

A review on the effectiveness of the Vietnam national diabetes mellitus screening program from 2009 to 2015

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A review on the effectiveness of the Vietnam national diabetes mellitus screening program from 2009 to 2015

A thesis submitted in partial fulfillment of the requirement for the degree of Master in Public Health

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Glossary

Control: Reduction of disease incidence, prevalence, morbidity or mortality to a locally acceptable level as a result of deliberate efforts. Continued intervention measures are required to maintain the reduction (Michael J. Cuomo and Lawrence B. Noel Jr. PUBLIC HEALTH GLOSSARY: Terms and Definitions Guide for US Air Force Public Health Professionals. <http://www.phsource.us/PH/PDF/PARA/Public%20Health%20Glossary.pdf>)

Coverage (rate): The proportion of the estimated targeted population which has been reached. These are often used in relation to preventive programs, where target populations can be more easily estimated (S.Witter, T. Ensor, M.Jowett and R.Thompson. Health Economics for Developing Countries. 2010).

Effectiveness: The extent to which a specific intervention, procedure, regimen or service, when deployed in the field, does what it is intended to do for a defined population (S.Witter, T. Ensor, M.Jowett and R.Thompson. Health Economics for Developing Countries. 2010).

Follow-up: Monitoring a person's health over time after treatment. This includes keeping track of the health people who participate in a clinical study or clinical trial for a period of time, both during the study and after the study ends (NCI Dictionary of Cancer Terms. <http://www.cancer.gov/publications/dictionaries/cancer-terms?cdrid=44671>).

Incidence: The number of cases of disease that have their onset during a prescribed period of time. It is often expressed as a rate. Incidence is a measure of morbidity or other events that occur within a specified period of time (Sources: National Conference of State Legislatures, Public Health Accreditation Board).

Intervention: A term used in public health to describe a program or policy designed to have an effect on a health problem. Health interventions include health promotion, specific protection, early case finding and prompt treatment, disability limitation and rehabilitation (Sources: National Conference of State Legislatures, Public Health Accreditation Board).

Outcome: The effect on the health status of a health care intervention, or lack of intervention (S.Witter, T. Ensor, M.Jowett, and R.Thompson. Health Economics for Developing Countries. 2010).

Prevalence: The number of cases of a disease, infected people or people with some other attribute present during a particular interval of time.

It often is expressed as a rate (Sources: National Conference of State Legislatures, Public Health Accreditation Board).

Prevention: Actions were taken to reduce susceptibility or exposure to health problems (primary prevention), detect and treat disease in early stages (secondary prevention), or alleviate the effects of disease and injury (tertiary prevention) (Sources: National Conference of State Legislatures, Public Health Accreditation Board).

Utilization: Use of existing capacity, often measured as an average over a period (S.Witter, T. Ensor, M.Jowett, and R.Thompson. Health Economics for Developing Countries. 2010).

Universal access: to treatment or prevention services. These are services that are reachable, affordable and acceptable to all those in need (WHO. Technical Meeting for the development of a Framework for Universal Access to HIV/AIDS Prevention, Treatment and Care in the Health Sector. 2005. http://www.who.int/hiv/universalaccess2010/UA_definitions_Dec05.pdf).

Risk factor: Personal qualities or societal conditions that lead to the increased probability of a problem or problems developing (Sources: National Conference of State Legislatures, Public Health Accreditation Board).

Screening: The use of technology and procedures to differentiate those individuals with signs or symptoms of disease from those less likely to have the disease (Sources: National Conference of State Legislatures, Public Health Accreditation Board)

Treatment: The substance or procedure studied in an experiment or observational study. At issue is whether the treatment has an effect on the outcome or variable of interest.

Type 1 diabetes: A condition characterized by high blood glucose levels caused by a total lack of insulin. Occurs when the body's immune system attacks the insulin-producing beta cells in the pancreas and destroys them. The pancreas then produces little or no insulin. Type 1 diabetes develops most often in young people but can appear in adults (American Diabetes Association. Common Terms. <http://www.diabetes.org/diabetes-basics/common-terms/common-terms-s-z.html>).

Type 2 diabetes: A condition characterized by high blood glucose levels caused by either a lack of insulin or the body's inability to use insulin efficiently. Type 2 diabetes develops most often in middle-aged and older adults but can appear in young people (American Diabetes Association. Common Terms. <http://www.diabetes.org/diabetes-basics/common-terms/common-terms-s-z.html>).

List of abbreviations

BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
GDP	Gross Domestic Product
HIV/AIDS	Human Immunodeficiency Virus Infection/Acquired Immunodeficiency Syndrome
HRH	Human Resources for Health
IDF	International Diabetes Federation
NCDs	Non-Communicable Diseases
NGOs	Non-governmental organisations
OOP	Out-of-pocket
PMC	Preventive Medicine Center
T2D	Type 2 diabetes
THE	Total Health Expenditure
UHC	Universal Health Coverage
WHO	World Health Organization

Abstract

Background: Diabetes in Vietnam is one of 4 main non-communicable diseases with high morbidity and mortality after cardiovascular diseases, chronic respiratory diseases, and cancer. The national diabetes mellitus control project has been implemented to respond to the disease starting from 2008. There was a need to review the achievement of the first and most important objective of the project which deals with screening, clinical management and intervention on high-risk population in Vietnam. The results from the review will help for a better understanding of the status of management and intervention of Type 2 Diabetes (T2D) in Vietnam and to provide recommendations for the national diabetes mellitus control project.

