Rerkasem, 2008). Chiang Mai is an old city; however, it is a main city for tourists in the North of Thailand. This may reflect the rapid growth in economy in the last five years (UNDP, 2007), and relatively high socioeconomic status of Chiang Mai within the Northern Region (UNDP, 2007).

Chiang Mai province consists of 24 districts that are semi-urban or rural areas. Criteria for district selection to participate in study were: 1). Districts within 40 km. of Chiang Mai city and 2). Districts having less than 50% agricultural households. Eight districts were eligible for the study. Five districts were randomly selected. The implementation and evaluation of the CHCWs' training program was randomized and

controlled. The unit of randomization was the health care center in Chiang Mai province (**Figure 6.1**). Each health care center has one CHCW who takes responsibility for chronic disease prevention and health promotion.

Randomization was conducted at the district level and then randomizing CHCWs within districts. The total number of CHCWs in the five districts was sixty-nine. CHCWs were randomly assigned to intervention or control groups with stratification at the district level and the education level (< and \geq Bachelor's degree). Folded pieces of papers with name of each health care center were provided for picking up. Thirty-five CHCWs of 69 were randomized to the intervention group and 34 CHCWs to the control group (**Figure 6.1**). The assignment of CHCWs to intervention or control was kept exactly as randomly picking up before starting the training program.

Figure 6.1: Sample selection



IG = Intervention group, CG = Control group

6.3.2 Implementation

The training course served as a basis of health education for the 35 CHCWs in the intervention group. The course was designed to facilitate learning about prevention of type 2 diabetes as well as skill development to support activities aimed at primary prevention of diabetes at the community level. The training was delivered over 16 sessions of 2.5 hour each within a four month period. A mix of classroom and E-learning approaches was used. The teaching and learning strategies included discussions, problem-based learning, community-based application assignments, self evaluations, and on-line supports. It also encompassed key health messages for the population about diet, physical activities, and risk factors related type 2 diabetes. The training course and the formative research have been described in further detail elsewhere (Chapter 3).

6.3.3 Assessment

All 69 CHCWs were tested for knowledge at baseline and after 4 months, whether they received the intervention or not. The knowledge questionnaire was developed specifically for the study and consisted of four parts; understanding of nutritional terms, understanding of nutritional recommendations, knowledge of food sources related to the advice, and nutrition knowledge and general risk factors related to diabetes. There were 27 questions. The total score was 100.

Content validity and reliability of the pre-post test questionnaire were assessed. Content validity was reviewed by two Thai experts at the Institute of Nutrition, Mahidol University. The experts provided comments on the clarity and appropriateness of the content and style of each question. Reliability of the knowledge questionnaire was tested with 32 CHCW volunteers from one district in Chiang Mai province, Thailand that did not participate in the training program by how consistently the questions within each section corresponded to overall knowledge scores measured using Cronbach's alpha statistic. There were questions using case-based examples and questions using more traditional formats, e.g., multiple choice. Cronbach's alpha coefficients for both sections averaged 0.785 (Number of items, 127). However, several of the participants commented that they did not like the case based questions and did not know how to answer them. The responses were therefore examined by question type. For questions that used case-based examples the scores were inconsistent with the total (Cronbach's alpha, averaged 0.26 (Number of items, 32). For sections of the knowledge questionnaire that used fill in the blanks, true-false, short answers, and multiple choice questions. Cronbach's alpha coefficients for the knowledge questionnaire averaged 0.775 (Number of items, 95) which includes all sub questions of the 27 questions. Therefore,

the questions were felt to be more appropriate for baseline testing and repeat four month testing and were retained. This was also felt to be more fair since control CHCWs would have less exposure to case format. The quizzes were completed in class by intervention CHCWs and in groups of ~ 10 students at a local health center for control CHCWs. Intervention and control students were tested within a week of each other at both pre and post-time periods. Students were asked to keep to the tests confidential (**Appendix F**).

The Office of Research Ethics at the University of Waterloo, Ontario, Canada; Mahidol University, Nakhon Pathom province, Thailand and the office of Disease Prevention and Control, Ministry of Public Health, Thailand granted permission to conduct the study.

6.3.4 Data analysis

Data from participants were entered into and analyzed by SPSS Version 13.0 for Windows (Levesque, 2007). Descriptive statistics were used to describe participants' characteristics. Student's two-tailed paired t-test were used comparing scores of knowledge gain within groups and Independent sample t-test between groups. Significance was set at $p < 0.05$.

6.4 Results

6.4.1 Characteristics of the CHCWs

The characteristics of CHCWs randomized to intervention and control groups were similar (**Table 6.1**). The majority of CHCWs of the intervention and control groups were female, older than 35 years and had graduated with a Bachelor's degree. They had worked in public health for an average of 18.4 (± 4.97) years for the intervention group and 20.7 (± 5.69) years for the control group.

Table 6.1: General information

	Intervention	Control
Total participants:	35	34
Gender, (n (%)):		
Female.....	34 (97)	30 (88)
Male.....	1 (3)	4 (12)
Age (years), (n (%)):		
25-34.....	6 (17)	4 (12)
35-44.....	22 (63)	16 (47)
45-54.....	7 (20)	14 (41)
Work experience (years) (n (%)):		
< 10.....	1 (3)	1 (3)
11-15.....	13 (37)	6 (18)
16-20.....	7 (20)	8 (23)
> 20.....	14 (40)	19 (56)
Mean \pm SD.....	18.4 \pm 4.97	20.7 \pm 5.69
Education background, total (percent):		
Diploma.....	2 (5.7)	1 (3)
Bachelor's degree	31 (88.6)	30 (88)
Master's degree.....	2 (5.7)	3 (9)

6.4.2 Knowledge testing

The knowledge test of nutrition, health and diet-disease related to diabetes was performed by all the CHCWs at the time of recruitment. The overall scores were very low in both groups (56 % for intervention and 55% for control). No significant differences were found between the intervention and control group. In the same way, each topic of the knowledge test was not significantly different between the groups at baseline (**Table 6.2**). The score for the section on understanding of nutritional recommendation was lowest.

Table 6.2: Pre-test scores (N = 69)

	Intervention (mean ± SD)	Control (mean ± SD)	p value
1. Understanding of nutritional terms (total score = 18) (% of total score of each topic)	9.4±2.87 (52)	8.5±2.25 (47)	> .154
2. Understanding of nutritional recommendations (total score = 25) (% of total score of each topic)	7.1±3.25 (28)	7.5±4.71 (30)	> .716
3. Knowledge of food sources related to advice (total score = 36) (% of total score of each topic)	26.3±3.19 (73)	25.8±3.33 (72)	> .511
4. Knowledge of diet-diseases association (total score = 21) (% of total score of each topic)	13.8±1.44 (66)	13.1±1.64 (62)	> .072
Total (total score = 100) (% of total score)	56.5±6.26 (56.5)	54.9±6.98 (54.9)	> .287

Thirty-five CHCWs participated in the diabetes prevention education training over a four month period. The overall score was significantly different between intervention and control groups post intervention ($p < .001$). In addition, scores for each of the four topic areas were significantly different between groups at $p < .001$. In the intervention group, the mean scores for two topics (Understanding of nutritional terms and Understanding of nutritional recommendations) were lower than the desired 70%. In the control group, the mean total score and three topic scores fell below 70% (**Table 6.3**).

Table 6.3: Post-test scores (N = 69)

	Intervention (mean ± SD)	Control (mean ± SD)	p value
1. Understanding of nutritional terms (total score = 18) (% of total score of each topic)	11.6±2.24 (64)	8.9±2.12 (49)	< .001
2. Understanding of nutritional recommendations (total score = 25) (% of total score of each topic)	17.1±3.60 (68)	8.6±2.85 (34)	< .001
3. Knowledge of food sources related to advice (total score = 36) (% of total score of each topic)	29.4±1.94 (82)	26.7±2.44 (74)	< .001
4. Knowledge of diet-disease associations (total score = 21) (% of total score of each topic)	16.4±1.96 (78)	13.2±2.71 (63)	< .001
Total (total score = 100) (% of total score)	75.5±6.01 (75.5)	57.4±5.59 (57.4)	< .001

When pre-post scores were compared within group, the overall score and each topic score were significantly different at $p < .001$ for the intervention group. However, the scores of control group were not significantly different than baseline after four months (**Table 6.4**).

Table 6.4: Pre-post-test scores with intervention and control groups

	Intervention (mean \pm SD)		Control (mean \pm SD)	
	Pre-test	Post-test	Pre-test	Post-test
1. Understanding of nutritional terms	9.4 \pm 2.87	11.6 \pm 2.24*	8.5 \pm 2.25	8.9 \pm 2.12
2. Understanding of nutritional recommendations	7.1 \pm 3.25	17.1 \pm 3.60*	7.5 \pm 4.71	8.6 \pm 2.85
3. Knowledge of food sources	26.3 \pm 3.19	29.4 \pm 1.94*	25.8 \pm 3.33	26.7 \pm 2.44
4. Knowledge of diet-disease associations	13.8 \pm 1.44	16.4 \pm 1.96*	13.1 \pm 1.64	13.2 \pm 2.71
Total (total score = 100)	56.5\pm6.26	75.5\pm6.01*	54.9\pm6.98	57.4\pm5.59

*Different from baseline, P< .001

6.5 Conclusions and discussion

The diabetes prevention education program for CHCWs resulted in improved knowledge after a four month period. The study showed similar results to the U.S. community health educators study of Ackermann and colleagues (2008), in which improved knowledge of nutrition, health and diet-disease relationships was observed after a four month training period (Ackermann *et al.*, 2008).

The training was different from traditional training in Thailand, given the long period of training, the small groups of CHCWs (up to 10 each class) and interactive in-class and E-learning approaches. The program was developed based on CHCWs' needs and their inputs. The diverse approaches used to facilitate learning in the current diabetes education program appear have been effective. Interestingly, understanding of nutritional terms and understanding of nutritional recommendations scored lower than the desired 70% and lower than other topic areas. This may reflect the emphasis of this section on remembering versus the higher skills of learning, such as applying, analyzing, evaluating and creating (Forehand, 2005) that the approach emphasized. It is impressive that there were no dropouts in the program. Moreover, the post-program evaluation achieved 100% participation in both intervention and control communities. This success was achieved without paying incentives for participation as has been done in other studies (Smith *et al.*, 2008). It was interesting that the pre testing of the knowledge test revealed a lack of comfort with a case-based approach. This may reflect lack of exposure. On in-class quizzes that used case-based examples, the intervention group scored 14.9 ± 2.49 out of 24 marks (range 8 – 20, 33% - 83 %), more poorly than on the final test.

The success reflects the cooperation of health care offices in Chiang Mai province. The local public health professors recognized that the program helped to support CHCWs to address community needs in preventing chronic diseases and indeed were partners in the formative stages of developing the program. The novel strategies linked case and community-based application with knowledge acquisition. This innovative approach may serve not only to increase the knowledge of CHCWs about diabetes prevention; it may also provide a compelling learning model for future.

6.6 Competing interests

The authors declare that they do not have any competing interests. Sranacharoenpong K wrote the manuscript based on KS's PhD thesis. Hanning RH is the supervisor. Chittchang U served as a committee member. All authors (Sranacharoenpong K, Hanning RH, Chittchang U) read, provided feedback, and approved the final manuscript.

6.7 Acknowledgements

This research was supported by a grant from the Nestlé Foundation, Switzerland. The authors acknowledge the team staff of the health care offices in the six districts: Hangdong, Maetang, Sankampang, Sanpatong, Sansai, and Saraphe in Chiang Mai province in Thailand. The authors particularly thank team staff of The Office of Disease Prevention and Control 10 Chiang Mai province, Ministry of Public Health for their facilities and hospitality.

CHAPTER 7

General Discussion and Recommendations

7.1 Overall findings

The studies described in this thesis set out to design, implement and evaluate a community-tailored diabetes prevention education program for community health care workers (CHCWs) in the north region of Thailand. The short-term effectiveness of the community-based continuing education training program in enhancing CHCW's knowledge was clearly demonstrated through the randomized community-based trial in semi-urban Chiang Mai province. Further, process evaluation indicated positive responses to the training approach.

7.2 Barriers and opportunities for a community-based diabetes prevention education program in Thailand

The results from the formative evaluation supported the potential of a diabetes prevention education program for CHCWs in Chiang Mai province, Thailand. It was clear that chronic diseases have become a crucial public health problem. Prevention of these diseases and promotion of health must be priorities and need to be addressed using approaches that can feasibly be integrated into the public health system. However, the results indicated many barriers to current health promotion that might be obstacles for CHCWs in their communities.

The Thai Ministry of Public Health (MPOH) has established public health policy that mandates public health programs across Thailand in such areas as family planning, AIDS,

Tuberculosis and immunization. While these programs have been successful, other programs such as smoking cessation, campaigns against alcohol, and chronic disease prevention have not been effective and sustainable (Lyttleton, 1996; Wibulpolprasert & Pengpaibon, 2000).

It seems that health promotion programs are only instituted in Thailand when health practitioners are mandated to implement them by government policy or when the programs are financed by government (Wibulpolprasert, 2000). In the same way, some programs have not been sustained because they were part of the work of CHCWs who have many responsibilities and have had to turn their attention to new government policies and mandated programs. Therefore, since there are currently no government policies or mandated programs aimed clearly at diabetes prevention, the concept of health promotion is not currently a focus for CHCWs and other health professionals. Their work is confined to routine treatment of existing disease and, since 2004, screening for chronic disease risk factors (Wibulpolprasert & Pengpaibon, 2000; Wibulpolprasert, 2002; Aekplakorn *et al.*, 2007).

On the other hand, the formative evaluation also indicated some points of strength to support a diabetes prevention education program for CHCWs. Some health professionals, including CHCWs, expressed concern that the incidence and prevalence of diabetic patients in their community has increased over time. Unfortunately, they have had no specific mandate to educate people about prevention or risk management. Moreover, CHCWs expressed lack of knowledge and confidence in their ability to provide relevant advice on lifestyle. Hence, they recognized a need for diabetes prevention action but also a need for their own further education to enable them to address diabetes prevention. Other supportive

points that emerged from this formative study were the existence of a comprehensive, government-supported diabetes screening system, short course training at local hospitals, and the feasibility of using computers and the internet to support CHCW education at the health center level.

The formative research demonstrated that there was general support for a diabetes prevention education program on the part of the many stakeholders who were consulted within Chiang Mai province: CHCWs, health professors, public health workers and at-risk community members. This was critical since input from these individuals would be necessary to further develop and ultimately help sustain such a program (Buranatrevedh & Sweatsriskul, 2005; Mosavel *et al.*, 2005). The increasing incidence and prevalence of diabetes and obesity, and the importance of effectively addressing lifestyle related diseases were undoubtedly a concern for community stakeholders at all levels. Health education to support CHCWs to work with their communities to develop and deliver culturally appropriate lifestyle interventions was seen as a priority the thesis research went on to address.

7.3 Development of a tailored diabetes prevention education program for Thai CHCWs and outcome evaluation

An innovative tailored diabetes prevention education program for Thai CHCWs was developed based on the results of formative community evaluation. There were several examples of effective exercise programs from western concepts/senses that were considered (Quinn & McNabb, 2001; Tregonning *et al.*, 2001; Smith *et al.*, 2008). However,

exercise in the Western style designated activities with special clothing, tools, and gymnasiums. These approaches were not relevant to the Thai culture, especially in semi-urban areas in the North region of Thailand. Further, the healthy food components of the programs reviewed often focused on food and culture in the Western context – which is also different from the Asian culture- even though a few western fast food restaurants are found in Chiang Mai province. Therefore, the content knowledge of this program was based on the Thai context and adapted to the northern culture. However, the review of the literature was helpful to inform the learning approaches, format of the course, technology support and process of evaluation of the program.

The diabetes prevention education program was designed to facilitate the learning and skill development of CHCWs about community-based prevention of type 2 diabetes. The course curriculum was designed to prepare CHCWs with a strong background to support activities aimed at prevention of diabetes for at-risk people, e.g., those who are overweight or obese. In addition, it supported the role of CHCWs as communicators at the community level through skill development and resource templates. Although CHCWs recognized that knowledge was important and they wanted to attend the training, time constraints and the many responsibilities of CHCWs were limitations that had to be considered in the education program development. Learning is a process that takes time, support and motivation, especially to prevent the diseases (Bruner, 1996; Knowler *et al.*, 2002). In the end, a-four month training program was designed with eight in-class discussions and self-directed E-learning materials and supports. The learning approaches were designed based on theory and documented experience of effective strategies to enhance the retention and application of

knowledge. This departed from the traditional didactic approach to health education in Thailand. The program was also designed to help foster the role of CHCWs as change agents and effectively integrate their health promotion work into the health system. A six-month follow-up inventory of health promotion activities of CHCWs in control versus intervention communities will help to determine whether the approach has been successful, however, that component of the research extends beyond the current thesis research.

In the class discussion, CHCWs were exposed to a new learning style, evaluations, and assignments. Moreover, the E-learning approach was challenging to CHCWs during the training program. Fifty-four percent of them felt computer skills were easy to learn. However, some of CHCWs are older and found it challenging to learn a new technology. Peer to peer learning during the training likely contributed to the effectiveness (McLoughlin & Darvill, 2007). It is noteworthy that one hundred percent of CHCWs (35 CHCWs) participated in the training and evaluation throughout.