Methodology: Literature review on coverage and systematic review to find evidence for the effectiveness of the program.

Results: In the period 2009-2015, only 14.7% of people 45 years and above who had high risk of diabetes had access for screening. This result showed a gap between the demand for screening and utilization. There was evidence that the diabetes screening program, with management and treatment, reduced the prevalence of diabetes and pre-diabetes after 1 and 2 years follow-up. The intervention on diabetes also showed the good impact on the improvement of diabetes awareness and reduction of harmful lifestyles. However, there were inconsistencies in the results of lifestyle changing such as smoking, eating fatty food and physical inactivity.

Conclusion: In the context of a limited budget, there is a need to use risk assessment form to calculate risk score for the purpose of an increased coverage. Guidelines for the cooperation between treatment and prevention should be established and implemented with regular monitoring and prevention. For a substantial intervention, studies with long-term follow-up are needed.

Introduction

I'm a researcher have worked in Department of Epidemiology, Institute of Public Health at Ho Chi Minh City since 2009. I am also a graduate fellow of Vietnam Field Epidemiology Training Program. The task of an epidemiologist requires me to do activities on disease control, scientific research and training. I used to work on communicable diseases for the past ten years. This time, a thesis on diabetes is a good opportunity to expand my knowledge on non-communicable diseases control in Vietnam. As Bertrand Piccard said "Pioneering spirit should continue, not to conquer the planet or space... but rather to improve the quality of life".

In Vietnam, the 21st century witnesses the development of non-communicable diseases, in which diabetes is one of the leading diseases caused a severe burden on the health system. Mortality and morbidity of diabetes increase every year. The Vietnam national diabetes mellitus control project was initiated in 2009 in order to respond to the burden of diabetes. In this project, the national diabetes screening program was the most important program besides the training and communication program. To find the evidence for the effectiveness of the diabetes screening program, the coverage, and evidence for the effectiveness of the program was reviewed. This thesis included 6 chapters.

Chapter 1 describes the background information in Vietnam such as demographic characteristics, economic development, culture and health system as well as the problem statement, justification, and objectives.

Chapter 2 provides the method of searching, collecting and analyzing data to achieve the objectives of this thesis.

Chapter 3 presents the results of coverage and evidence of the effectiveness of diabetes screening program.

Chapter 4 describes the reasons for the low coverage and impact of evidence on the improvement of the program.

Chapter 5 makes conclusion on the most important findings of this thesis.

Chapter 6 provides recommendations for policy makers and implementers to increase the coverage and effectiveness of the program.

Chapter 1: Background

1.1. Background information on Vietnam

1.1.1. Demographic

Vietnam is administratively divided into three regions (Northern, Central, and Southern) and six socio-economic sub-regions (Northern Midlands and Mountains, Red River Delta, North and South Central Coast, Central Highlands, Southeast, and Mekong River Delta¹ (See *Annex 1 for map*)².

In 2014, the population Vietnam is 90,728,900 people. The total fertility rate in Vietnam has declined substantially over the past years (See *Annex 2 for fertility rate from 1999-2009*)¹. This has been influenced by the government's family planning policy, the two-child policy. The well-being and health of people are improved as shown by the increase of life expectancy at birth, from 59 in 1972³ to 73 in 2014⁴. This has led to an increased aging population (See *Annex 3 for population pyramid*)¹, creating challenges and demands on the health system. Therefore new strategies are urgently needed to respond to the health needs of the old population group.

There are 54 ethnic groups in Vietnam. The Kinh, the biggest ethnic group, accounts for 86% of the nation's population. Other ethnic groups account for a range of 1.2% to 1.9% of the total population such as Tay, Thai, Muong, Khme, and Mong. The Kinh people mainly inhabit the Red River delta, the central coastal delta, the Mekong delta and major cities. The other groups are scattered over mountain areas from the North to the South. Particularly, most of Khmer people are living in the Mekong delta¹.

1.1.2. Economy

The economy is based on agriculture. The Renovation period started at the end of the 1980s, where the economy has been transformed from a centrally planned to a market economy. This progress led to the poverty declining from 37.4% in 1998 to 8.4% in 2014⁵. This helped Vietnam in changing from a low-income country to a low-middle income country. The economic development is related to the increase of non-communicable diseases, especially type 2 diabetes⁶.

The urbanization began to increase along with economic development. People tended to migrate from rural to urban areas for better opportunities. During the period 1999-2009, the urban population grew rapidly, on average of 3.4% per year, while in rural areas, population growth only reached a

0.4% per year¹. In 2015, the Gross Domestic Product (GDP) was 193,599 billion US dollars, GDP per capita was 2,111 US dollars Compared to 10 Southeast Asian countries, GDP per capita in Vietnam was low (ranked 6th)⁷.

In 2009, an overall of 96.1% of households used electricity. The proportion of households that used sanitary toilets in urban areas, was double than in rural areas, 87.8% versus 39.0% respectively. The proportion of households using clean water was 86.7%. Nationally, 86.9% of households used a television, a doubling since 1999. The proportion of households using motorcycles was 72.3%¹. The household out-of-pocket (OOP) share of total health expenditure (THE) remained high at 48.8% in 2012⁸.

1.1.3. Culture

Vietnamese culture values parents and ancestors. In a family, women are expected to submit to their husbands. As the influence of the culture, most of the men are raised to sit and drink or smoke while the women do all of the housework. The negative effect of this culture is the high prevalence of smoking and drinking in males. A national survey of risk factors for the non-communicable disease at 8 provinces in Vietnam showed that the proportions of current smokers (males 55.7%, females 1.7%), and binge-drinkers (males 25.11%, females 0.63%)⁹.

The proportion of physical activity of men in Northern provinces (87.9% in Hoa Binh, 83.5% in Thai Nguyen) was higher than central provinces (80.0% in Daklak, 73.2% in Binh Dinh) and southern province (37.2% in Can Tho). The proportion of physical activity in big cities was low, 38.4% in Ha Noi and 28.7% in Ho Chi Minh City. The proportion of physical activity of women was slightly lower than men. The fruit/vegetable consumption in Northern was also higher than Southern⁹.

There are differences of Vietnamese food preparation practices and taste in each region of Vietnam (Northern, Central, and Southern). These differences are based on distinctive and unique characteristics representing the geographical location and the living condition of inhabitants there. People in Northern region tend to use less spice and monosodium glutamate to increase appetite. Food in the Central region is characterized by its hot and spicy flavors. Compared to Northern people, residents in the Southern region are adding sugar to food instead of monosodium glutamate.

1.1.4. Health system

The Vietnam health system is described in this part including health services delivery, health workforce, health information, essential medicine,

financing, and leadership and governance. The administrative structure of the health care system in Vietnam is centralized with 4 levels (central, provincial, district and communal).

In 2013, the total number of health facilities was 13,680, in which 1,125 of the facilities were hospitals. The distribution of health facilities at central level was 46 (0.03%), at the provincial level, it was 447 (3.33%), at the district level, it was 1,214 (8.87%) and at the communal level, it was 11,033 (80.65%)¹⁰. The private providers provided care to 60% of all outpatient contacts in Vietnam¹¹.

Number and distribution of inpatient beds per 10 000 population in 2013 was 24.7. This distribution was higher than the target in 2015 and very close to the target to 2020, 24.7 vs. 23 and 25 respectively¹⁰.

Health Workforce/Human resource for health (HRH)

The Health Statistics Year Book 2013 showed the increase of number of health workers per 10 000 population. The number of doctors was close to the target 2015 (7.6 vs. 8). The number of pharmacists was higher than the target 2015 (2.1 vs. 1.8)¹⁰. The number of nurses and midwives were increasing with 83,369 and 27,837 respectively¹⁰ in 2013.

The Joint Annual Health Review in 2009 on Human Resources for Health in Vietnam showed the shortage of health workers in preventive medicine and other specialties. The number of staff in preventive medicine is too low compared to the plan and policy for establishment of centers such as preventive medicine, inspectorate of food safety and hygiene. There is an imbalance across less-attractive specialties, especially a severe shortage of university-trained pharmacists, preventive medicine staff, para-clinical staff and staff in other less-attractive specialties¹².

Other problems on health workforce are the inappropriate distribution of health workforce and lack of highly qualified health experts/specialists. There is a severe shortage of qualified staff at the provincial and district level¹².

Health Information

Health information is very important for decision making. The Health Information System in Vietnam is operated based on Ministry of Health guidelines for the regime on notification of, reporting on, and declaration of diseases and communicable diseases. This guideline showed that 42 communicable diseases are required to be reported daily, weekly or monthly¹³. Meanwhile, there is still no similar guideline of the Ministry of Health for reporting the non-communicable diseases. This led to poor data

quality on non-communicable diseases due to lack of country ownership. The data was not trusted or used for policy-making, program action, and research to effectively allocate resources based on needs and system performance.

A thesis of Eivind AndersBerg in 2007 showed the challenges of implementing a health information system in Vietnam. The biggest challenge was the variation in the support given by the Vietnam authority and Ministry of Health for the implementation and sustainability of the system¹⁴.

Essential Medicines

The ministry of health procures and distributes medicines for service delivery. Vietnam has produced medicines satisfying requirements of treatment, pricing and supply capability¹⁵. However, the pharmaceutical import index was still many times higher than the export, 17.5 times in 2012 and 18.5 times in 2013. The drug expenditure per capital was 19.5 USD in 2012 and 31.18 in 2013, the growth rate was 59.9%¹⁰.