Process evaluation of the program was conducted. The satisfaction evaluation indicated a high score of approval with the training. Eighty-three percent of participants liked the methods of classroom discussion and E-learning. They gained not only knowledge, but also gained enjoyment and friendship from the training. In addition, assignments were useful for them and they liked to do them and submitted them on time. After participants completed the training program, they thought they could adapt the program knowledge to their communities. They also felt more confident to teach at-risk populations about diabetes prevention. Hence, the program was perceived as being very successful.

7.4 Four months of community-based training for intervention group

The outcome evaluation also supported the success of the program. The training program implementation was randomized and controlled. The training aimed to support the activities of CHCWs in Thailand in preventing type 2 diabetes through their communities. The short-term impact of the four month training program on the knowledge of CHCWs was assessed between intervention compared to control groups in Chiang Mai province, Thailand. At the baseline, the overall scores were very low in both groups (56 % for intervention and 55% for control). No significant differences were found between the intervention and control group. Participants in the intervention groups achieved knowledge gain after the four month training program. The overall score was significantly different between intervention and control groups post intervention ($p < .001$). The pre-post knowledge tests confirmed that the overall program was helpful to CHCWs, however, the specific merits of training materials, format, content, and multiple learning approaches was not assessed (Briggs *et al.*, 2006).

The researchers and CHCWs of the study groups set mutual agreements before the training program started. CHCWs understood the benefits that they might gain from the research project. It should be noted that in this study, although the CHCWs of the intervention groups lived and worked in the same five districts as the control groups, their health centers were some distance from each other. They did not exchange information about the training or activities of the training, including post-testing questionnaire. It is worth noting that the CHCWs participated in the training program voluntarily and were not required to do so by the heads of the local health care offices. Moreover, the only incentives that CHCWs received from the research project were certificates and T-shirts (**Appendix G**).

It would seem that CHCWs valued the opportunity of achieving knowledge they felt was important to their' roles that they could contribute to their communities.

7.5 Limitations

It was recognized in advance that this study had some limitations. The development of the training program used many approaches, such as traditional and E-learning approaches, to support CHCWs's achievement. While this might be a strength of the program, it was also a challenge when it came to the evaluation process. It was difficult to assess the direct impact of any single approach component. It was likely that achieving knowledge resulted from having many mutually reinforcing program components.

The research study assessed participant satisfaction with the training program by using single questions rating satisfaction. The scores were fairly high. However, the researchers may have failed to ask questions regarding additional key points needed for evaluation by using this quantitative method. For example, barriers and problems to care from the participants' perspectives were needed to focus. Although CHCWs were given the opportunity for open-ended comments, an arms-length qualitative evaluation might have provided additional feedback

7.6 Conclusions

An innovative diabetes prevention education program was initiated in Thailand. Successful community-based training programs have been addressed through coalitions of health professionals, academicians, community members, and practitioners (Baker *et al.*,

1998; Huang *et al.*, 2002; Jenum *et al.*, 2006; Satterfield *et al.*, 2003). Hence, the diabetes prevention education program was developed through partnerships among university-affiliated health professionals, local health professionals, CHCWs, and at-risk community members. A local network was established and facilitated the research program. In order to identify health problems within the target community and guide the design of the tailored training program for CHCWs, formative research was a crucial step and conducted in the early phase of the program. The diabetes prevention education program was effective in improving CHCWs' health knowledge relevant diabetes prevention. The innovative learning model has potential to expand chronic disease prevention training of CHCWs to other parts of Thailand. Ultimately, prevention of chronic diseases and associated risk factors should be enhanced.

7.7 Next steps

7.7.1 Research plan

The current research is part of an on-going study that will evaluate the effectiveness of the new training approach six-months post-training, on long-term knowledge of CHCWs, community activities and awareness of key messages by at-risk community members in CHCWs' communities. To date, the researchers have collected the baseline data of 987 at-risk members in 69 villages in five districts of CHCWs' in both intervention and control communities (**Appendix C**). The baseline data consisted of awareness of key messages related to diabetes and nutrition; weight, height, and waist circumference measurements; and blood pressure. The researchers anticipate that diabetes prevention activities and community understanding of key messages and risk factors of diabetes will be enhanced in intervention

versus control communities. The result of this phase should become available in 2010. During this phase, the researchers do not expect to see weight loss or physical activity increase given the short term outcome.

7.7.2 Potential

Diabetes can be delayed and prevented by targeting specific lifestyle behaviors within the context of the communities (Pichette *et al.*, 1997; Caballero *et al.*, 1998; Gittelsohn *et al.*, 1999; Gilliland *et al.*, 2002). The training approach is an effective model for CHCWs to support their gain in knowledge and support dissemination to community people. This training format has potential for wide dissemination for other training needs. This model can also be adapted to other communities within Thailand. Finally, a well-designed CHCW training program is only one part of a comprehensive strategy for diabetes prevention that should involve community organizations, health professors, CHCWs, and MOPH as partners to prevent diabetes.

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APPENDICES

APPENDIX A: Interview guidelines for in-depth interviews and focus groups

**Interviewing guideline for in-depth interviews
with health care professionals**

1. CHCWs' Responsibilities

- 1.1. Routine work for a week
- 1.2. Explain / focus on NCD work
- 1.3. How do you feel about your work
- 1.4. How can the project support your work

(Probe: about health promotion activities or continuing education points)

2. Diabetes situation in the community

- 2.1. Explain about this problem in this community
- 2.2. How are you doing with at-risk groups?
- 2.3. Explain about activities of CHCWs to support the groups

3. Knowledge support

- 3.1. Discuss about sources of health information
- 3.2. Discuss about current knowledge and practices regarding diabetes
prevention / health promotion / nutrition
- 3.3. Discuss approaches / methods you used to access to health information
- 3.4. Discuss about advantages and disadvantages of information technology
for helping you to learn and full fill your roles

4. Usability / practical

- 4.1. Discuss about class / training approaches that you like to participate in
(Probe: class/training incorporate technology, e-mail/ web-based or chat groups,
and practical assignments)

- 4.2. Discuss about topics of training that you would like to know more about to support your work (Probe: What knowledge do you need to be more effective, what skill do you need, what on-going support and how do you like to learn)
- 4.3. Discuss about an example of training module (Probe: the training using learner-center approach, move away from didactic instructor driven and using D4L process)
- 4.4. Discuss about current strategies or approaches that you use to teach at-risk Groups (Probe: frequency, reach, evaluation)
- 4.5. Discuss CHCWs' interaction with at-risk groups regarding knowledge, health prevention, or health promotion.

5. What challenges

- 5.1. How could a diabetes prevention programs be implemented effectively in your community
- 5.1. Discuss about what will need to be place for the program to be successful
- 5.2. What will be the challenges?

**Interviewing guideline for focus group and in-depth interview
with at-risk community member**

1. Diabetes history

- 1.1. Family history of diabetes
- 1.2. Expectations about developing diabetes
- 1.3. Participant's understanding of diabetes at the time of screening test

2. Knowledge of food selection and eating patterns recommended about nutrition

- 2.1. Beliefs about the relationship among diabetes, food selection, and eating patterns
- 2.2. Understanding of the guidelines for a "recommended diet" for health

3. Institutional aspects of health information / health education

- 3.1. Participant's interaction with their physicians /CHCWs regarding health information
- 3.2. Sources of educational information for healthy eating
- 3.3. Impressions of formal health education received
- 3.4. What did you receive in the way of health information or health education that was most helpful to you?
- 3.5. What did you receive in the way of health information or health education that was least helpful to you?

4. Other sources of health information

- 4.1. Discuss about other sources of health information you used
- 4.2. Do you use the Internet to find health information? Why?
- 4.3. How do you feel about health information technology?

4.4. Do you have any concerns about health information on the Internet?

5. Usability

5.1. Discuss about the way that you like to know about health information

5.2. How do you share health information with your community now?

5.3. What supports would help you to prevent type 2 diabetes in your
community?

5.4. How could a diabetes prevention program be implemented effectively in your
community

APPENDIX B: Invitation letter and consent form

Date

Dear (*insert participant's name*):

My name is Kitti Sranacharoenpong and I am a PhD candidate at the Department of Health Studies and Gerontology of the University of Waterloo (UW), Canada. I, along with Dr. Rhona Hanning (UW) and Dr.Suttalak Smitasiri (Institute of Nutrition, Mahidol University, INMU), have received Chiang Mai Hospital Board's approval to conduct interviews with key individuals as part of the project entitled, "Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand"

The interview will be used to help develop a program using information technology, to support healthcare workers in the prevention of chronic disease, e.g., type 2 diabetes. The interview will be facilitated by Kitti Sranacharoenpong.

Participation in this session is voluntary and involves an hour of your time to discuss issues associated with the topic above. The sample interview questions are "Is type 2 diabetes a problem in Thailand?" and "What do you think of lay health care workers current knowledge and practices regarding type 2 diabetes prevention/health promotion?" There are no known or anticipated risks to your participation in this session. You may decline answering any questions you feel you do not wish to answer and may withdraw from participation at any time by advising the researcher. Declining to answer a question or to participate will in no way influence your employment or relationship with the INMU. All information you provide will be considered confidential and grouped with responses from other participants.

Your name will not be identified with the information you provide. Further, you will not be identified by name in the thesis or any report resulting from this study. Interviews will be conducted at provincial hospitals, district or sub-district hospitals, or health centers in Chiang Mai province, Thailand. With your permission, the interview will be audiotaped. The tapes, as well as any notes relating to the interviews will be kept in locked filing cabinets at INMU and University of Waterloo for five years and then confidentially destroyed.

If you have any questions about participation in this interview, please feel free to discuss these with the interviewer, or later, by contacting Dr. Suttalak Smitasiri (INMU), at +662-441-0218. If you are interested in receiving a copy of the executive summary of the interview outcomes, please contact Kitti Sranacharoenpong at ksranach@ahsmail.uwaterloo.ca

I will contact you by phone within 3 days to ask whether you are interested in participating in this study. If you would like to help us in the interview session, I will confirm about place and time.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo, Canada and Mahidol University, Thailand. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes of this office at +01-1-519-888-4567 Ext. 36005 or e-mail at ssykes@uwaterloo.ca.

Thank you for your assistance with this project.

Yours sincerely,

Kitti Sranacharoenpong, PhD Candidate
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CONSENT FORM (INTERVIEW)

I have read the information presented in the information letter about the study being conducted by Kitti Sranachoenpong. I have had the opportunity to ask the researcher any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted. I am aware that I may withdraw from participation without penalty at any time by advising the facilitator of this decision.

I understand that the interview will be audio taped to facilitate the collection of information with the understanding that all information which I provide will be held in confidence and I will not be identified in the thesis, summary report, or publication. I understand that I may withdraw this consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo, Canada and Mahidol University, Thailand. I understand that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Office of Research Ethics, Dr. Susan Sykes of this office at +01-1-519-888-4567 Ext. 36005 (UW), at ssykes@uwaterloo.ca, or Kitti Sranachoenpong at +662-441-0218 (INMU), at ksranach@ahsmail.uwaterloo.ca, or Dr. Rhona Hanning at +01-1-519-888-4567 Ext. 35685 (UW), at rhanning@healthy.uwaterloo.ca.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this interview and to keep in confidence information that could identify specific participants and/or the information they provided.

(Print) participant's name

Participant's signature

Date (mm/dd/yyyy)

Witness's signature

Date (mm/dd/yyyy)

The consent will not be completed until just prior to the interview.

APPENDIX C: Baseline results of at-risk population

CHAPTER 3: ADDENDUM

Method:

1. Setting and subjects

The study was conducted in five districts in Chiang Mai province. From each of the communities in intervention (n = 35) and control (n = 34) groups for the CHCW study, were recruited 18 at-risk individuals (9 males, 9 females) by community screening for a total of 1,100 subjects. At-risk subjects were recruited by CHCWs and invited by the project. The at-risk groups for diabetes include those who are;

- 1) overweight or obese (Body Mass Index (BMI) ≥ 25 , and/or
- 2) Waist circumference ≥ 90 cm. in males and ≥ 80 cm. in females, but do not have known diabetes, and/or
- 3) Hypertension, and/or
- 4) Family history of type 2 diabetes.

2. Data collection

Participants agreeing to participate completed a brief knowledge test and provided contact information for follow-up. Data were collected by Sranacharoenpong K and his team before the training sessions for CHCWs had been started. General characteristics, anthropometric measurements (weight, height, and waist circumference), blood pressure, factors related to diabetes, sources of health information, and nutrition knowledge and awareness of key words relating to healthy eating were collected. It took 2 -2.5 hours for data collection in each community. No monetary compensation was provided. However, a incentive gift of the project and health data were disseminated to the participants.

3. Questionnaire

The development of the questionnaire was based on studies of Amend (2007), Mochari (2008), and Segal-Isaacson (2004). The content of questionnaire was reviewed with faculty from INMU and UW. The questionnaire consisted of four parts; general information, understanding of risk factors of diabetes, understanding and awareness of healthy key words, and understanding of nutrition knowledge.

Results:

Table C.1 shows the general information of 987 participants completing the questionnaire. Of these, 50% were female, 70% finished primary school.

Table C.1: General information of at-risk population

	Group	
	Intervention	Control
Total (n, (%))	511 (52)	476 (48)
Gender (n, (%))		
- Male.....	230 (45)	205 (43)
- Female.....	281 (55)	271 (57)
Age, years (n, (%))		
< 44.....	122 (23.9)	124 (26.1)
45-49.....	115 (22.5)	103 (21.6)
> 50.....	274 (53.6)	249 (52.3)
Education level		
- No education.....	12 (2.3)	9 (1.9)
- Primary school.....	364 (71.2)	357 (75.0)
- Secondary school.....	107 (20.9)	83 (17.4)
- Vocational college.....	19 (3.7)	11 (2.3)
- University.....	9 (1.8)	16 (5.2)
Marriage status		
- Single.....	56 (11)	40 (8.4)
- Married.....	386 (75.5)	379 (79.6)
- Widowed.....	49 (9.6)	37 (7.8)
- Divorced.....	20 (3.9)	20 (4.2)

Table C.2 shows risk factors related to type 2 diabetes and diabetes risk score. More than forty percent of both groups were overweight and obese. Hypertension was a problem of participants in both groups. The percent of individuals whose waist circumference was over the standard was higher in females than males. Sixty per cent had family members who passed away by or had history of type 2 diabetes. The average DRS score of both groups was 9.9.

Table C.2: Risk factors related to type 2 diabetes

	Group	
	Intervention (N = 511)	Control (N = 476)
Body mass index* (n, (%))		
- overweight (≥ 23 to ≤ 27.5).....	212 (41.5)	178 (37.4)
- Obesity (≥ 27.5).....	205 (40.1)	206 (43.3)
Hypertension (n, (%)).....	216 (42.3)	188 (39.5)
Waist circumference (n, (%))		
- Male: > 90 cm.....	106 (20.7)	102 (21.4)
- Female: > 80 cm.....	212 (41.5)	207 (43.5)
Family history of type 2 diabetes (n, (%)).....	302 (59.1)	293 (61.6)
Diabetes Risk Score (DRS) (n, (%))		
- DRS < 6.....	47 (9.2)	40 (8.4)
- DRS 6 – 8.....	113 (22.1)	121 (25.4)
- DRS 9 -10.....	109 (21.3)	80 (16.8)
- DRS ≥ 11	242 (47.4)	235 (49.4)
- Median (min, max).....	10 (0, 17)	10 (0, 17)
- Mean (SD).....	9.9 (3.28)	9.9 (3.29)

* WHO expert consultation (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. The Lancet, 157-163.

Table C.3 shows top five sources of health information. Most had received health information from doctor, nurses at hospitals, and from CHCWs at health care centers. TV and radio were cited as media from which participants received messages and information more often than newspapers.

Table C.3: Top 5 sources of health information

Rank	Intervention group		Control group	
	source	(n, (%))	source	(n, (%))
1	Doctors, nurses, CHCWs.....	114 (24)	Doctors, nurses, CHCWs.....	110 (22)
2	TV.....	90 (19)	TV.....	101 (20)
3	Radio.....	75 (16)	Hospitals.....	72 (14)
4	Health care volunteers...	53 (11)	Health care volunteers...	72 (14)
5	Relatives, friends.....	48 (10)	Radio.....	72 (14)

Table C.4 – C.6 indicate that participants did not understand factors related type 2 diabetes, nutritional knowledge, and key words regarding healthy eating. Although some participants responded that they understood key words, further investigation found that they often misunderstood some aspects of prevention and health knowledge.

Table C.4: Baseline of knowledge score

	Group	
	Intervention (N = 511)	Control (N = 476)
Understanding of factors related type 2 diabetes (score = 25)		
- Median (min, max).....	8 (0, 14)	8 (0, 15)
- Mean (SD).....	8.4 (2.34)	8.3 (2.37)
Understanding of nutritional knowledge (score = 16)		
- Median (min, max).....	5 (0, 12)	5 (0, 14)
- Mean (SD).....	5.2 (2.41)	5.2 (2.33)

Table C.5: Have you ever heard these key words?