A research on medicine prices, availability, and affordability in Vietnam showed that medicines were high in price, and low in both availability and affordability, especially in the public sector. The availability of the lowest priced generic equivalent was greater than innovator brand. The number of days' wages of the lowest-paid unskilled government worker need to purchase of treatment in Vietnam was higher than those in Western Pacific Region. The price of diabetes medicine was higher than medicines for respiratory infection and asthma but lower than ulcer¹⁶.

Health Financing

Health financing is critical for service delivery. Total health expenditure (THE) declined from 6.4% in 2010 to 6.2% in 2011 and then to 5.97% in 2012⁸. The percentage of the health insured population was 70%. The government subsidizes at least 50% of the premium for persons with low incomes but still has not improved enrollment of this group. Many such persons joined the health insurance scheme only when they needed to use health-care services. Despite the increase of social health insurance (SHI), the out of pocket payments (OOP) for health are still very high and accounts for 55% of the total health expenditure¹⁷. The OOP is a risk factor leading to poverty.

Leadership and Governance

Recently, Vietnam government showed stewardship in the vertical health system (*See Annex 4 for the administrative structure of the health system*) by providing The National Strategy on Protection, Caring, and

Improvement of people's health in the period of 2011-2020 with a vision to 2030. The overall objective of this strategy is focused on universal health coverage and the specific objectives are the improvement of the health system. These specific objectives are included control diseases, enhance health care services, family planning, develop human resources for health, innovative health care financing, ensure the quantity of medical product and enhance leadership as well as information and research¹⁸.

The government of Vietnam has developed and issued a system of policies on prevention and control of cancers, cardiovascular diseases, diabetes, chronic obstructive pulmonary disease, asthma and other non-communicable diseases. The purpose of these policies is to minimize morbidity, disability, and mortality, in which government takes leadership and health sector plays a key role¹⁹⁻²².

Diabetes program diagram

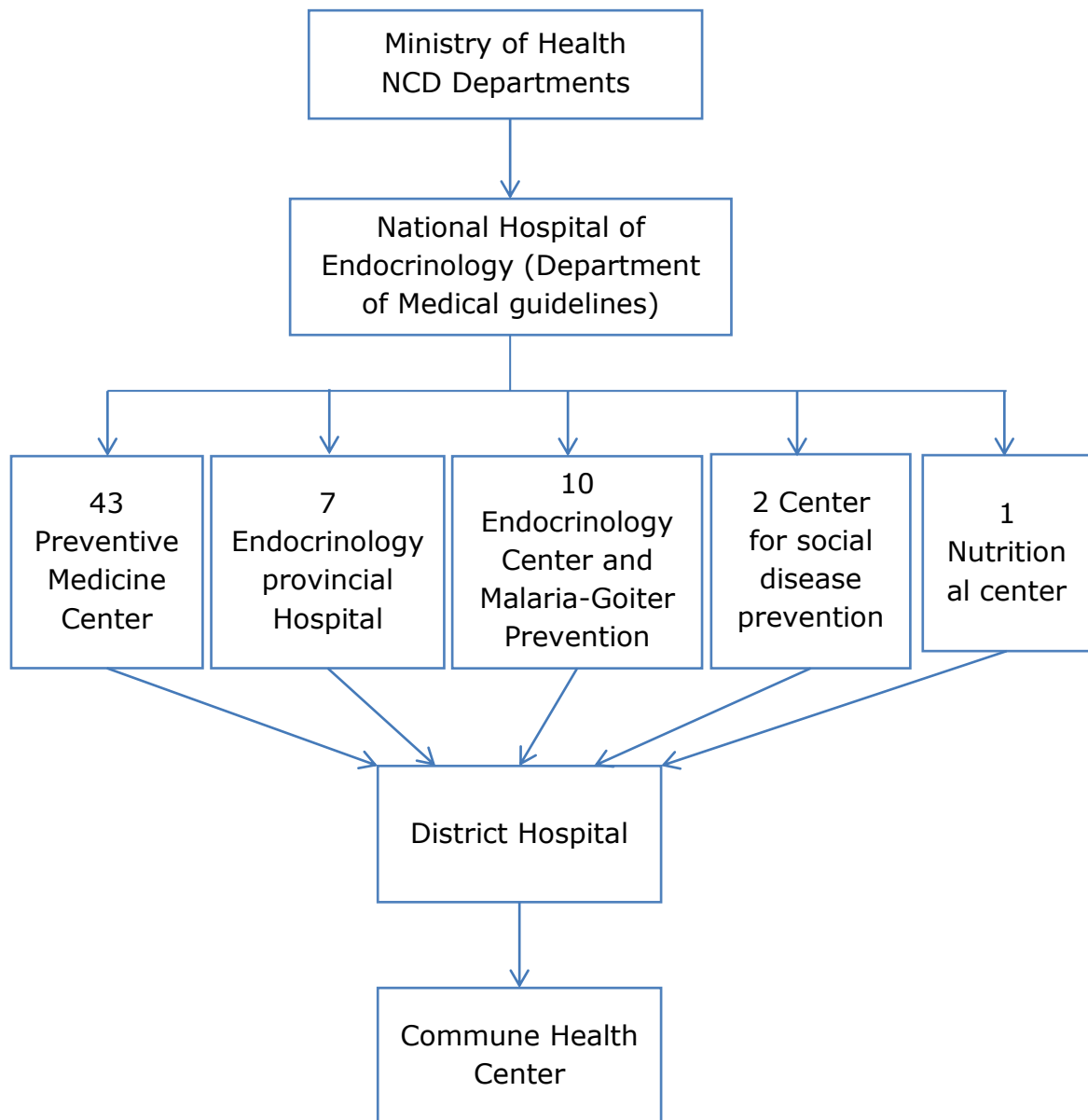


Figure 1: Network diagram of Vietnam national diabetes screening program

The ministry of health has the overall leadership of the national diabetes mellitus control project, in which the screening program is the principal activity for early detection, management, and prevention.

The Department of Medical Guidelines at National Hospital of Endocrinology is responsible for planning, monitoring, and surveillance of the project. This unit also collaborates with health agencies at the provincial level to implement the screening and surveillance activities of the project.

The network of the diabetes control program had some changes at the provincial level in the period from 2010 to 2015^{23, 24}. In 2010, Preventive Medicine Center (PMC)/ Preventive Healthcare Center at provincial level, Endocrinology Hospital (15 units) and Endocrinology Center 12 units) involved in the network. In 2012, there were PMC (45 units), Endocrinology Hospital (5 units), Endocrinology Center (5 units), Malaria-Goiter Prevention Center (5) and Nutritional Center (1). In 2015, 2 Center for Social Disease Prevention participated in endocrinology and metabolism network besides PMC (43 units), Endocrinology Hospital (7 units), Endocrinology Center and Malaria-Goiter Prevention Center (10 units) and Nutritional Center (1 units) (Figure 3).

The district Hospitals worked and collaborated directly with the provincial level to employ diabetes prevention activities in the communities. They received close support from commune health centers. Together, the program implementers conducted screening program activities including the establishment of screening and counseling sites and implementing communication activities.

At the commune level, the diabetes activities implemented include i) preventing diabetes through behavior change communication; ii) identifying high risk persons for diabetes and responses to eliminate these risk factors; iii) screening, early diagnosis of diabetes and pre-diabetes and referral to higher level for confirmation and timely treatment; iv) managing and monitoring patients who receiving treatment at higher level.

1.1.5. Burden of disease

In the disease statistics including communicable diseases, non-communicable diseases, and injury in Vietnam, the morbidity and mortality of communicable diseases are decreasing from 55.5% and 53.6% in 1976 to 25.3% and 12.2% in 2013 respectively. Meanwhile, the trend of non-communicable diseases morbidity and mortality was increasing from 39% and 41.8% in 1986 to 63.5% and 69.6% in 2013, respectively (See Annex 5 for trend morbidity and mortality whole country)²⁵.

In 2014, NCDs are estimated to account for 73% of total deaths. Out of all deaths (percentage of total deaths, all ages, both sexes), 30% were due to cardiovascular disease, 21% from cancer, 6% from chronic respiratory diseases, 3% from diabetes and 2% from mental and neurological disorders²⁶.

1.2. Problem statement, Justification, Research Questions and Objectives

1.2.2. Problem statement

Type 2 diabetes accounts for 90% of all diabetes cases around the world²⁷. More than 80% of diabetes-related deaths occur in low- and middle-income countries²⁸. In 2015, the International Diabetes Federation estimated that one in 11 adults had diabetes and that one in two adults with diabetes was undiagnosed. According to IDF, 12% of global health expenditure was spent on diabetes²⁹.

The prevalence of T2D in Vietnam (8%)³⁰ was greater than type 1 diabetes (0.05%)³¹. Among 10 Southeast Asia countries, the prevalence of T2D(8%) was fourth highest after Malaysia (11.7%), Singapore (11.1%) and Thailand (8.2%)³². Diabetes in Vietnam was one of 4 main non-communicable diseases with high morbidity and mortality after cardiovascular diseases, chronic respiratory diseases, and cancer³³.

Recently, in a systematic review on prevalence and risk factors for type 2 diabetes in Vietnam, 2 national surveys and 8 regional investigations showed that the prevalence of T2D were 2.7% in 2002 and 5.4 in 2012. The prevalence in the northern region was 1.4% in 1994 and 3.7% in 2012. In southern region they were 3.8% in 2004, 7.0% in 2008 and 12.4% in 2010. The risk factors of T2D included older age, urban residence, high levels of body and abdominal fat, physical inactivity, sedentary lifestyle, genetic factors, and hypertension³⁴.