Key words	Intervention (n = 511) (n, (%))			Control (n = 476) (n, (%))		
	Never	Yes		Never	Yes	
		But, don't understand	understand		But, don't understand	understand
1. Unsaturated fat	256 (50)	190 (37)	65 (13)	227 (48)	161 (34)	88 (19)
2. Body mass index	288 (56)	137 (27)	86 (17)	298 (63)	101 (21)	77 (16)
3. Food exchange list	253 (50)	180 (35)	78 (15)	257 (54)	140 (29)	79 (17)

Key words	Intervention (n = 511) (n, (%))			Control (n = 476) (n, (%))		
	Never	Yes		Never	Yes	
		But, don't understand	understand		But, don't understand	understand
4. Appropriate waist circumference	150 (29)	136 (27)	255 (44)	155 (33)	128 (27)	193 (41)
5. Energy 2000 Kcal	265 (52)	186 (36)	60 (12)	240 (50)	179 (38)	57 (12)
6. High sodium	235 (46)	200 (39)	76 (15)	209 (44)	189 (40)	78 (16)
7. Antioxidant	226 (44)	213 (42)	72 (14)	217 (46)	193 (41)	66 (14)
8. Fiber	170 (33)	176 (34)	165 (32)	146 (31)	155 (33)	175 (37)
9. Cholesterol	93 (18)	158 (31)	260 (51)	76 (16)	157 (33)	243 (51)
10. Omega- 3	238 (47)	202 (40)	71 (14)	236 (50)	187 (39)	53 (11)

Table C.6: Additional testing of participants who claimed to understand key words (from Table H.5) to assess true understandings

Key words and questions	Intervention	Control
	Correct (n, (%))	Correct (n, (%))
1. Unsaturated fat <i>Question: Unsaturated fat is fat that experts say is most important for people to cut down.</i>	39 (60) (n = 65)	42 (48) (n = 88)
2. Body mass index <i>Question: The normal level of BMI is 26 kg/m².</i>	18 (21) (n = 86)	19 (25) (n = 77)
3. Food exchange list <i>Question: Small fishes are a good source of calcium similar to milk.</i>	67 (86) (n = 78)	64 (81) (n = 79)
4. Appropriate waist circumference <i>Question: The appropriate waist circumference for male is not more than 40 inches.</i> <i>Question: The appropriate waist circumference for female is not more than 35 inches.</i>	57 (25) 52 (23) (n = 225)	47 (24) 53 (28) (n = 193)
5. Energy <i>Question: What energy level per day do the Thai FBDGs recommend for adults?</i>	0 (0) (n = 60)	0 (0) (n = 57)
6. High sodium <i>Question: Fermented traditional soy beans are low in sodium.</i>	22 (29) (n = 76)	24 (31) (n = 78)

Key words and questions	Intervention	Control
	Correct (n, (%))	Correct (n, (%))
7. Antioxidant <i>Question: Vitamin C is an Antioxidant.</i>	39 (54) <i>(n =72)</i>	37 (56) <i>(n =66)</i>
8. Fiber <i>Question: Durians provide low fiber.</i> <i>Question: Brown rice provides more fiber than sticky rice.</i>	58 (35) 138 (84) <i>(n = 165)</i>	75 (43) 149 (85) <i>(n=175)</i>
9. Cholesterol <i>Question: Coconut milk is high in cholesterol.</i>	17 (7) <i>(n = 260)</i>	15 (6) <i>(n = 243)</i>
10. Omega- 3 <i>Question: Tuna fishes are a bad source of fat.</i>	25 (35) <i>(n = 71)</i>	30 (57) <i>(n = 53)</i>

Discussion

The results of the community assessment show that community members who were, for the most part, at risk for diabetes had poor knowledge or understanding of type 2 diabetes risk factors, understanding of nutritional knowledge, and understanding of healthy eating key words.

Since CHCWs are one of the main sources of information reported by these individuals, the findings add further support to the need for a diabetes prevention education program for CHCWs. The findings further identify areas of confusion regarding diabetes and nutrition concepts that CHCWs can potentially clarify. The findings also direct CHCWs to potential media and other sources for disseminating their health information.

APPENDIX D: Diabetes education prevention program

Diabetes education prevention program for community health care workers in Chiang Mai province, Thailand

Introduction

The diabetes training course will be designed to facilitate the learning and skill development of community health care workers (CHCWs) about community-based prevention of type 2 diabetes. In designing a curriculum, teaching approaches and learning theories, creativity, fun and experiential learning should be incorporated. This training course will serve as a basis of health education for workers; however, it will also encompass key health messages for the population about diet, physical activity, smoking and symptoms of type 2 diabetes. An adjunct to the interactive-computer based learning modules will be the links to human and material resources and support. The key components of the proposed program content are: Diabetes and Lifestyle, Nutrition, Fitness and Understanding the Human Body. There are eight modules designed to be delivered in any order. They are designed to complement each other. CHCWs may also choose to work through the modules in a fragmented fashion; each part of a module has a clear introduction and closure, allowing learners to divide each module into several shorter lessons, or to incorporate the content of different modules in a given learning session.

Format of diabetes education prevention program

1. Target groups:

- 1.1. CHCWs in Chiang Mai province have background about primary health care and public health.
- 1.2. CHCWs work at community health care centers, the sub-district levels.
- 1.3. Education levels of CHCWs are Bachelors' degree of nursing or public health.
- 1.4. CHCWs are familiar with basic computer skills.

2. Assumption:

2.1. The program will be delivered by instructors or facilitators over 2.5 - 3 hours once a week for 4 months (total = 37- 40 hours) and on-going support will be provided an additional six months;

2.2. The program, including the facilitated learning activities, will engage learners through E-learning via web-base (www.FitThai.org) and/or CD-ROM;

2.3. Learning activities are designed to work with the least advanced computer system in Chiang Mai community health care centers (e.g., Microsoft XP, speed of internet 56 K, high speed internet, or wireless)

2.4. CHCWs have input into the design and on-going quality improvement of the program.

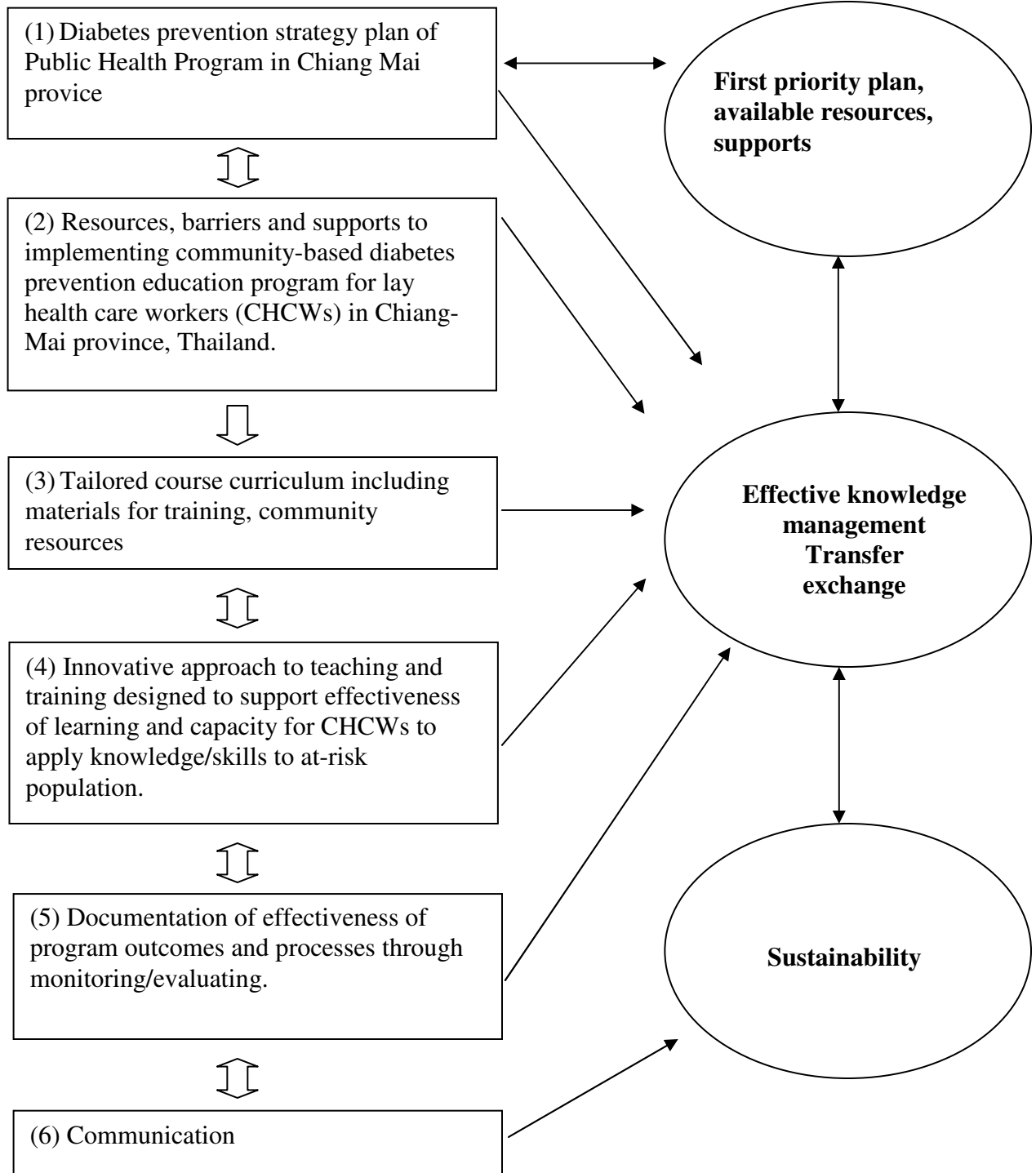
3. Instructors:

3.1. Sranacharoenpong K, a PhD. Candidate at the University of Waterloo, Canada

4. Language:

Program instructions are in Thai and resource materials will be developed in both Thai and English.

Conceptual framework (based on formative evaluation)



Course contents

The course curriculum will be designed to prepare CHCWs with a strong background to support activities aimed at prevention of diabetes for at-risk people.

There are eight modules that would normally be delivered over 16 sessions of 2.5 hours each. The following sections describe each module of the curriculum according to the objectives, anticipated learning outcomes, teaching strategies, logistics (time and resources), and any associated self-directed learning and evaluation activities. By the time CHCWs have completed the health education training, they should attain the following global objectives.

Course delivery format

1. The program designed

Module	Session	Learning strategy	Activities/ Tools/Materials				Evaluations	
			Web-info	Audio	Clip	Newsletter	In-class	On-line
1	1	In-class	✓				✓	
2	2	In-class	✓				✓	
	3	Self-learning	✓		✓	✓		✓
	4	(Activity)	-----(<i>collect baseline data</i>)-----					
	5	(Activity)						
	6	In-class	✓				✓	
3/4	7	Self-learning	✓	✓	✓	✓		✓
	8	In-class	✓				✓	
	9	Self-learning	✓	✓	✓	✓		✓
	10	In-class	✓				✓	
5/6	11	Self-learning	✓	✓	✓	✓		✓
	12	In-class	✓				✓	
7	13	Self-learning	✓	✓	✓	✓		✓
	14	In-class	✓				✓	
8	15	In-class	✓				✓	

2. Teaching and learning strategies:

The theoretical foundation on which the learning program for CHCWs is based, is the T5 instructional design model of the University of Waterloo, Canada. T5 model draws from constructivism socially shared cognition and distributed learning theory. The underlying premise is that students learn better through opportunities for interaction, feedback, reflection and active application of concepts. By extension, CHCWs will apply adult learning principles to help their communities and community members to integrate new information, e.g., regarding food labeling, dietary guidelines and healthy eating index.

The traditional approach to learning in Thailand is didactic, in that teachers play major roles in the class. The learners are only listeners, absorbing and interpreting foundational knowledge. The starting courses with foundational knowledge/information are used for learners' remembering and understanding. Once the learners can remember and understand, teachers hope that they can move on to the higher skills of learning, such as applying, analyzing, evaluating and creating. However, the problems of the traditional approach to learning are not only that students lack motivation and engagement in mastering the foundational knowledge/information, but also that they have difficulty remembering and understanding. The D4L process places the learners within a supportive environment that motivates by engaging them in higher level applications as a way of mastering each set of primary and ancillary competencies. The focus of the diabetes prevention education program will be on engaging the learners in applications where they are asked to apply, analyze, evaluate or create 'some things' relative to the defined course competency. The ancillary foundational knowledge, which is required in mastering the primary competencies, is in turn mastered through the association of mastering the primary competencies. The diabetes program will be delivered using different approaches. Group discussions, self learning and

problem based case study are integrated in the program.

3. Tool and materials:

Technology helps to organize learning materials, assignments and resources to promote application, integration and synthesis of course content vs memorization of information. The use of learning technology also facilitates ongoing support of learners (CHCWs). The website for the project (www.FitThai.org) will be created to organize learning materials, assignments and resources. Newsletters, brochures, audio clip, VDO clip may be used to support CHCWs' learning.

Module 1: Introduction and overview of the training program and pre-test

Goal: To motivate CHCWs to participate fully for the full program.

Learning Objectives:

By the end of the first session:

1. Prior Learning Assessment: Participants will have completed a baseline evaluation designed to test their knowledge of key diabetes-related concepts and their self-reported confidence in performing specific activities/skills related to diabetes prevention/ public health programming in their communities.

2. Participants will identify their personal goals for participation. They will also identify specific learning priorities and interests through ranking various curriculum sub-topics, skills and other course components. They will identify if they already feel that they have sufficient knowledge or skill in any of these areas.

3. Participants will be aware of the overall course objectives, curriculum and expectations for participation and evaluation. They will have received a binder with written documentation of the course objectives and curriculum.

4. Participants will gain familiarity with some of the approaches that will be used in class, e.g., small group activities, sharing and discussion.

5. By the end of the post-class: Module 1 assignment, participants will have demonstrated that they know how to log on to the course web site, access materials, submit assignments and use web-based communication strategies.

Learning Environment Tasks:

1. Welcome and Introductions
2. Ice breaker activities:
3. Small group activity: Students might be asked to reflect and share “One of the most enjoyable learning experiences I ever had”.
4. Evaluation Activity: Students complete prior learning knowledge and baseline confidence assessments.
5. Needs Assessment: Students rank their priorities, interests and prior learning.
6. Lecture: The course objectives and curriculum will be introduced and a binder of materials provided. Students will be introduced to the course web site, their personal login information and how to use the site.
7. Summative Activity: Students will complete a sheet on their personal goals for participating in the course.

Assessment:

Use the web-site discussion board to;

- 1) Access the reading for next week, and
- 2) Answer the module one questions which instructor has posted under the course materials section.

Module 2: The role of the CHCWs to prevent diabetes, community awareness and promotion, and evaluation

Goal: CHCWs understand that they are part of a team, which includes the persons with risk factors of diabetes. Their roles are also to work with other team member to improve the health and quality of life of their at-risk populations with diabetes.

Learning Objectives:

2. Participants will be able to use local survey data to identify specific sub-populations at increased or decreased risk for type 2 diabetes.
3. Participants will be able to accurately measure height, weight and waist circumference. They will appraise values against recognized criteria.
4. Participants will be able to examine a one- day dietary record and modify the foods to reflect dietary recommendations for healthy eating.
5. Participants will be able to examine a food frequency questionnaire to understand dietary food pattern of at-risk population

Learning Environment Tasks:

1. Web-based approach (self learning):

Task 1: Weight, height and waist circumference

Task 1.1: Problem based situation. Participants will review task 1 and task 2 on the website before they come to the class for discussion.

One day in your community, you (CHCWs) meet three women who are going to

make a merit at the temple. This month there are a lot of Thai festivals at the temple and Ms.Pong mentions that she is worried about her weight gain. She so enjoys eating after she makes merit and meets a lot of her friends at the temple. Ms. A. and Ms. B do agree with Ms. C. Therefore, they ask you if they seem overweight or obese. What do you want to tell them? What are you going to suggest to them about monitoring their weight? What is an easy method to interpret the results? In your opinion, who is overweight or obese (# 1, 2 or 3) if you just only look at them? Do you think the others agree or disagree with you to judge overweight or obesity (if just look at)? What is the best way?

Task 1.2: These are information about weight and height of Ms. A, Ms. B and Ms.C that might be helpful for you to suggest them. What do you want to tell them?

Name	Current weight (kg.)	Current height (cm.)
1. Ms. A	62	155
2. Ms. B	62	160
3. Ms. C	64	160

Task 2: Food record and dietary food pattern

Task 2.1: Prepare guideline, food record form and real size utensil pictures for CHCWs to record their food for one day.

Task 2.2: Prepare guideline, food frequency questionnaire for CHCWs to record their food habit.

2. In class approach:

Task 1: Weight, height and waist circumference

Activity 1: Open floor for all CHCWs to discuss about the problem and present their opinion.

Activity 2: Practice measuring weight and height correctly

A teacher (Sranacharoenpong K) will explain about measuring weight and height correctly.

All CHCWs will practice to measure their own / their friends' weight and height.

Activity 3: Practice interpreting the result by BMI chart and calculation

1. A teacher will ask CHCWs' opinion about interpreting their weight and height.
2. A teacher will explain about BMI and show the method to interpret weight and height.
3. A teacher will show the BMI calculation formula.
4. A teacher will explain more details of risk factor of overweight and obesity related to disease. The class will discuss any advantages and limitations of the BMI method.

Task 2: Food record and dietary food pattern

Each participant reports his/her result. He/she will discuss the problems when he/she records food (see form attached).

Task 3: Using local survey data to identify specific sub-populations

Participants identify sub-population with risk factors of type 2 diabetes from their local survey data. Instructor will lead them to understand a Diabetes Risk Score (DRS) to identify at-risk population with type 2 diabetes.

Brainstorm and find the method to support CHCWs to collect data and the way to identify at-risk population accurately.

3. Activities, tools and materials support:

- Clip: The importance of breakfast related to obesity, diabetes and other disease (From Thai TV program)
- Clip: Diabetes risk factors by Associate Professor Sirichakwal PP, the Institute of Nutrition, Mahidol University, Thailand

Assessment:

Web-based:

Use the web-site discussion board to;

- 1) access the reading for next week,
- 2) access the supported materials
- 3) answer the module two questions which instructor has posted under the course materials section, and

In class:

- 1) Participatory rate
- 2) Comments and rank their opinion of each question of the module two

**1 day food record form
(based on Thai Food Based Dietary Guidelines (FBDGs))**

Please count your portion size in each food group based on Thai FBDGs.

Sum your food portion sizes in each food group and compared with recommendation.

Name-surname.....gender.....age.....years

Date of record (dd/mm/yyyy).....

Do you exercise regularly? () Yes () No

Weight.....kg. Height.....cm.

BMI = (kg / m²) Normal BMI = 18.5 – 22.9 kg / m²

Energy / portion		1	2	3	4	5	6	7	8	9	10	11	12
83	Rice group												
RSSs* / day												

*RSS = Rice Serving Spoon

Energy / portion		1	2	3	4	5	6
11	Vegetable group						
RSSs* / day						

Energy / portion		1	2	3	4	5
67	Fruit group					
Portions / day					

Energy / portion		1	2	3	4	5	6	7	8	9	10	11	12
26	Meat group												
Spoons / day												

Energy / portion		1	2	3
124	Milk group			
Glasses / day			

Energy / portion		1	2	3	4	5	6	7	8	9
45	Fat group									
Tea spoons / day									

Energy / portion		1	2	3	4	5	6	7	8
20	Sugar								
Tea spoons / day								

Total energyKcal/day

Module 3/4: Eat right, find the way

Goal: To provide a basis for nutritional knowledge for healthy living that;

- understand food based dietary guideline for Thai people, and
- understand nutrition flag and appropriate food portion for each person.

Learning Objectives:

1. Participants will identify the components of a healthy diet; an overview of the good healthy eating guide (Thai food based dietary guidelines), an explanation of five food groups concept and their impacts on body weight and diabetes.

2. Participants will describe the benefits of healthy eating and identify factors influencing eating habits. They will also identify strategies to overcome barriers/support healthy eating in their communities.

3. Participants will be able to instruct groups on healthy portion sizes for each food group.

4. Participants will gain familiarity with some of the design and implementation of community learning resources (e.g., eating tips, menu planning) that will demonstrate in the class.

5. Participants will gain familiarity with some of the learning objects; a flexible meal planning tool to educate individuals and groups about improving eating habits that will be demonstrated in the class.

6. Participants will gain familiarity to adapt existing resources for education (e.g., menu planning) to the local context, e.g., local foods, northern Thai foods.

Learning Environment Tasks:

1. Web-based approach (self learning):

Task 1.1. Understanding of food groups in “Nutritional Flag”

The instructor will prepare self learning tasks for participants. Participants identify each food in five food groups in nutritional flag. They have to complete the task before attending the class.

Task 1.2. Understand ground on healthy portion sizes for each food group

Participants will learn to estimate portion of foods from photographs.

Task 1.3. Eat right, find the way

Participants will listen to audio files as lists below that will be assigned to participants each time before they discuss in the class. The length of each audio file is around 10 to 15 minutes. The audio knowledge will be recorded from the experts at Institute of Nutrition, Mahidol University, Thailand

1. *Eat right, find the way: Part 1*
2. *Eat right, find the way: Part 2*
3. *Eat right, find the way: Sugar, salt and Oils*
4. *Eat right, find the way: Vegetable and Fruit*
5. *Eat right, find the way: Rice and cereal group, meat group and milk group*

Task 1.4. Learn to evaluate yourself from “Nutritional Flag”

Participants will record their food for one day to understand the way to estimate the portion size in each food group. The record form and guideline will be provided online. Participants have to finish this task before next class and bring the assignment for discussion.

2. In class approach:

Task 1.1. Discussion

Volunteer participants will lead the group to discuss about these topics:

- The problems and understand of food in each food group based on Nutritional Flag
- The problems of estimation food portion size and tips to easily to remember and apply
- The understanding of using evaluation form of Nutritional Flag
- The understanding of “Eat right, find the way” in each audio file and the way to communicate right message to at-risk population with diabetes

Task 1.2. Demonstration

Some foods in each food group will be prepared to demonstrate to the participants each portion size. Combination foods (e.g., noodles with soup and fish balls, rice on top with pork green curry, and Pad-Thai) and local food (e.g., rice noodle with local curry, chilli paste) will be prepared for them to estimate the main ingredients.

Task 1.3. Summarize key messages

Instructor will summarize key messages each time and provide materials supported.

Assessment:

Web-based:

Use the web-site discussion board to;

- 1) Access the reading for next week,
- 2) Access the support materials

- 3) Answer the module questions which instructor has posted under the course materials section, and

In class:

- 1) Participatory rate
- 2) Comments and rank their opinions of each question of the module
- 3) Participants will be able to identify food items in five food groups
- 4) Participants will be able to recommend appropriate food portion size for people.

**Module 5/6: Concerning of food products/supplements, nutritional labeling,
and party/social food**

Goal: To provide participants with an understanding of food products/supplements concerning, nutritional labeling, and party/social food. These selected issues were related to prevent diabetes for at-risk populations. Participants also demonstrate their understanding of key messages, communication, and awareness.

Learning Objectives:

1. Participants will be able to understand the importance and necessity of some food products/supplements.
2. Participants will be able to read and explain the importance nutritional labeling and the meaning of key messages of the labeling.
3. Participants will be able to understand social factors that might affect at-risk persons' health, e.g., party/social food and local food when they have often special events in their community.

Learning Environment Tasks:

1. Web-based approach (self learning):

Task 1. Food products and supplements

Listen to audio file from the expert to get some idea and answer questions

Task 2. Nutritional labeling

Participants will bring a nutritional label that they find interesting and might or might

not understand to the class for discussion.

Task 3. Party/ social food

Problem-based situation will be provided to all participants. Participants should read the situations and set their own three questions. They will bring their questions to the class for discussion.

2. In class approach:

Task 1. Group discussion

Volunteer participants will lead the group to discuss and food products / supplements. In addition, each participant will discuss about nutritional label concerning/questions that participants prepares before the class.

Task 2. Brainstorm of social factors in their communities

Participants will brainstorm about social factors affecting people when they have special events in their communities. They will find the best way to suggest to people avoiding or reducing some foods that might be risk factors.

Assessment:

Web-based:

Use the web-site discussion board to;

- 1) Access the reading for next week,
- 2) Access the support materials
- 3) Answer the module questions which instructor has posted under the course materials section, and

In class:

- 1) Participatory rate
- 2) Comments and rank their opinions of each question of the module
- 3) Participants will be able to understand key messages of food products / supplements, nutritional labeling and social factors.

Module 7: Fit Fit Fit! You do it, you got it.

Goal: To provide participants with knowledge regarding methods and motivations that can optimize the benefits and minimize the risk of regular exercise.

Learning Objectives:

1. Participants will discuss about barriers to physical activity. Participants will also discuss the benefits of being active, physical activity guidelines, tips on how to get active and strategies to stay active.

2. Participants will discuss and identify ways to cue physical activity (e.g., post an activity graph, physical activity resources)

3. Participants can recommend physical activities that may be done at home.

4. Participants will learn ways to motivate at-risk populations and to use monitor physical activity form.

Learning Environment Tasks:

1. Web-based approach (self learning):

Task 1: Complete questions before attending the class

Q.1. List any barriers to physical activity from your experience. (We will use this question to solve problems and find the way from the group to motivate at-risk population.)

Q.2. List ways to cue physical activity

Task 2: Physical activity form

Participants will record their activities for three days according to the form and

guideline provided.

Task 3: All participants will complete this task before attending the class

We will provide audio clip interviewing from the expert.

2. In class approach:

Task 1: Group discussions

- Opening floor for all participants will discuss about self learning task 1, 2 questions.

We will summarize and find the best way for motivation for long term.

Discussion:

We have been talking about the kind of activity you will be recording in the form. Another important kind of activity is called “lifestyle activity”. It involves making active choices throughout the day. It is hard to record this kind of activity, so we are not asking you to write it down. However, it is just as important as what you do record.

An example of an inactive choice is when you shop, park your car as close as you can to the entrance the store. An active choice is to park your car further away and walk. Another example of an active choice is to walk up the stairs. An inactive choice would be to take the elevator. This may only take a minute or so to do, but every minute of activity has an impact on your overall health and it adds up to a “more active you”.

What are some active choices you could make during the day? What are some inactive choices you could limit?

- Participants will discuss the way to evaluate physical activity using the record form.
Possibilities, barriers, and sustainability?

Task 2: Volunteer participants will lead the group to discuss about these topics:

- Anywhere, anytime, anybody to exercise and the way to evaluate.
- “10,000 steps closer to preventing diabetes” Can you do it, how to know?

(We will provide audio clip interviewing from the expert.)

Assessment:

Web-based:

Use the web-site discussion board to;

- 1) Access the materials and questions for next week,
- 2) Answer the module questions which instructor has posted under the course materials section, and

In class:

- 1) Participatory rate
- 2) Comments and rank their opinions of each question of the module
- 3) Participants will be able to suggest other choices of physical activities to people.
- 4) Participants will be examine three days physical activity and interpret the result.

Module 8: What next, challenge you and post-test

Goal: To challenge CHCWs to prevent diabetes and other chronic diseases for people.

Learning Objectives:

1. To summarize all modules that participants have attended and answer their questions
2. To encourage and support participants in the future for their responsibility
3. Participants will have completed a post evaluation designed to test their knowledge gain of key messages and self-reported confidence in performing activities.

Learning Environment Tasks:

1. We will open floor for all participants to ask or express their opinions about diabetes prevention program that they attend for 4 months.
2. Participants complete post learning knowledge and confidence assessments.
3. Instructors will summarize key messages of the program
4. Closing ceremony

Assessment:

1. Post assessments

APPENDIX E: Examples of tailored materials of the program

1. Monthly newsletter

JOIN PROJECT AMONG:

- ◆ UNIVERSITY OF WATERLOO, CANADA
- ◆ INSTITUTE OF NUTRITION, MAHIDOL UNIVERSITY, THAILAND
- ◆ THE OFFICE OF DISEASE PREVENTION AND CONTROL 10, CHIANG MAI, THAILAND

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...Objective of "FitThai newsletter" is a tool to communicate between health care workers at the health care centers and experts to deliver health promotion and related information preventing chronic diseases for Thai people...

... Inside ...

**Eat Like Thais,
Free from
Diseases**

◆ Supported by
The Nestlé Foundation,
Switzerland



The banner features four images: a traditional Thai painting of a woman, a pink sign with Thai text, another traditional Thai painting, and the logos for the University of Waterloo, the Institute of Nutrition, and the FIT for Thai project. The FIT logo includes the Thai text 'กินพอดี มีสุขภาพดี' and 'UW Canada INMU Thailand'.

::: Newsletter :::

Issue 3: September, 2008 For more information, please visit the website, www.FitThai.org

Eat Like Thais, Free from Diseases

"The grass is always greener on the other side of the fence" means we often do not appreciate the value of the familiar. This parable is suitable for ones that prefer Western food or so called "Junk food" than Thai food or so called "Health food". There are always questions of how to eat to stay away from illness. The answer for that is to eat like Thais, free from diseases.



An illustration showing a family of three people sitting around a small table, eating a meal. The scene is set in a traditional Thai home with wooden pillars and a tiled floor. The family appears to be enjoying their food together.

Thais in the old days were very smart in eating. Thai dishes are set with varieties of healthful food. Foreigners admire Thai food as health food. This is because of its variety in types of food and ingredients. Thai food is often eaten in a set which comprises rice and 3-4 side dishes. Meat used in cooking is varied, and one can find a lot of vegetables in many side dishes i.e. vegetables with chili paste and mixed vegetables in hot

sour soup curry. Furthermore, Thai food is low in fat due to its cooking processes of boiling, grilling and roasting which hardly use oil except for a small amount when stir frying. Thai curry may or may not be cooked with coconut milk, which is high in saturated fat. Although there is coconut milk in curry, the chance of getting too much is low since Thais always eat a variety of other side dishes. Normally, if you eat like Thais, fat accounts for not more than 25-30% of total calories.

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Eat Like Thais, Free from Diseases

Examples of low fat Thai food are as follows.

Food	Calories (kcal)	Protein (grams)	Fat (grams)	Carbohydrate (grams)
Gang Lieng 1 serving (180 g)	89	10	1.2	8
Gang Som Dauk Kae 1 serving (180 g)	60	8	1.4	4
Tom-yum Goong 1 serving (180 g)	77	9	4	1.6
Yum Tua Poo 1 serving plate (115 g)	143	10.9	6.2	10.8
Yum Ma-kur Yow 1 serving plate (105 g)	78	5.4	3.2	7

The other selling point of Thai food is that it has herbs and spices as ingredients, which are of use to the body. Many herbs have fragrance and taste; thus, they are used in flavouring food. Studies have found that substances in herbs are able to prevent and cure diseases. Some Thai dishes have a very bold taste i.e., chili paste. If chili paste is not hot, it is not likely to be a Thai who cooked it! Chili paste must be hot, very hot to moderate hot depending on types of chili used.

Scented oils in garlic	may help lower triglyceride level in blood.
Flavonoid in onion	Antioxidant, inhibits the formation of free radicals.
Capcysin in chili pepper	Antioxidant, inhibits the formation of free radicals.

Another advantage of Thai food mentioned earlier is that it contains a lot of vegetables. Each type of vegetable has its own advantage. Generally, vegetables are sources of dietary fibre which is healthful, i.e., makes the excretory system function normally and binds toxic chemicals so that they go through the intestine quickly, which helps reduce formation of cancer. Colourful vegetables are rich in antioxidants. The last advantage of vegetables is the ability to reduce the absorption of cholesterol in the body, which helps lower a level of cholesterol in blood and the oxidation of cholesterol, which helps reduce atherosclerosis. How many portions of vegetables should we eat daily? The nutrition flag recommends eating 4-6 rice serving spoons of vegetables, but feel free to eat more than the recommended level.



“... Herbs in foods became interesting issues when we knew some of them can prevent diseases ...”



Eat Like Thais, Free from Diseases

Vegetable 1 rice serving spoon	Dietary Fibre (grams)
Cooked pumpkin 40 g	1.0
Cooked ivy gourd 50 g	1.4
Cooked kale 47 g	1.4
Cooked Chinese morning glory 50 g	1.1
Cooked water mimosa 42 g	2.1
Cooked long bean 45 g	1.7
Cooked celery cabbage 62 g	1.0
Uncooked long bean 50 g	1.9
Uncooked brinjal 62 g	1.8
Uncooked cucumber 58 g	0.6



“... preparing and cooking method of vegetables are important because they can preserve some nutritive values that can play role as antioxidants...”

Nowadays, the way of living of many Thais has changed. Some people probably think that they can't eat rice with side dishes when they have to prepare and eat food in a hurry. There are still choices for Thais who crave good health within Thai fast food. Even though it is called fast food like Western fast food, its nutritional value cannot be compared. Examples of Thai fast food with nutritional value are as shown in the table below.



Eat Like Thais, Free from Diseases

One Plate Menu	Calorie (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Dietary Fibre (g)	Remarks
Kow Yum Puk Tai 1 serving (189 g)	248	7.2	6.5	40.1	2.3	Low calorie High dietary fibre Low fat
Ka-nom Jean Num Yah 1 serving (435 g)	332	12.9	9.6	48.6	3.1	Low fat High dietary fibre
Ka-nom Jean Num Ngeeow 1 serving (323 g)	243	15.6	8.4	26.2	1.8	Low calorie High protein Low fat
Pud Thai Sai Khai 1 serving (244 g)	578	18.7	30	58.2	6.6	High dietary fibre High fat High protein High calorie
Guay-teow Sen Lek Hang 1 Serving (215 g)	421	18.4	17.8	46.8	3.6	High dietary fibre Moderate fat High protein High calorie
Kow Kloog Ga-pi 1 serving (296 g)	614	20.3	24.3	78.7	1.3	High fat High protein High calorie High sodium



“...Both of soluble and dissoluble dietary fibres are no any nutritive values, but they are important for digestive system ...”

Up until now, you have already perceived several advantages of Thai food for health both in the long and short run. In the long run, vegetables help prevent non-communicable diseases that start with obesity and can develop into other forms of diseases afterward. In the short run, Thai foods with vegetables help maintain normal daily nutrient requirements, help in the function of the excretory system, and also help the country to have a sustainable food system. However, good health does not mean to only eat well and eat enough. There are other factors that count, i.e., exercise regularly and avoid stress. This is not to totally oppose eating Western food. You can eat if you want to but go easy on oily, salty and sweetened foods.

JOIN PROJECT AMONG:
UNIVERSITY OF WATERLOO, CANADA
INSTITUTE OF NUTRITION, MAHIDOL
UNIVERSITY, THAILAND
THE OFFICE OF DISEASE PREVENTION AND
CONTROL 10, CHIANG MAI, THAILAND
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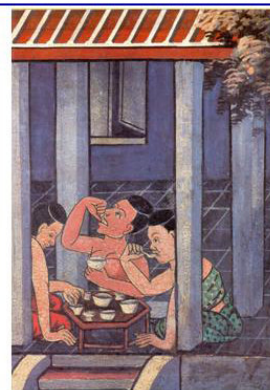
www.FitThai.org



Supported by
The Nestlé Foundation,
Switzerland

“... On nutrition issues, this research institute has thoroughly studied all aspects... Not only the technical or theoretical aspects of food and nutrition, but this institute has conducted research on all aspects and process, from food production to uses of foods in relation to health benefits and risks. Their work lps to elucidate how foods are beneficial for prevention or treatment of diet related diseases, or may contribute to unnecessary illness. The work covers how to promote healthy and strong populace, to be highly valued human resources for the country..”