The asymptomatic pre-clinical phase of T2D can be up to 12 years before its clinical diagnosis³⁵. Therefore leaving a large window period for early detection, one of the strategies for control of T2D is early detection - screening and diagnosis - and treatment to reduce serious complications and improve the quality of life. Other strategies are education, to increase self-care knowledge, lifestyle management (including nutrition, physical activity, smoking), psychological care, self-monitoring, blood glucose control, blood pressure control, cardiovascular risk protection, prevention of nerve and kidney damage, foot care and eye screening³⁶.

Type 2 diabetes (T2D) usually occurs in adults when the body cannot produce enough or properly use insulin. This status leads to high blood glucose levels. The most frequent T2D symptoms are frequent urination, excessive thirst, weight lost and blurred vision. The symptoms are usually mild and most of people do not recognize their T2D status until the complications appear. T2D is a leading cause of cardiovascular diseases such as, stroke, blindness, nervous system damage, kidney failure, non-traumatic lower-limb amputation and sexual dysfunction in men.

The primary causes of T2D are still not known. However, the risk factors of T2D are confirmed including excess body weight, physical inactivity and poor nutrition as well as a family history of diabetes and a past history of gestational diabetes and advancing age.

1.2.3. Justification

In 2008, the Vietnam government approved the National Target Program on social diseases, dangerous epidemics and HIV/AIDS for 2006-2010, in which diabetes was one of the specified priorities. The objectives of the diabetes program were: i) make 50% of population aware of diabetes and its risk factors; ii) reduce the proportion of undiagnosed cases of diabetes and the prevalence of pre-diabetes in community to less than 60%; iii) establish, employ and sustain the model of diabetes management on the whole country; and iv) provide follow-up and care to 50% of diabetes patients³⁷. However, the actual implementation of this program started in 2010, two years later.

In 2012, the National Target Program for the period 2012-2015 was reviewed and approved. The new program objectives were: i) increase screening in the community and manage 60% of pre-diabetes and 50% diabetes people; ii) training and refresher training for 100% of health workers in the diabetes program; and iii) complete the treatment network with 100% hospitals with an Endocrine department³⁸.

The national diabetes mellitus control is a new project (already running for 6 years) in Vietnam. This review focuses on the first objective of the

national project, which deals with screening, clinical management and intervention on the high-risk population in Vietnam.

Framework of Vietnam national diabetes screening program

The Vietnam national diabetes screening program, part of the diabetes mellitus control project, implemented 3 prevention levels (*Table 1*). At the primary prevention level, the intervention activities were focused on individuals at risk. At the secondary prevention level, the activities were implemented on diabetes patients to prevent complications. At tertiary prevention level, the activities to reduce complications were implemented³⁰.

At primary prevention level, a diabetes screening program provided free early detecting, managing and counseling, treatment and monitoring as early as possible for individuals with diabetes and for individuals at risk. The definition of an individual at risk followed the guidelines of the Ministry of Health³⁹. An individual was at high risk of diabetes if aged 45 years and above with any one of the six risk factors following: BMI ≥ 23 , blood pressure $> 130/85$, family history of diabetes, metabolism or pre-diabetes history, history of special pregnant and dyslipidemia (*Table 1*).

Table 1: Risk factors for Pre-diabetes and Type 2 diabetes of Vietnam national diabetes screening program

1. Age	≥ 45 and one of risk factors following
2. BMI	≥ 23 (IDF, 2005)
3. Blood pressure	$> 130/85$
4. Family history	Parent, sister, brothers or children with diabetes
5. Metabolism history, pre-diabetes history	History of Impaired Fasting Glucose (IFG), Impaired Glucose Tolerance (IGT)
6. History of special pregnancy	Gestational diabetes, giving birth to a baby more than 3600 gram, multiple miscarriage or stillbirth
7. Dyslipidemia	HDL-c < 0.9 mmol/l Triglyceride > 2.2 mmol/l

Secondary and tertiary prevention levels were aimed at both old and new diagnosed patients with type 2 diabetes. The expectations of these preventions were to prevent the progress of diabetic complications and enhance the quality of life for diabetes patients.

Overall, the national screening diabetes program offered practical instructions for intensive lifestyle management, particularly at primary and tertiary prevention.

Table 2: Framework of Vietnam national screening program

Primary Prevention		Secondary prevention	Tertiary prevention
Total population	Individuals at risk	Diabetes patients	Complications
<ul style="list-style-type: none"> - KPA survey on diabetes control (once per two years) to certify the awareness of people on diabetes. The results use to establish communication program which is appropriated for each region of Vietnam. - Develop communication documents - Promote diabetes prevention and treatment communication on mass media. 	<ul style="list-style-type: none"> - Screening, early detecting diabetes. - Managing and counseling to prevent and delay the development of diabetes in individuals with pre-diabetes. - initiate treatment and monitoring as early as possible in individuals with diabetes. - Nutritional and physical activity counseling for individuals at risk. 	<ul style="list-style-type: none"> - Treatment according to guidelines, assuring that patients have advantage, economic, and effective accessibility to the treatment - counseling on preventing complications - health promotion and education for patients on self-care and blood glucose - build up diabetes clubs for patients - screening for risk factors such as tuberculosis 	<ul style="list-style-type: none"> - active treatment for patients to reduce complications and mortality - promote counseling, educating patients to implement treatment guidelines - Check-up and establish follow-up notebooks.