**A speech of Her Royal Highness Princess Maha Chakri Sirindhorn
Given at a Special Lecture on
Delivery of Food and Nutrition to Rural Areas
Institute of Nutrition, Mahidol University
11 December, 1987**



References:

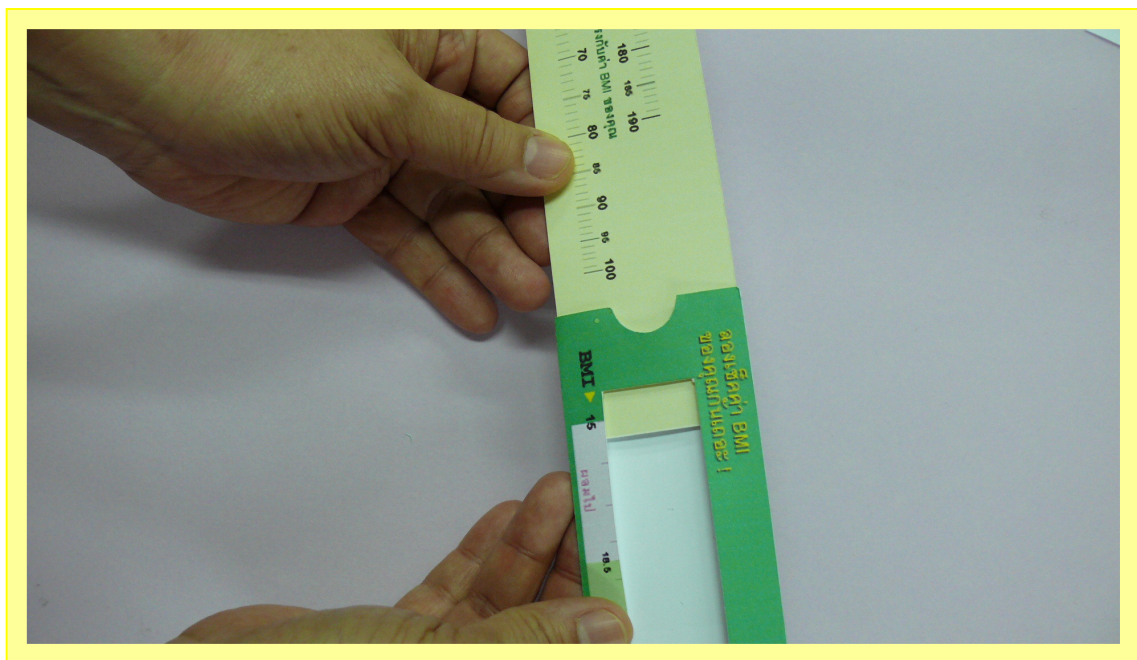
- ◆ A Committee in Developing the Dietary Guidelines for Better Health of Thais. *Nutrition Flag Manual*. The Division of Nutrition of the Ministry of Public Health, B.E. 2543.
- ◆ Readers' Digest Thailand. Foods that harm, Foods that heal., B.E. 2543
- ◆ Institute of Nutrition, Mahidol University, Nutritive value of Thai food, B.E. 2542.

Thank you for kind persons:

- | | |
|---|---|
| ◆ Assistant Professor Uraiporn Chittchang | Institute of Nutrition, Mahidol University |
| ◆ Associate Professor Prapaisri Sirichakwal | Institute of Nutrition, Mahidol University |
| ◆ Associate Professor Rhona Hanning | University of Waterloo, Canada |
| ◆ Dr. Saowanee Wiboolsanti | Office of Disease Prevention and Control 10, Chiang Mai |
| ◆ Mrs. Nittaya Rawongparn | Office of Disease Prevention and Control 10, Chiang Mai |

2. Body Mass Index ruler

(Developed by Assistant Professor Uraiporn Chittchang,
Institute of Nutrition, Mahidol University, Thailand)



3. Example of an audio lecture

Project Summary: Audio lecture (Fruit and vegetable groups)

1) SlideCount : 30

2) Size of Slides:

Slide1 : 7.3sec	Slide16: 26.2sec
Slide2 : 4.1sec	Slide17: 30.3sec
Slide3 : 3.0sec	Slide18: 83.0sec
Slide4 : 4.7sec	Slide19: 38.9sec
Slide5 : 25.1sec	Slide20: 43.9sec
Slide6 : 13.3sec	Slide21: 59.6sec
Slide7 : 23.0sec	Slide22: 25.9sec
Slide8 : 44.6sec	Slide23: 64.6sec
Slide9 : 20.7sec	Slide24: 31.9sec
Slide10: 26.3sec	Slide25: 35.0sec
Slide11: 22.5sec	Slide26: 70.8sec
Slide12: 25.3sec	Slide27: 34.3sec
Slide13: 45.0sec	Slide28: 12.6sec
Slide14: 12.4sec	Slide29: 3.4sec
Slide15: 16.4sec	Slide30: 27.1sec

3) Start and End Options used:

- a) Loading screen: C:\Program Files\Adobe\Adobe Captivate 3\Gallery\Preloaders\ConnectPreLoader.swf
- b) Password Protect : Yes
- c) Project Expiration Date : None
- d) Fade in on the first slide : Yes
- e) Fade out on the Last Slide : Yes
- f) Project end action : Stop project

4) Preferences Used:

a) Output options used:

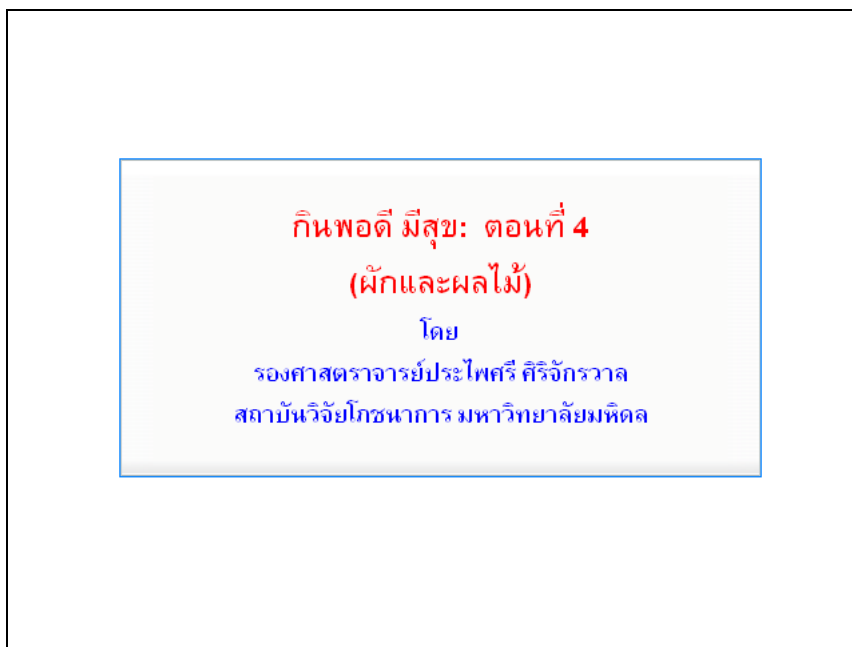
- a) Advanced movie compression : Yes
- b) Compress compile SWF file : Yes
- c) Include Adobe Connect Server metadata: No
- d) 508 compliance : Yes
- e) Frames per second : 30

b) Visual and Sound effects:

- a) JPEG Image Quality : 90%
- b) Include mouse when project is generated : Yes
- c) Include audio when project is generated : Yes
- d) Play tap audio for recorded typing : Yes

5) Background Audio : Behr, Franz - Polka

Slide2



Properties:

Display Time : 4.10 sec
Transition : Fade
Navigation : Go to next slide
Audio : None

Objects:

1) Text Caption: Eat right find the way: Episode 4 (Vegetable and fruit groups)

By

Associate Professor Prapaisri Sirichakwkal
Institute of Nutrition, Mahidol University, Thailand

Slide3



รศ. ประไพศรี ศิริจักรวาล
สถาบันวิจัยโภชนาการ มหาวิทยาลัย

Properties:
Display Time : 3.00 sec
Transition : Fade
Navigation : Go to next slide
Audio : None

Slide4



ความสำคัญของผัก-ผลไม้ต่อสุขภาพ

รองศาสตราจารย์.ดร.ประไพศรี ศิริจักรวาล
สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

1

Properties:
Display Time : 4.70 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 33

Slide5

วิถีชีวิตของคนไทยปัจจุบัน

- **การบริโภคอาหาร**
 - อาหารพลังงานสูง กินเนื้อสัตว์เพิ่มขึ้น
 - ขนมขบเคี้ยว
 - น้ำหวาน Animation (640 x 480) (x:0; y:0)
 - กินผัก ผลไม้น้อยลง
- **การใช้พลังงานลดลง**
 - ออกกำลังกายน้อยลง
 - มีเครื่องทุ่นแรงมากขึ้น

2
Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 25.10 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 34

Slide6

อาหารไขมันสูง

- ทอด
- กะทิ
- เนื้อสัตว์ติดมัน

Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 13.30 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 35

Slide7

การกินผัก ผลไม้บ่อย

Animation
(640 x 480)
(X:0; Y:0)

- โรคหัวใจและหลอดเลือด 31%
- โรคหลอดเลือดสมองอุดตัน 11%
- โรคมะเร็งระบบทางเดินอาหาร 19%*

* WHO International Agency for Research on Cancer

4
Prapai Sri Sirichakwal, INMU

Properties:
Display Time :23.00 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 36

Slide8

ผัก ผลไม้ ป้องกันโรคไม่ติดต่อเรื้อรัง:

- สารต้านอนุมูลอิสระ เช่น เบต้า-แคโรทีน วิตามินซี
- สารพฤษเคมี
- โยอาหาร

Animation
(640 x 480)
(X:0; Y:0)

**WHO/FAO แนะนำให้กินผักผลไม้ให้หลากหลาย
อย่างน้อยวันละ 400 กรัม**

5
Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 44.60 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 37

Slide9

ปริมาณการบริโภคผักผลไม้ของคนไทยปัจจุบัน

กลุ่มอายุ (ปี)	ผัก(กรัม)	ผลไม้(กรัม)
1-5	9.8	44.0
6-14	13.9	61.5
15-59	23.1	77.1
>60	21.0	63.6
หญิงตั้งครรภ์	21.4	88.9
หญิงให้นมบุตร	20.4	87.1

ข้อมูล: รายงานการสำรวจภาวะอาหารและโภชนาการ กองโภชนาการ กรมอนามัย กระทรวงสาธารณสุข 2546

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Properties:
 Display Time : 20.70 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 38

Slide10

คู่มือธงโภชนาการ
กินพอดี สุขีหัวใจไทย

ผัก 1 ทัพพี = 40 กรัม
6 ทัพพี = 240 กรัม

ผลไม้ 1 ส่วน = 70 กรัม
4 ส่วน = 280 กรัม

เพื่อสุขภาพที่ดี
กินอาหารให้หลากหลาย ในสัดส่วนที่เหมาะสม

ISBN : 978-915-128-7

จัดทำโดย คณะโภชนาการ สถาบันโภชนาการ มหาวิทยาลัยมหิดล
จัดพิมพ์โดยสถาบันโภชนาการ มหาวิทยาลัยมหิดล กรุงเทพมหานคร 2546

Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 26.30 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 39

Slide11



Properties:
Display Time : 22.50 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 40

Slide12



Properties:
Display Time : 25.33 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 41

Slide13

กลุ่มผลไม้ 1 ส่วน

ผลไม้ผลใหญ่ 6-8 คำ
(แตงโม, มะละกอ, สับปะรด)

ผลไม้ขนาดกลาง 1-2 ผล
(ส้ม, ชมพู่)

ผลไม้ขนาดเล็ก 4 ผล
(เงาะ, มังคุด)

ผลไม้ขนาดเล็กมาก 8-10 ผล
(องุ่น, ลำไย, สาลี่)

Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 45.00 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 42

Slide14

ประโยชน์ของผัก-ผลไม้

- 😊 แหล่งวิตามิน-แร่ธาตุ
- 😊 แหล่งใยอาหาร
- 😊 สารต้านอนุมูลอิสระ
- 😊 สารพฤกษเคมี

11
Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 12.41 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 43

Slide15

สารประกอบหลักในผัก-ผลไม้

⇒ สารอาหาร วิตามิน แร่ธาตุ โยอาหาร

⇒ สารพฤกษเคมี (Phytochemicals)

12
Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 16.40 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 44

Slide16

สารอาหารในพืชผัก-ผลไม้

วิตามินและสารตั้งต้นของวิตามิน

- วิตามินซี

ผัก: ผักสดต่างๆ พริกหวาน หน่อไม้ฝรั่ง มะเขือเทศ กะหล่ำดอก ผักบุ้งไทย
ผลไม้: ฝรั่ง มะม่วงดิบ มะละกอสุก ส้ม ลิ้นจี่ ลูกท้อ
มะปราง มะขามหวาน

บทบาทวิตามินซี: สารต้านอนุมูลอิสระ ทำให้ผนังเซลล์แข็งแรง
ป้องกันเลือดออกตามไรฟัน บำรุงผิว จำเป็นในการสร้างกระดูก
สร้างภูมิคุ้มกัน

13
Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 26.22 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 45

Slide17

วิตามินและสารตั้งต้นของวิตามิน

- เบตา-แคโรทีน

ผัก: ยอดกระถิน, ชะพลู, ตำลึง, คื่นช่าย, สะเดา, ใบย่านาง, ใบยอ, ใบแมงลัก, ยอดมะระ, แครอท, ฟักทอง

ผลไม้: มะม่วงสุก, มะละกอสุก, กล้วย

บทบาทเบตา-โรทีน: สารต้านอนุมูลอิสระ, สารตั้งต้นของวิตามินเอ, ช่วยในการมองเห็น, สร้างภูมิคุ้มกัน

14
Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 30.31 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 46

Slide18

แร่ธาตุ: แคลเซียม, เหล็ก, โปแตสเซียม

แคลเซียม: คื่นช่าย, ต้นช่าย, กวางตุ้ง, ใบย่านาง, ชีทะเล, ถั่วพู, ตำลึง, ฟักทอง

เหล็ก: ใบบัวบก, ต้นช่าย, ผักแพว, ผักหวาน

โปแตสเซียม: หัว, ลำไย, ละมุด, กล้วย, มะละกอ, ทุเรียน, ขนุน, เห็ด, หน่อไม้ฝรั่ง, สะเดา, มะเขือเทศ, ฟักทอง, ผักแพว, ผักกระโดน, ผักบุ้ง, ปวยเล้ง

แคลเซียม: สร้างกระดูกและฟัน, ควบคุมการทำงานของกล้ามเนื้อและระบบประสาท

เหล็ก: สร้างเม็ดเลือดแดง, ขนถ่ายออกซิเจน, จำเป็นในการพัฒนาการของสมอง

โปแตสเซียม: ช่วยในระบบสมดุลอิเล็กโทรไลต์ และการทำงานของกล้ามเนื้อ

15
Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 83.00 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 47

Slide19

สารอาหารในพืชผัก-ผลไม้

ใยอาหาร:

ผัก: ยอด/ดอกแค ต้นช่าย ใบ/ดอกขี้เหล็ก พักกระเจต พักกระโดน พักเม็ก พักแพว มะขามอ่อน มะเขือพวง ชะพลู ใบย่านาง ใบยอ สะเดา เห็ดหูหนู

ผลไม้: ละมุด ฝรั่ง มะม่วงดิบ มะขามเทศ

บทบาทใยอาหาร: ช่วยระบบขับถ่าย จับไขมันและโคเลสเตอรอล ปกป้องระบบทางเดินอาหาร ถ้าได้รับปริมาณมากเกินไปจะขัดขวางการดูดซึมของแร่ธาตุ

16
Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 38.90 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 48

Slide20

สารประกอบหลักในผัก-ผลไม้

⇒ สารอาหาร วิตามิน แร่ธาตุ ใยอาหาร

⇒ สารพฤกษเคมี (Phytochemicals)

มีมากกว่า **12,000** ชนิด เป็นส่วนที่ทำให้พืชมีสี กลิ่น รส แตกต่างกันไป มีประโยชน์ต่อมนุษย์ในการ **ต้านอนุมูลอิสระ** ป้องกันโรค ต้านความเสื่อมของร่างกาย ขับสารพิษและสารก่อมะเร็ง ป้องกันสารพันธุกรรม(DNA) และอื่น ๆ อีกมากมาย

17
Prapai Sri Sirichakwal, INMU

Properties:
 Display Time : 43.90 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 49

Slide21

แหล่งที่มาของอนุมูลอิสระ

ภายนอก: มลพิษในอากาศ ดับเพลิง แสงแดด
อาหารที่มีกรดไขมันไม่อิ่มตัว รังสีแกมมา
คลื่นความถี่วิทยุบางชนิด ธาตุเหล็กสูง

ภายใน: เมตาบอลิซึมภายในเซลล์ ขบวนการทำลาย
แบคทีเรียภายในเซลล์ของระบบภูมิคุ้มกัน
การบาดเจ็บของเนื้อเยื่อ โมเลกุลไขมันใน
ร่างกายที่ได้รับออกซิเจนส่วนเกิน

Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 59.60 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 50