No review has been done so far on the coverage and evidence for the effectiveness of the national diabetes screening program. Therefore, this study aims to understand the coverage of the diabetes screening program. The evidence for the effectiveness of the program is also critically analyzed. The results of this study will help to get a better understanding of the status of management and intervention of T2D screening in Vietnam and provide recommendations for the national diabetes mellitus control project.

1.2.4. Research questions

1. Does the national diabetes screening program actually cover the population of 45 years old and above?
2. Is there evidence that the diabetes screening program reduces diabetes and pre-diabetes morbidity in the population of 45 years old and above?
3. Does the diabetes screening program increase the awareness of the risk factors, symptoms and methods of prevention of the T2D?
4. Does the diabetes screening program change lifestyle in terms of eating habits, physical activity, smoking, and drinking?

1.2.5. Overall objective

To understand the coverage of the national diabetes screening program and find evidence for its effectiveness in reducing the burden of disease and causing behavioral change. The recommendations will be used for the improvement of the program.

1.2.6. Specific objectives

1. To describe the coverage of the Vietnam national diabetes screening program: screening, diagnosis, treatment, and follow-up.
2. To identify the evidence that the diabetes screening program reduces diabetes and pre-diabetes morbidity.
3. To identify the evidence that the diabetes screening program improves awareness of the risk factors, symptoms and the method of prevention in adults with T2D.
4. To identify the evidence for the effectiveness of the diabetes screening program on lifestyles in terms of eating habits, physical activity, smoking and drinking in adults with T2D and pre-diabetes.
5. Provide recommendations for policy makers and program implementers.

Chapter 2: Methodology

2.1. Study design

This study used literature review to describe the coverage of the national diabetes screening program. The systematic review was used to evaluate the effectiveness of community interventions on the health outcome and diabetes awareness and lifestyle. The systematic review is conducted according to the Cochrane handbook for systematic reviews of interventions⁴⁰ and Guidelines on Systematic Reviews of Health Promotion and Public Health Intervention⁴¹.

2.2 Theory of change/Conceptual Framework

To evaluate the effectiveness of diabetes screening program, using the theory of change is useful as it is a more formative approach. This theory articulates expected processes and outcomes that can be reviewed over time⁴². It also helped to identify strong points and bottlenecks where the process might be getting stuck. The theory of change also helped to identify problematic areas of the program to be reviewed and fine-tuned. For this study, the theory of change was created based on WHO health system framework (See Annex 6)⁴³, the framework of Vietnam national diabetes screening program (Table 1)³⁰ and Knippenberg/Tanahashi model^{44, 45}.

In this study, the coverage of diabetes screening program was affected indirectly by funding, expertise of professional staff and infrastructure, communication and monitoring and evaluation. The activities of the program which link directly to coverage were described including screening, treatment and management and behavior change communication. A part of monitoring and evaluation activity was mentioned in health information system.

The coverage was also affected by the health outcomes including diabetes and pre-diabetes status; the awareness on risk factors, symptoms and prevention of diabetes; and the change in eating habits, physical activity, smoking, drinking and the BMI of people aged 45 years and above. The financial and social risk protection and client's satisfaction were important outcomes but they were not cover in this review (Figure 1).