Slide22

การป้องกันอนุมูลอิสระ

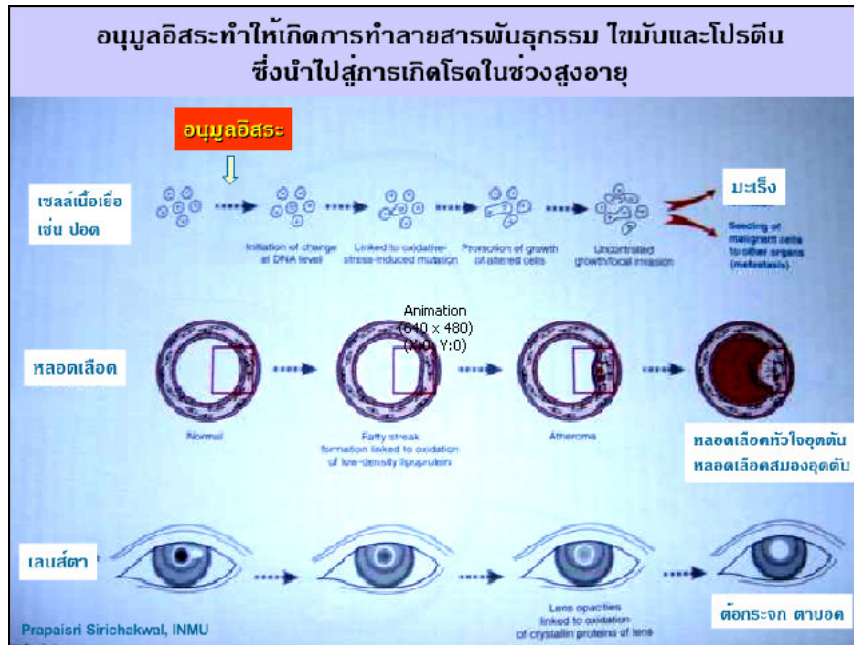
ระบบการป้องกันที่สำคัญของร่างกาย มี 2 ระบบ

- **ระบบเอนไซม์:** Superoxide dismutase (Zn, Cu, Mn)
Catalase
Glutathione peroxidase (Se)
- **ระบบที่ไม่ใช่เอนไซม์:** วิตามินอี
(สารต้านอนุมูลอิสระ) วิตามินซี
เบต้า-แคโรทีน
สารพฤกษเคมี (phytochemicals)

Prapai Sri Sirichakwal, INMU

Properties:
Display Time : 25.90 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 51

Slide23



Properties:
 Display Time : 64.60 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 52

Slide24



Properties:
 Display Time : 31.90 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Recording25

Slide25



Properties:
 Display Time : 35.00 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 53

Slide26

การเตรียม, การปรุงผัก-ผลไม้อย่างถูกวิธี

ผัก

- เลือกผักที่สด สะอาดไม่ช้ำ
- ล้างผักก่อนหั่น
- ไม่หั่นผักเป็นชิ้นเล็กเกินไป
- การตัดใช้ไฟแรงและรวดเร็ว

ผลไม้

- เลือกผลไม้ที่สด ไม่ช้ำ
- ล้างผลไม้ก่อนปอกและไม่ปอกผลไม้ทิ้งไว้
- ผลไม้ที่ทานทั้งเปลือกได้ ควรทานทั้งเปลือก
- น้ำผลไม้ดื่ม ควรดื่มทันที

23
Prapai Sirichakwal, INMU

Properties:
 Display Time : 70.80 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 54

Slide27

เพื่อสุขภาพที่แข็งแรง

สร้างพฤติกรรมการบริโภคผัก-ผลไม้
ลดอาหารหวาน-มัน-เค็ม

- 😊 จัดอาหารที่มีผักทุกมื้อ
- 😊 จัดผลไม้เป็นอาหารว่างทุกวัน (แทนขนมหวาน/ขบเคี้ยว)
- 😊 ดื่มน้ำเปล่าสะอาดหลังอาหาร หากเป็นน้ำผลไม้ไม่ควร มีน้ำตาลเกินร้อยละ 5

สร้างพฤติกรรมการออกกำลังกาย

24
Prapaisri Sirichakwal, INMU

Properties:
 Display Time : 34.32 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 55

Slide28

รักสุขภาพ → ลดอาหารหวาน มัน เค็ม

เพิ่มการบริโภคผัก-ผลไม้

Prapaisri Sirichakwal, INMU

Properties:
 Display Time : 12.63 sec
 Transition : Fade
 Navigation : Go to next slide
 Audio : Audio Clip 56

Slide29



Properties:
Display Time : 3.40 sec
Transition : Fade
Navigation : Go to next slide
Audio : Audio Clip 57

Slide30

ขอบคุณ: ข้อมูลจาก

รองศาสตราจารย์ประไพศรี ศรีจักษ์รวาล

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

ข้อมูลเพิ่มเติม:

พัฒนาโดย: กิตติ สรณเจริญพงศ์

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Website: www.FitThai.org

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University of Waterloo, Canada

Institute of Nutrition, Mahidol University, Thailand

The office of Disease Prevention and Control 10, Chiang Mai, Thailand

Properties:

Display Time : 27.10 sec

Transition : Fade

Navigation : Go to next slide

Audio : None

Objects:

1) Thank you:

Associate Professor Prapaisri Sirichakwkal

Institute of Nutrition, Mahidol University, Thailand

2) Text Caption : copyright2008 @ Kitti Sranachoenpong

University of Waterloo, Canada

Institute of Nutrition, Mahidol University, Thailand

The office of Disease Prevention and Control 10, Chiang Mai, Thailand

3) Text Caption:

Developed by: Kitti Sranachoenpong

E-mail: ksrnach@ahsmail.uwaterloo.ca

ksranach@gmail.com

Website: www.FitThai.org

4. Example of an online quiz

Project Summary: Online rice quiz

1) SlideCount : 12

2) Size of Slides:

Slide1 : 3.9sec	Slide7 : 3.0sec
Slide2 : 3.0sec	Slide8 : 3.0sec
Slide3 : 3.0sec	Slide9 : 3.0sec
Slide4 : 3.0sec	Slide10: 3.0sec
Slide5 : 3.0sec	Slide11: 3.0sec
Slide6 : 3.0sec	Slide12: 3.0sec

3) Start and End Options used:

a) Loading screen	: None
b) Password Protect	: No
c) Project Expiration Date	: None
d) Fade in on the first slide	: Yes
e) Fade out on the Last Slide	: Yes
f) Project end action	: Stop project

4) Preferences Used:

a) Output options used:

a) Advanced movie compression	: Yes
b) Compress compile SWF file	: Yes
c) Include Adobe Connect Server metadata	: No
d) 508 compliance	: Yes
e) Frames per second	: 30

b) Visual and Sound effects:

a) JPEG Image Quality	: 90%
b) Include mouse when project is generated	: Yes
c) Include audio when project is generated	: Yes
d) Play tap audio for recorded typing	: Yes

5) Background Audio: None

6) Score setting: 10

a) Quiz Name: Quiz

b) Quiz Requirement: Optional - The user can skip this quiz

c) Quiz Settings :

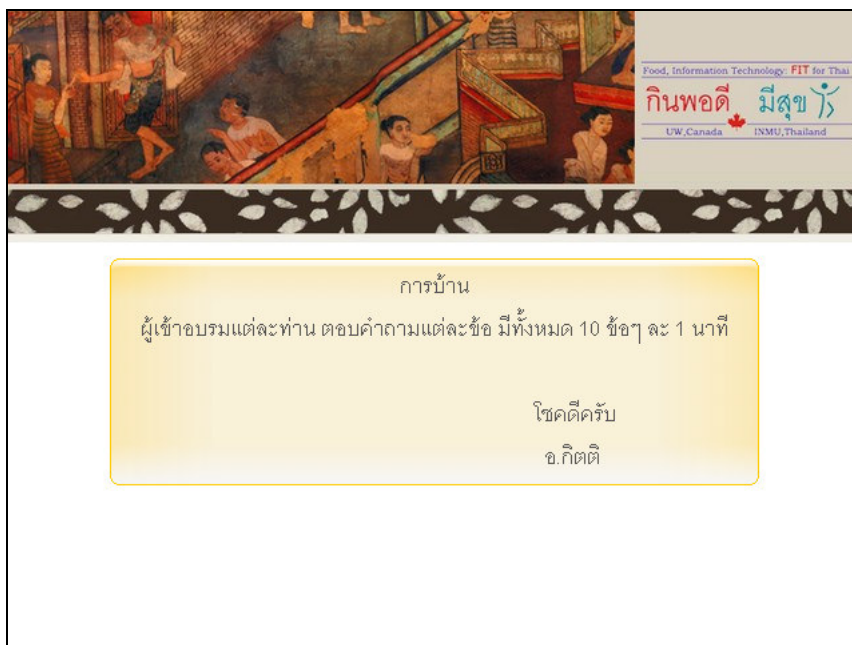
a) Allow backward movement	: Yes
b) Show score at the end of quiz	: Yes
c) Allow user to review the quiz	: Yes
d) Show Progress	: Yes

d) Pass / Fail Options:

a) Total marks needed to pass	: 80%
b) Passing grade-Action	: Go to next slide
c) Failing Grade-Action	: Go to next slide
d) Number of attempts	: 1

7) Number Of Hidden slides: None

Slide1



การบ้าน

ผู้เข้าอบรมแต่ละท่าน ตอบคำถามแต่ละข้อ มีทั้งหมด 10 ข้อๆ ละ 1 นาที

โชคดีครับ
อ.กิตติ

Properties:

Display Time	: 3.87 sec
Transition	: No Transition
Navigation	: Go to next slide
Audio	: None

Objects:

- 1) Image: Fit-Thai_header-color-blank3 copy.jpg (2)
- 2) Text Caption: Quiz – Rice group

Instruction:

Student has to complete 10 questions in 10 minute

Good luck
Kitti

Slide2

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ ข้าวเท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 3 ทัพพี

B) 2 ทัพพี

C) 1.5 ทัพพี

D) 1 ทัพพี



จะ ตอบข้อนี้ก่อน จะไปข้อถัดไป

ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 1 of 10

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

Multiple choices

How many rice serving spoons?

- A) 3 rice serving spoons
- B) 2 rice serving spoons
- C) 1.5 rice serving spoons
- D) 1 rice serving spoons

Points : 1
Type : Graded
Passing grade-Action : Go to next slide
Failing Grade-Action : Go to next slide
Number of attempts : 1
Failure levels : 1
Reporting-Objective Id: Quiz10031
Reporting-Interaction Id: Interaction10089

Objects:

1) Image: food20.bmp

Slide3

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ ข้าวเท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 3 ทัพพี

B) 2 ทัพพี

C) 1.5 ทัพพี

D) 1 ทัพพี



อะ อะ ตอบข้อนี้ก่อน จะไปข้อถัดไป

ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 2 of 10

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

Multiple choices

How many rice serving spoons only for rice group?

- A) 3 rice serving spoons
- B) 2 rice serving spoons
- C) 1.5 rice serving spoons
- D) 1 rice serving spoons

Points : 1
Type : Graded
Passing grade-Action : Go to next slide
Failing Grade-Action : Go to next slide
Number of attempts : 1
Failure levels : 1
Reporting-Objective Id: Quiz10031
Reporting-Interaction Id: Interaction10517

Objects:

1) Image: food17.bmp

Slide4

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ ข้าวเท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 1 ทัพพี

B) 1.5 ทัพพี

C) 2 ทัพพี

D) 2.5 ทัพพี



จะถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 3 of 10

Properties:

Display Time : 3.00 sec

Transition : No Transition

Audio : None

Multiple choices

How many rice serving spoons only for rice group?

- A) 3 rice serving spoons
- B) 1.5 rice serving spoons
- C) 2 rice serving spoons
- D) 2.5 rice serving spoons

Points : 1

Type : Graded

Passing grade-Action : Go to next slide

Failing Grade-Action : Go to next slide

Number of attempts : 1

Failure levels : 1

Reporting-Objective Id: Quiz10031

Reporting-Interaction Id: Interaction10682

Objects:

1) Image: food21.bmp

Slide5

Multiple choice Incorrect - Click anywhere to continue


จากรูปภาพ เล็งใหญ่กะประมาณเท่ากับที่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 1 ทัพพี

B) 2 ทัพพี

C) 2.5 ทัพพี

D) 3 ทัพพี



ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 4 of 10

Properties:

Display Time : 3.00 sec

Transition : No Transition

Audio : None

Multiple choices

How many rice serving spoons for noodles?

- A) 1 rice serving spoons
- B) 2 rice serving spoons
- C) 2.5 rice serving spoons
- D) 3 rice serving spoons

Points :1

Type : Graded

Passing grade-Action : Go to next slide

Failing Grade-Action : Go to next slide

Number of attempts : 1

Failure levels : 1

Reporting-Objective Id: Quiz10031

Reporting-Interaction Id: Interaction10847

Objects:

1) Image: food05.bmp

Slide6

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ เลื่อนใหญ่กะประมาณเท่ากับที่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 1 ทัพพี

B) 2 ทัพพี

C) 3 ทัพพี

D) 4 ทัพพี



ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 5 of 10

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

Multiple choices

How many rice serving spoons for noodles?

- A) 1 rice serving spoons
- B) 2 rice serving spoons
- C) 2.5 rice serving spoons
- D) 3 rice serving spoons

Points : 1
Type : Graded
Passing grade-Action : Go to next slide
Failing Grade-Action : Go to next slide
Number of attempts : 1
Failure levels : 1
Reporting-Objective Id: Quiz10031
Reporting-Interaction Id: Interaction11012

Objects:

- 1) Image: food03.bmp

Slide7

Multiple choice

Incorrect - Click anywhere to continue

จากรูปภาพ เส้นเล็กกะประมาณเท่ากับที่ทัพพี (กะประมาณโดยสายตาของท่าน)


A) 1 ทัพพี

B) 2 ทัพพี

C) 2.5 ทัพพี

D) 2.75 ทัพพี

ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป



Question 6 of 10

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

Multiple choices

How many rice serving spoons for noodles?

- A) 1 rice serving spoons
 B) 2 rice serving spoons
 C) 2.5 rice serving spoons
 D) 2.75 rice serving spoons

Points : 1
Type : Graded
Passing grade-Action : Go to next slide
Failing Grade-Action : Go to next slide
Number of attempts : 1
Failure levels : 1
Reporting-Objective Id: Quiz10031
Reporting-Interaction Id: Interaction11177

Objects:

1) Image: food04.bmp

Slide8

Multiple choice

Incorrect - Click anywhere to continue

จากรูปภาพ ขนมหุ้นเท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)


A) 1 ทัพพี

B) 2 ทัพพี

C) 3 ทัพพี

D) 4 ทัพพี

ยืนยัน



อะ อะ ตอบข้อนี้ก่อน จะไปข้อถัดไป

ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 7 of 10

ลบ กลับ ต่อไป

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

Multiple choices

How many rice serving spoons for rice noodles?

- A) 1 rice serving spoons
- B) 2 rice serving spoons
- C) 3 rice serving spoons
- D) 4 rice serving spoons

Points : 1
Type : Graded
Passing grade-Action : Go to next slide
Failing Grade-Action : Go to next slide
Number of attempts : 1
Failure levels : 1
Reporting-Objective Id: Quiz10031
Reporting-Interaction Id: Interaction11342

Objects:

1) Image: food10.bmp

Slide9

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ ข้าวเหนียวเท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 1 ทัพพี

B) 1.5 ทัพพี

C) 2 ทัพพี

D) 2.5 ทัพพี



จะ จะ ตอบข้อนี้ก่อน จะไปข้อถัดไป

ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 8 of 10

Properties:

Display Time : 3.00 sec

Transition : No Transition

Audio : None

Multiple choices

How many rice serving spoons for sticky rice?

- A) 1 rice serving spoons
- B) 1.5 rice serving spoons
- C) 2 rice serving spoons
- D) 2.5 rice serving spoons

Points : 1

Type : Graded

Passing grade-Action : Go to next slide

Failing Grade-Action : Go to next slide

Number of attempts : 1

Failure levels : 1

Reporting-Objective Id: Quiz10031

Reporting-Interaction Id: Interaction11507

Objects:

1) Image: food23.bmp

Slide10

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ ขนมนึ่งเท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 1.5 ทัพพี

B) 2 ทัพพี

C) 2.5 ทัพพี

D) 4 ทัพพี



ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 9 of 10

Properties:

Display Time : 3.00 sec

Transition : No Transition

Audio : None

Multiple choices

How many rice serving spoons for bread?

- A) 1.5 rice serving spoons
- B) 2 rice serving spoons
- C) 2.5 rice serving spoons
- D) 4 rice serving spoons

Points : 1

Type : Graded

Passing grade-Action : Go to next slide

Failing Grade-Action : Go to next slide

Number of attempts : 1

Failure levels : 1

Reporting-Objective Id: Quiz10031

Reporting-Interaction Id: Interaction11672

Objects:

1) Image: food33.bmp

Slide11

Multiple choice

Incorrect - Click anywhere to continue


จากรูปภาพ ซาลาเปา (เฉพาะแป้ง) เท่ากับกี่ทัพพี (กะประมาณโดยสายตาของท่าน)

A) 1/2 ทัพพี

B) 1 ทัพพี

C) 1.5 ทัพพี

D) 2 ทัพพี



ถูกต้อง และ click ปุ่ม "ต่อไป" เพื่อตอบข้อถัดไป

Question 10 of 10

Review Area

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

Multiple choices

How many rice serving spoons for Chinese bun?

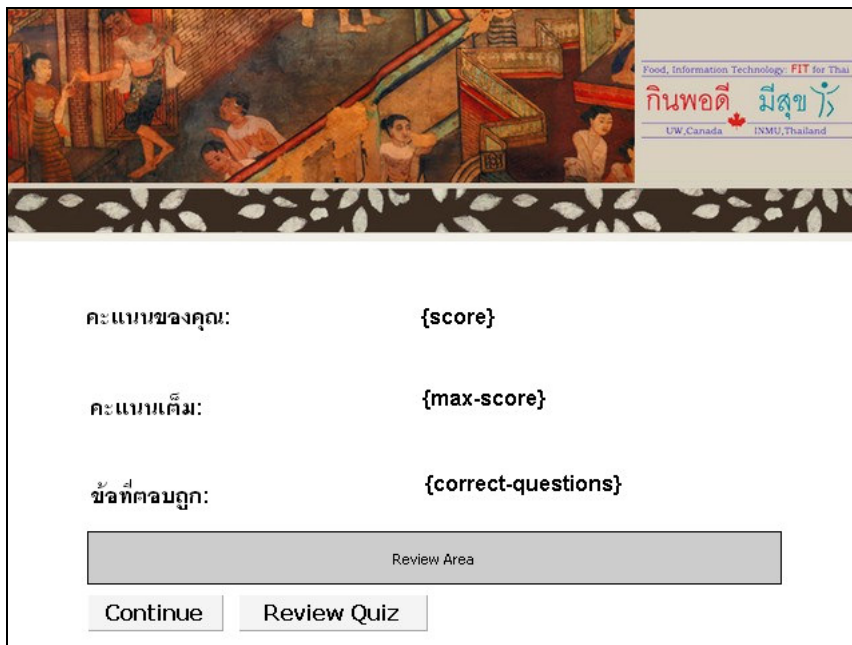
- A) 1/2 rice serving spoons
- B) 1 rice serving spoons
- C) 1.5 rice serving spoons
- D) 2 rice serving spoons

Points : 1
Type : Graded
Passing grade-Action : Go to next slide
Failing Grade-Action : Go to next slide
Number of attempts : 1
Failure levels : 1
Reporting-Objective Id: Quiz10031
Reporting-Interaction Id: Interaction11837

Objects:

1) Image: food30.bmp

Slide12



Food, Information Technology: FIT for Thai
กินพอดี มีสุข
UW, Canada INMU, Thailand

คะแนนของคุณ: {score}

คะแนนเต็ม: {max-score}

ข้อที่ตอบถูก: {correct-questions}

Review Area

Continue Review Quiz

Properties:

Display Time : 3.00 sec
Transition : No Transition
Audio : None

APPENDIX F: Pre-post test questionnaire and case-based questionnaire

1. Pre-post test questionnaire

Nutrition Knowledge Questionnaire (Pre-Post test)

Instruction:

- 1. You have 25 minute to complete all questions.
- 2. Participants' information will be kept confidential.

Individual information:

- 1. **Name:**
- 2. **Gender:** () Female () Male
- 3. **Age:** years
- 4. **Marital status:** () Married () Living common-law
 () Widowed () Divorced
 () Separated () Single
- 5. **Education level:**
- 6. **Occupation:**
- 7. **Office address:**
- 8. **Work experience:** years
- 9. **Mobile phone:**
- 10. **E-mail:**

1. How many servings of fruit and vegetables a day do you think experts are advising people to eat? (One serving could be, for example, an orange or a rice serving spoon of cooked vegetable)

Food group	For people with energy needs of;		
	1600 kcal	2000 kcal	2400 kcal
1.1. Fruit (servings)			
1.2. Vegetable (rice serving spoons)			

2. Which fat do experts say is most important for people to cut down on? (choose only one)

- monounsaturated fat
- polyunsaturated fat
- saturated fat
- no correct answers

3. One gram of fat provides..... (choose only one)

- 4 Kcal
- 8 Kcal
- 9 Kcal
- no correct answers

4. One gram of protein provides energy..... (choose only one)

- more than carbohydrate
- less than carbohydrate
- equal to carbohydrate
- no correct answers

5. Which appropriate percent of energy distribution do experts recommend? (choose only one)

- Protein: Fat: Carbohydrate = 12-15: 25-30: 55-60
- Protein: Fat: Carbohydrate = 15-20: 27-35: 50-60
- Protein: Fat: Carbohydrate = 10-20: 25-30:60-70
- no correct answers

6. From Thai Nutritional Flag, which energy level do experts recommend for working men, 25-60 years old? (choose only one)

- 1600 Kcal/day
- 2000 Kcal/day
- 2400 Kcal/day
- no correct answers

7. On a food label, the “% Daily Value” table compares key nutrients per serving for a person consuming how many kcalories? (choose only one)

- 1,500
- 2,000
- 2,500
- 3,000

8. From Thai Nutritional Flag, how many servings of fruit do experts suggest for working women, 25-60 years old, per day? (choose only one)

- 4 portions, e.g., 6 pieces of ripe papaya + 1 banana + 1 guava + 1 oranges
- 4 portions, e.g., 12 pieces of ripe papaya + 1 banana + 1/2 guava + 2 oranges
- 4 portions, e.g., 6 pieces of ripe papaya + 1 banana + 2 oranges
- no correct answers

9. Do you think these are high or low in added sugar? (choose only one per food)

Food items	High	Low	Not sure
9.1. Bananas	()	()	()
9.2. Unflavored yoghurt	()	()	()
9.3. Ice cream	()	()	()
9.4. Ready to drink(coffee, tea)	()	()	()
9.5. Soft drink (Coca cola, Pepsi)	()	()	()

10. Do you think these are high or low in fat? (choose only one per food)

Food items	High	Low	Not sure
10.1. Traditional northern style Hang-lae curry	()	()	()
10.2. Traditional northern style steamed curried-chicken	()	()	()
10.3. Traditional northern style Meat curry	()	()	()
10.4. Rice noodles with a northern style curry	()	()	()
10.5. Sweet sticky-rice topped with minced shrimp and coconut shreds	()	()	()
10.6. Fried Chinese buns	()	()	()
10.7. Traditional northern style pork sausages	()	()	()
10.8. Thai custard	()	()	()
10.9. Fresh sugar palm drink	()	()	()
10.10. Stir fried shrimp with vegetable	()	()	()

11. Do you think experts put these in these in the starchy foods group? (choose only one per food)

Food items	Yes	No	Not sure
11.1. Taro	()	()	()
11.2. Corn	()	()	()
11.3. Pumpkin	()	()	()
11.4. Tofu	()	()	()
11.5. Konjac	()	()	()

12. Do you think these are high or low in salt? (choose only one per food)

Food items	High	Low	Not sure
12.1. Traditional Sausages	()	()	()
12.2. Milk	()	()	()
12.3. Mushroom	()	()	()
12.4. Chili paste	()	()	()
12.5. Traditional northern style assorted preserved beans (tua nao)	()	()	()

13. Do you think these are high or low in fiber (choose only one per food)

Food items	High	Low	Not sure
13.1. Traditional northern style rice snacks	()	()	()
13.2. Bananas	()	()	()
13.3. Eggs	()	()	()
13.4. Red meat	()	()	()
13.5. Cabbage	()	()	()
13.6. Nuts	()	()	()
13.7. Brown rice	()	()	()
13.8. Sticky rice	()	()	()
13.9. Durian	()	()	()
13.10. Traditional northern style assorted preserved beans (tua nao)	()	()	()

14. Do you think these fatty foods are high or low in saturated fat? (choose only one per food)

Food items	High	Low	Not sure
14.1. Mackerel	()	()	()
14.2. Vegetable oil	()	()	()
14.3. Red meat	()	()	()
14.4. Palm oil	()	()	()
14.5. Coconut milk	()	()	()

15. Some foods contain a lot of fat but no cholesterol.

() agree

() disagree

16. A glass of unsweetened fruit juice counts as a portion of fruit.

() agree

() disagree

17. Saturated fats are mainly found in: (choose only one)

() vegetable oils

() dairy products

() vegetable oils and dairy products

() sugar

18. There is more protein in a glass of whole milk than in a glass of skimmed milk.

() agree

() disagree

19. A type of oil which contains mostly monounsaturated fat is: (choose only one)

- coconut oil
- sunflower oil
- olive oil
- palm oil

20. There is more calcium in a glass of whole milk than a glass of skimmed milk.

- agree
- disagree

21. Which one of the following has the most calories for the same weight? (choose only one)

- sugar
- starchy foods
- fiber
- fat

22. Polyunsaturated fats are mainly found in: (choose only one)

- vegetable oils
- dairy products
- vegetable oils and dairy products
- no correct answers

23. Nonnutritive substances found in plant foods that show biological activity in the body are commonly known as: (choose only one)

- folionutrients
- inorganic fibers
- phytochemicals
- phyllochemicals

24. Do you think these are factors to increase the chances of developing type 2 diabetes?
(choose only one per food)

Factors	Yes	No	Not sure
24.1. Consume vegetable 3 rice serving spoons a day	()	()	()
24.2. Height (Tall or short)	()	()	()
24.3. Having some obese members/relatives in the family	()	()	()
24.4. Prefer coconut milk curries, sausages, pork rinds	()	()	()
24.5. Prefer sweeten fruits (e.g., durian, longan)	()	()	()
24.6. Do not drink milk	()	()	()
24.7. Having some relatives died from diabetes	()	()	()
24.8. Store some abdominal fat	()	()	()
24.9. Low birth weight less than 2,500 g.	()	()	()
24.10. Getting old	()	()	()
24.11. Prefer rice, sticky rice	()	()	()
24.12. No monosodium glutamate	()	()	()
24.13. Prefer pop, coffee and tea, or soft beverage	()	()	()
24.14. Woman is risk more than man.	()	()	()
24.15. Prefer table fish sauce all meal	()	()	()
24.16. Prefer traditional foods more than western foods	()	()	()
24.17. Prefer fried banana, and fried stuff	()	()	()
24.18. Using palm oil at home	()	()	()
24.19. Prefer red meat, high fat foods	()	()	()
24.20. Make a merit at the temple often	()	()	()

25. Which one of these is more likely to raise people's blood cholesterol level? (choose only one)

() antioxidants

() polyunsaturated fats

() saturated fats

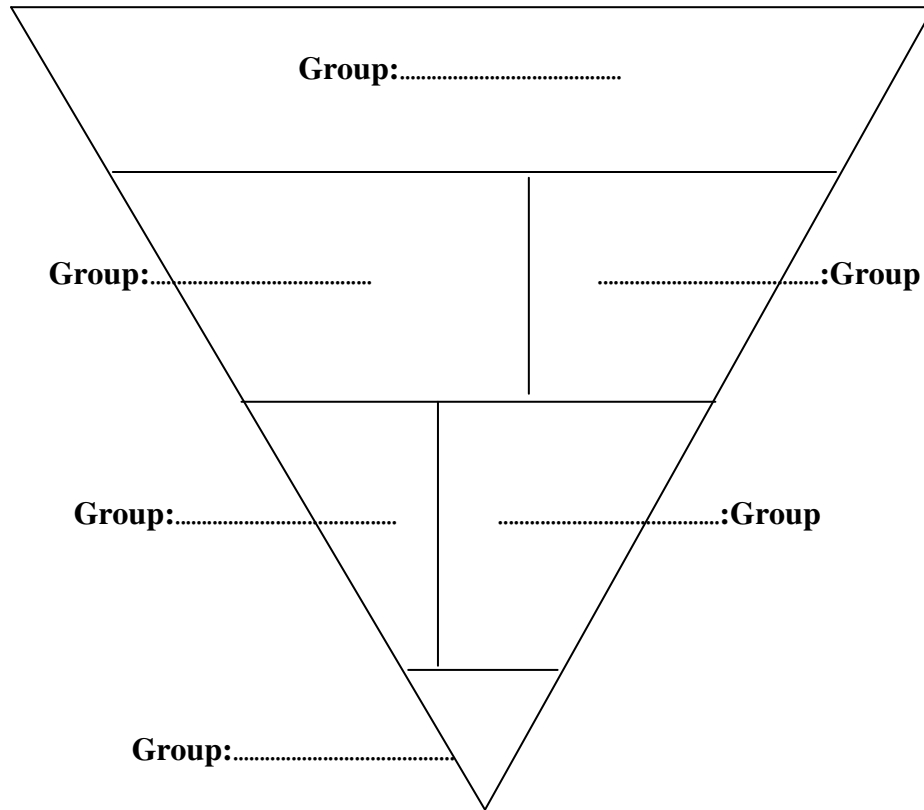
() cholesterol in the diet

26. Do you think these are antioxidants (choose only one per food)

	Yes	No	Not sure
26.1. Vitamin A	()	()	()
26.2. B complex vitamins	()	()	()
26.3. Vitamin C	()	()	()
26.4. Vitamin D	()	()	()
26.5. Vitamin E	()	()	()
26.6. Vitamin K	()	()	()
26.7. Zinc	()	()	()
26.8. Beta-carotene	()	()	()

27. From Thai Nutritional Flag, please put “**food group**” in the **flag** below based on portion sizes of each food group that experts recommend for general people to eat per day.

FOOD GROUP		
1. Fruit group	2. Vegetable group	3. Meat group
4. Milk group	5. Rice group	6. Fat, sugar, and salt



2. Case-based questionnaire

Nutrition Knowledge Questionnaire case-based examples

Individual information:

1. Name:

2. Gender: Female Male

3. Age: years

5. Education level:

6. Occupation:

9. Mobile phone:

True or fault Questions (choose only one)

Case 1: Mrs. Sang is obese living in Chiang Mai province. She get a high blood pressure, but she is not a diabetes patient yet. She likes to eat not many kinds of vegetable, e.g., sprouts, cucumbers, and Chinese cabbages. She likes to eat traditional northern style foods, e.g., sausages, meat curry and assorted preserved beans (tua nao). She knows from supplementation advertising on TV that chromium can help her insulin work better. Please answer following questions:

Questions	True	Fault	Not sure
1. She gets good source of “Beta-carotene”.			
2. She gets good source of “lycopene”.			
3. CHCWs should suggest her sodium intake not more than 3400 mg.			
4. CHCWs suggest her to eat Rice noodles with a northern style curry for lunch.			
5. CHCWs suggest her to eat rice salad for lunch.			
6. Mrs. Sang should lost 2 kg. in 2 months.			
7. CHCWs told Mrs. Sang that coconut milk is a source of monounsaturated fat.			
8. Egg yolk, liver and shell are good sources of chromium, so you can suggest Mrs. Sang helping her insulin work better.			

Case 2: Mr.Kong is a laborer, aged 40 years old, 165 cm. for height and 76 kg. for weight. His father passed away by diabetes last two years and now his mother is troubled with diabetes and hypertension. He lives in San Sai district, closed to Chiang Mai city. Normally, his wife has no time to cook for her family because she just got a baby. Her baby is not so well because a baby was born with under 2500 g. weight. However, this family eats sticky rice based, but cannot drink milk. From Mr. Kong information please list 8 risk factors with diabetes of him and give short reasons.

Risk factors	Short reason
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Case 3: Miss Sunee concerns her health and weight gain. She weighed 60 kg. and 170 cm. height. She is a teacher at a primary school in Chiang Mai province. She would like to ask CHCWs about:

1. CHCWs should recommend.....Kcal per day for her.
2. How many portion sizes of each food group she should eat based on Thai Nutrition Flag

2.1. Rice group.....	rice serving spoons <u>per day</u>
2.2. Vegetable group.....	rice serving spoons <u>per day</u>
2.3. Fruit group.....	serving sizes <u>per day</u>
2.4. Milk group.....	cup (s) <u>per day</u>
2.5. Meat group.....	spoons <u>per day</u>

3. If she cannot drink milk, how should CHCWs suggest that Miss Sunee get her calcium?

Give her two choices.

- 3.1.....
- 3.2.....

4. If she wants to drink milk,

- 4.1) what vitamins help calcium to be absorbed well and.....
- 4.2) source (s) of food (s)

5. Miss Sunee concerns about health, so matching sources of fat with these foods for her.

.....5.1. Almonds	A. Omega-3
.....5.1. Canola oil	B. Transfat
.....5.1. Avocado	C. Saturated fat
.....5.1. Cookies and bakeries	D. Unsaturated fat
.....5.1. Sausages	E. Cholesterol
.....5.1. Sun flower seeds	F. Polyunsaturated fat

APPENDIX G: Certificate for CHCWs' successful completion of the training program



This Certificate Is Presented To

Suttirust Udomsuk

In recognition of completion of the training program

“Diabetes Prevention Education Program”

This training program for health care workers used learning technology to support student-centred learning. The program which was designed to help health care workers to integrate Type 2 diabetes prevention into their ongoing work was held during August 13 – November 21, 2008

Faculty of Applied Health Sciences, University of Waterloo, Canada and Institute of Nutrition, Mahidol University, Thailand
Supported by: The Nestlé Foundation, Switzerland

Successful completion requirements
In-class Participation, Online Participation, Homework, Pre- and Post-test examination

Presented on November 21, 2008

Dr. Rhona M. Hauning
Principal Investigator
Faculty of Applied Health Sciences,
University of Waterloo, Canada

Kitti Sranacharompong
Instructor and PhD Candidate
University of Waterloo, Canada

Dr. Visith Chavsit
Director
Institute of Nutrition,
Mahidol University, Thailand

APPENDIX H: Research program poster presentations

1. Poster presentation at the International Union for Health Promotion and Education Conference, Vancouver, Canada 2007.



Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand

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ABSTRACT:

The main objective of this program is to build capacity for chronic disease prevention in Thailand through application of learning technologies in the nutrition education, support and accreditation of lay health care workers (LHCWs).

Specifically, an innovative computer-based program for type 2 diabetes prevention will be developed and tested. This program melds established partnerships among 1) The University of Waterloo (UW), Department of Health Studies and Gerontology, Institute of Nutrition, Mahidol University (INMU), and Ministry of Public Health (MOPH), Thailand and 2) UW, Centre for Learning and Teaching Through Technology and Mahidol University (LT3). The two year proposal will focus on capacity building and completion of a demonstration project in Chiang Mai province by Kitti Sranacharoengpong- a Thai PhD candidate at UW. Through this project:

- ◆ A template for a computer-based diabetes prevention education/support program will be developed and modified based on extensive input from key stakeholders. The process and outcomes of implementation the 4 month program will be tested.
- ◆ The effects of the program on the knowledge and practices of LHCWs will be assessed and compared between ten randomly allocated intervention and ten control communities at baseline, end of program (4 months) and following a 6 month community implementation phase. 30-50 local LHCWs will be trained in the diabetes prevention program. An inventory of community interventions will be made as part of the process evaluation.
- ◆ The awareness of key messages regarding diet, physical activity, smoking and diabetes of the at-risk population will be assessed and compared in intervention and control communities, both pre program and post community implementation phase.

It is anticipated that the MOPH will consider national application of this approach to the education, support and accreditation of LHCWs. Ultimately, prevention chronic diseases and associated risk factors should be enhanced.

RATIONALE:

- ◆ Thailand still has problems of deficiencies in its diet, such as low birth weight, underweight in school children, iron deficiency in preschool and school children.
- ◆ Paradoxically, the global epidemic of obesity has also affected the Thai population.
- ◆ Economic development in Thailand, rapid increase in food choice, and acculturation have contributed to the increased prevalence of obesity and chronic diseases, both in urban and rural areas.
- ◆ The risk factors for Type II diabetes, such as being overweight or obese, having an adverse abdominal distribution of body fat, and following unhealthy lifestyle behaviors, including dietary pattern, smoking and physical inactivity are modifiable and need to be the focus of prevention strategies.
- ◆ Successful programs to close the gap in diabetes-related health disparities in various racial and ethnic populations are built on strengthening the links between health care providers and the community members they serve.
- ◆ Many health programs are turning to community health workers for their unique ability to serve as "bridges" between community members and health care services.
- ◆ Recognition of the roles, skills, and contributions of LHCWs; support for programs, including stable funding, technical assistance, evaluation and continuing education are needed to respectfully and effectively integrate these workers into the health care delivery system.

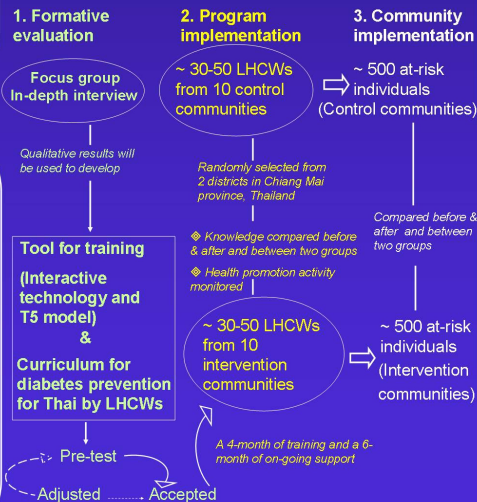
GOAL:

The ultimate goal of the project is to prevent the burden of diabetes among at-risk Thai populations, through public health leadership, linkages, and innovative use of learning technologies. In order to achieve the goal, this project considers input from multiple stakeholders to develop a diabetes prevention program, targeting at-risk Thai populations of the north region. This program for LHCWs will be informed by best practices and use Interactive Technologies (ITs) to facilitate learning and provide on-going support.

OBJECTIVE:

To design and implement a community-tailored diabetes prevention education program for LHCWs in the north region of Thailand. Learning technologies will be used to facilitate the acquisition of knowledge and skills by LHCWs and to provide on-going support to these workers in their local communities.

METHODS:



METHODS:

The study will be conducted in Chiang Mai province, Thailand. The study will be divided into 3 phases:

Phase I: Formative evaluation

- ◆ Development of the education program will be informed by:
 - ◆ In-depth interviews and focus groups with local health professionals, health policy decision makers, lay health care workers, and at-risk populations.
 - ◆ Reviewing the program and materials by INMU and UW faculty and Chiang Mai Public Health officers.
 - ◆ Pilot testing with LHCWs in a community not participating in the community implementation study.

Phase II: Program implementation

- ◆ An 8 module program will be delivered over 16 sessions of 3 hours.
- ◆ The knowledge of LHCWs will be evaluated pre-post training and between intervention and control communities.
- ◆ An inventory of health promotion activity will be maintained.
- ◆ A process evaluation will be conducted with LHCWs, for example, how often they access the course website, acceptability (message and format), and barriers measured by questionnaire and in-depth interview.

Phase III: Community implementation

- ◆ At-risk population (BMI ≥ 25) will be assessed at baseline and end for knowledge of diabetes, risk factors and awareness of key prevention messages.
- ◆ Data will be assessed and compared between intervention and control communities.
- ◆ Investigators will compare intervention and control communities regarding health care workers' knowledge change over the study.
- ◆ A process evaluation of phase III will be conducted.

CAPACITY BUILDING & SUSTAINABILITY:

- ◆ The diabetes prevention education program, incorporated into primary health care, will serve as a model of collaborative action for other governmental sectors and the community.
- ◆ As the program will progress to the stage of perpetuation and distribution, its integration into the existing community structure is directed towards the populations at-risk for diabetes and that the benefit goes to the community.
- ◆ The project will foster international exchange between the investigators and their respective institutions to determine how, collaboratively, they can best support chronic disease prevention in Thailand.

Acknowledgements:

- ◆ Graduate Studies Office, University of Waterloo, Ontario, Canada

◆ Funding support is acknowledged from the Nestlé Foundation, Switzerland



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Presented at IUHPE 2007, Vancouver, Canada.

2. Poster presentation at the International Congress on Dietetic, Yokohama, Japan, 2008.



Formative Evaluation to Develop a Diabetes Prevention Program for Lay Health Care Workers in Thailand

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RATIONALE:

- ◆ The prevalence of Type 2 diabetes in Thailand has begun to climb.
- ◆ The risk factors for Type II diabetes, such as being overweight or obese, having an adverse abdominal distribution of body fat, and following unhealthy lifestyle behaviors, including dietary pattern, smoking and physical inactivity are modifiable and need to be the focus of prevention strategies.
- ◆ Recognition of the roles, skills, and contributions of lay health care workers (LHCWs) and support for programs, including continuing education, are needed to respectfully and effectively integrate these workers into the health care delivery system.

OBJECTIVE:

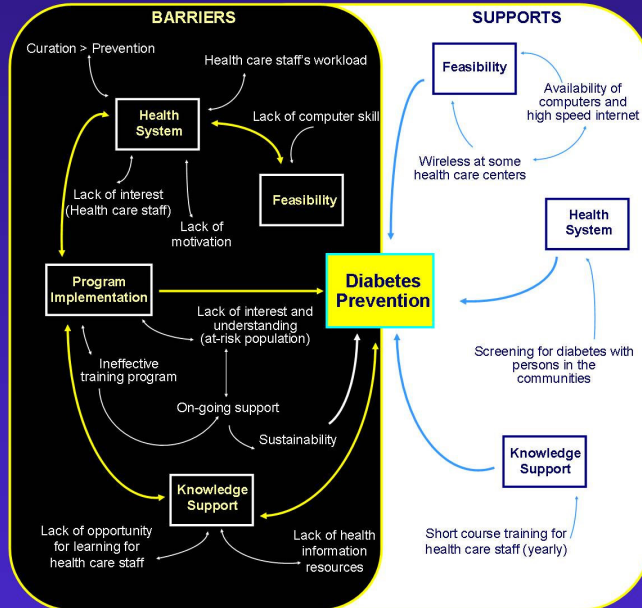
- ◆ To investigate barriers to and supports for implementing a diabetes prevention education program for LHCWs

METHODS:

- ◆ **Study setting:** San Sai district Chiang Mai province, Thailand was randomly selected from 8 districts that met the inclusion criteria of being within 40 Km. of the city of Chiang Mai and having < 50% agricultural households.
- ◆ **Sample selection:** A purposive selection strategy was employed to identify key informant participants for in-depth interviews. A convenience sample of at-risk community members from San Sai was recruited. Community volunteers were systematically screened for eligibility via a diabetes risk score for Thais (Aekplakom et al., 2006) based on age, sex, Body Mass Index (BMI), waist circumference, hypertension and history of diabetes in a parent or sibling.
- ◆ **Data collection:** Interviews and focus groups were used to gather information on prominent health concerns, gaps in services, experience with current training and support service needs for an innovative training program related to diabetes prevention. All interviews and focus groups were conducted at a place of the participant's choosing.
- ◆ **Data analysis:** A Thai research assistant fluent in the local language transcribed in-depth interview and focus group discussions from audiotape. All transcripts and field notes were organized by hand and using NVivo version 7 and the content analyzed thematically. A blended coding scheme was used, consistent with the pre-identified interview questions and categories and themes emerging from an initial process of open coding. Codes were constructed based on frequency, intensity, clarity and consistency of participants' supporting statements. Concept mapping portrayed barriers to and supports for implementing a diabetes prevention education program for LHCWs.

Characteristics of community participants for interviews and focus groups (N = 31)

Male (n, (%))	14 (45)	BMI (n, (%))	
Female (n, (%))	17 (55)	◆ Overweight (>23 - < 27.5)	14 (45)
Education (n, (%))		◆ Obesity (> 27.5)	10 (32)
◆ grade 4	26 (84)	Waist Circumference	
◆ more than grade 4	5 (16)	◆ Male (> 90 cm.)	4 (13)
Occupation (n, (%))		◆ Female (> 80 cm.)	13 (42)
◆ Agriculture	8 (26)	Hypertension (n, (%))	22 (71)
◆ Labor	14 (45)	Family history of Type 2 diabetes (n, (%))	25 (81)
◆ Own business	4 (13)	Diabetes risk score	
◆ Government staff	1 (3)	◆ median (min, max)	11 (6, 17)
◆ Homemaker	4 (13)	◆ mean (SD)	11.35 (2.76)
Age, years (mean (SD))	52.19 (5.58)		



Concept map of barriers & supports for a diabetes prevention education program for LHCWs

RESULTS:

Characteristics of participants, in-depth interviews (N = 12)

Male (n, (%))	2 (17)
Female (n, (%))	10 (83)
Education (n, (%))	
- Less than Bachelor degree	3 (25)
- Bachelor degree	9 (75)
Occupation (n, (%))	
- Doctor	2 (17)
- Practical nurses	5 (41.5)
- Public health staff	5 (41.5)
Age, years (Mean (SD))	44.5 (3.48)
Work experience, year (n, (%))	
- Less than 10 years	2 (17)
- More than 10 years	10 (83)

◆ Health system:

... I think it is hard to educate people to take care of themselves because the government provides free of charge medicine... (In-depth interview health care staff # 5).

... Yes, we have screening for diabetes with all people, aged 35 years old, but diabetes patients are increasing every day, I don't know how to prevent this problem... (In-depth interview health care staff # 3).

◆ Program implementation:

... I do not understand how many portion sizes of rice that I should eat per day, no one tell me... (In-depth interview at-risk people with DM # 4).

◆ Feasibility:

... It is good chance for me if there is e-learning course to support my work... (In-depth interview health care staff # 11).

◆ Knowledge support:

... Well, the district hospital has a short course training course for staff one time a year, but I don't like the training method. I don't get anything from the training and waste time... (In-depth interview health care staff # 12).

CONCLUSION AND IMPLICATIONS:

- ◆ Based on qualitative results, researchers developed appropriate tools for training for LHCWs (The second phase of the research project).
- ◆ Tailored course curriculum, innovative method for training, including e-learning (www.FITthai.org) were created for LHCWs in Chiang Mai province, Thailand.



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Acknowledgements:

◆ Funding support is acknowledged from the Nestle Foundation, Switzerland
 ◆ Graduate Studies Office, University of Waterloo, Ontario, Canada

Presented at 15th ICD, Yokohama, Japan

3. Poster presentation at the Graduate Student Research Conference, University of Waterloo, Waterloo, Canada, 2009



Development, Process and Outcome Evaluation of a Diabetes Prevention Education Program for Community Health Care Workers in Thailand



MAHIDOL UNIVERSITY
Wisdom of the Land

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BUILDING A TALENT TRUST

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RATIONALE:

- Type 2 diabetes and impaired fasting glucose have increasingly become a public health concern for Thailand.
- One approach to alleviating the chronic disease burden is to expand the knowledge at the grass-roots level.
- Sustained community education by community health care workers (CHCWs) is needed.
- CHCWs serve as "bridges" between health care providers and the community members they serve.
- Training is needed to support the effectiveness of CHCWs in health promotion.

OBJECTIVES:

- to describe briefly the development of a culturally tailored diabetes prevention education program for CHCWs in Thailand
- to document the process evaluation by CHCWs over three time points during the 4-month implementation of the program
- to assess pre-post program changes in CHCWs knowledge.

METHODS:

- Development of course curriculum:**
 - Eight modules were developed based on formative research that supported the need for an effective, sustainable program for knowledge translation to CHCWs and at-risk populations.
 - The course for CHCWs encompassed key health messages for the population about diet, physical activities, and risk factors of type 2 diabetes
 - In designing the modules, creatively, fun, and experiential learning were incorporated.
 - A mix of classroom and E-learning (www.FITThai.org) approaches were used.
 - Newsletters, online lectures and community resources were available online.
- Study sample:**
 - The 35 of 69 CHCWs were randomly selected from five districts in Chiang Mai province.
- Implementation:**
 - CHCWs met for classes in small groups of five to nine participants in each district. The 8 classroom discussion took 2.5 to 3 hours each.
 - Online learning materials were posted and updated at least once a week. Online quizzes were completed at the end of each module.
- Evaluation:**
 - All CHCWs were tested for knowledge before the start of the training program and after the 4 months by validated questionnaire
 - Participant satisfaction was assessed through three different short questionnaires.
- Data analysis:**
 - Descriptive statistics were used to describe participants' characteristics and Student's Paired t-test, two-tailed, was used for comparing scores of knowledge gain.

RESULTS:

Attendance (N = 35)		Accessing the E-learning website		
Attending (times)	# of students (Percent)	Age Group (Y)	# of times (mean + SD)	Median (Min, Max)
6	1 (3)	25-34	12.5 + 6.47	12 (6,23)
7	11 (31)	35-44	17.3 + 8.51	16 (5,38)
8	23 (66)	45-54	11.6 + 6.32	13 (3, 21)
Total	35 (100)	Total	15.3 + 8.05	13 (3,38)

Pre-Post test score (N = 35)

	Pre-test (mean + SD)	Post-test (mean + SD)	p value
1. Understanding of nutritional terms (question score = 18)	9.4+2.87 (52%)	11.6+2.24 (64%)	< .001
2. Understanding of nutritional recommendations (score = 25)	7.1+3.25 (28%)	17.1+3.60 (68%)	< .001
3. Knowledge of food sources related to advice (score = 36)	26.3+3.19 (73%)	29.4+1.94 (82%)	< .001
4. Knowledge of diet-diseases association (score = 21)	13.8+1.44 (66%)	16.4+1.96 (78%)	< .001
Total (total score = 100) (% of total score)	56.5+6.26 (56.5%)	75.5+6.01 (75.5%)	< .001

Process evaluation of the training program (N = 35)

Questions	Response (% of respondents)			
	Disagree	Agree	Strongly agree	Average (0 to 10) (SD)
1. You liked the methods of this training.	0	17	83	8.7 (1.36)
2. You learned new content.	3	29	68	8.1 (1.82)
3. Program was useful for your job.	0	3	97	9.3 (0.89)
4. Assignments were useful.	0	9	91	9.0 (1.14)
5. You liked to do assignments.	3	20	77	8.3 (1.53)
6. You could adapt program knowledge to your community work.	0	9	91	9.1 (1.01)
7. All materials (e.g., CD-ROM, E-earning, Newsletters) helped you to learn.	0	20	80	8.6 (1.21)
8. You felt more confident to teach at-risk populations after you this program.	6	40	54	7.7 (1.69)
9. Computer skills were easy to learn.	29	17	54	6.7 (3.31)
10. The length of the training program was not too long.	11	17	72	8.0 (2.65)

Participants & learning activities in Chiang Mai province



August 13 – November 21, 2008

Open-ended responses were summarized.

- "...I understood more about nutrition, food, and diabetes prevention from the training program. I enjoyed. It was fun..." (CHCW from San Pa Tong district, Chiang Mai province, Thailand)
- "...Well, I liked the training program and learning methods. It was a new thing for me. However, I needed on-going support..." (CHCW from Mae Tang district, Chiang Mai province, Thailand)

DISCUSSION & CONCLUSION:

- The current training program was feasible, enjoyable and improved diabetes knowledge.
- The improvement of CHCWs' knowledge from baseline to the end of the 4 months of training met a prior criteria for success (70%).
- CHCWs said the training program was fun, culturally relevant, and applicable to diabetes prevention.
- The teaching strategies, course content, format, and materials in this initiative develop have the potential to benefit other CHCWs in Thailand.
- Ongoing access to web-based materials and expert support may help sustain learning.

Acknowledgements:

- Funding support is acknowledged from the Nestle Foundation, Switzerland
- Department of Health Studies & Gerontology, University of Waterloo, Canada
- The Office of Disease Prevention and Control 10 Chiang Mai province, Ministry of Public Health, Thailand



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