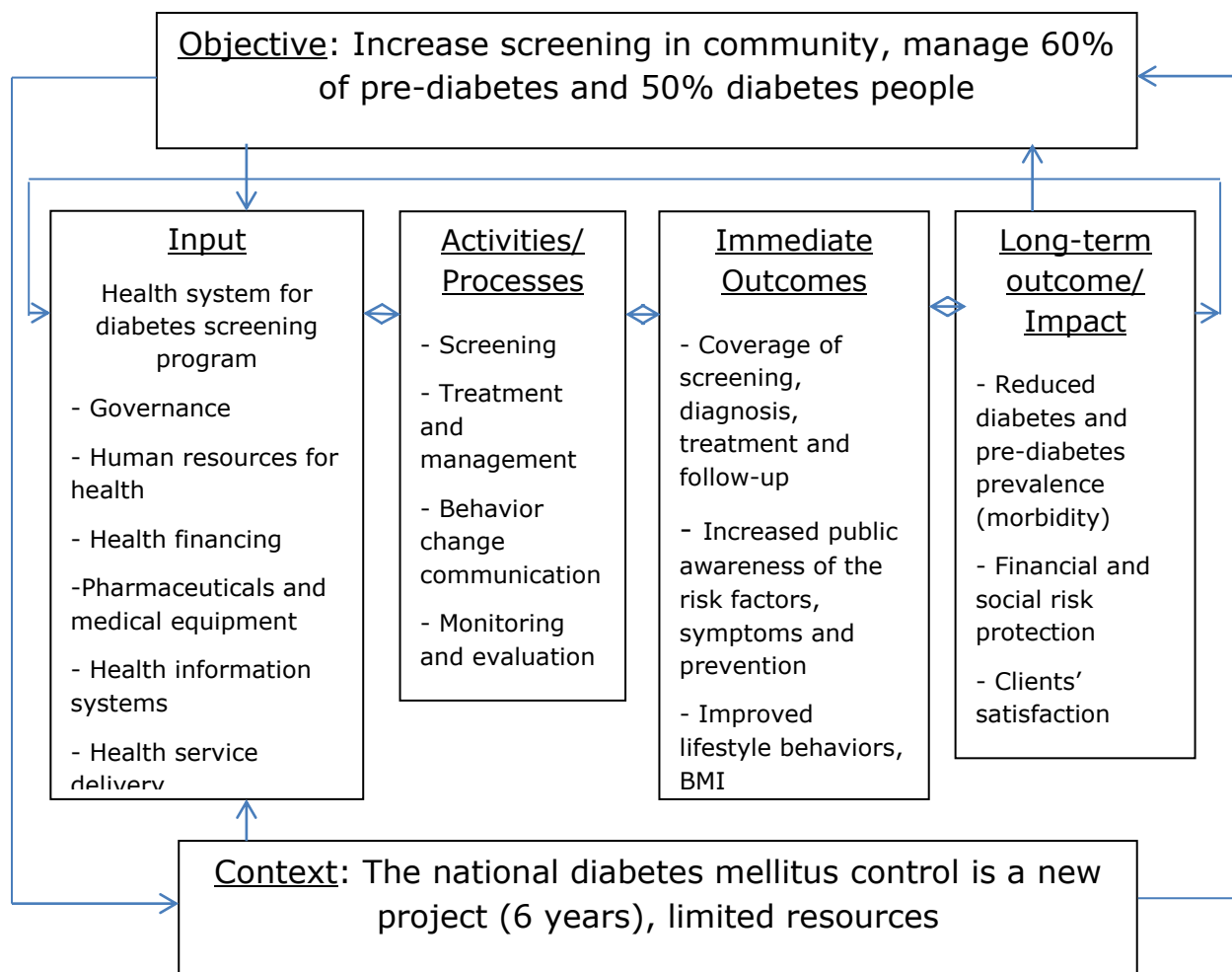


Figure 2: Theory of Change/Conceptual Framework

2.3 Literature search strategy

2.3.1 Search strategy for objective 1

Search engine including Pubmed, VU online, CDC, WHO, International Diabetes Federation will be used to collect English literature of the Vietnam national diabetes mellitus control project. The combination of keywords "diabetes", "type 2 diabetes", "Vietnam", "intervention", "prevention", "project", "program", "symptom", "lifestyle", "risk factors" were used.

Vietnamese literature was also collect with keywords were "đái tháo đường", "tiểu đường", "can thiệp", "phòng chống", "dự án", "chương trình", "triệu chứng", "lối sống", "yếu tố nguy cơ" on website of HCMC Medical Journal, Journal of Preventive Medicine and Google.

Inclusion criteria

All documentations, articles, and theses related to Vietnam national diabetes screening program were included. In review, quality criteria for inclusion were used as described below.

Quality appraisal of included data or information

The quality of the information was assessed based on:

- The original purpose of the data collection serves as government document; data collected for research institutions; or provide information about national diabetes prevention program for communities.
- To ascertain the credentials of the sources or authors of the information that the authors must have knowledge or experience, on providing or using Diabetes Prevention Program services and/or experience in health research.
- The date of publication must be from 2008, the time that the Prime Minister approved the national diabetes mellitus control project.
- The intended audiences are the Diabetes Prevention Program managers, institutions, the ministry of health, scientific experts, media and the community.
- The coverage of the report or document must be related to the Diabetes Prevention Program.
- Only the primary source is used for this study.
- The references to the articles, documents, reports must be clear described and can be effectively used for further searching.

Exclusion criteria

The documents, studies on gestational diabetes, type 1 diabetes, reviews, and articles duplicated from other articles were excluded.

Data before 2008 was also excluded.

2.3.2 Search strategy for objective 2, 3 & 4

Database searching

Primary peer-reviewed journals were searched for community interventional studies of T2D in Vietnam. English literature on T2D has been selected from the website of Pubmed, VU online library (searching in Wiley online library) using the combination of keywords.

Keywords: [diabetes OR type 2 diabetes AND Vietnam OR intervention OR risk factors OR symptom OR prevention OR lifestyle].

HCMC Medical Journal will be searched for Vietnamese literature with **keywords** were “đái tháo đường”, “tiểu đường”, “can thiệp”, “phòng chống”, “dự án”.

Both English and Vietnamese searches were used to reduce language bias that significant positive findings are more likely to publish in English language journals.

Hand searching has been used for the Journal of Practice Medicine because its website is not designed for database searching.

The reference lists of the articles which were identified were also used to retrieve other articles (snow-ball) on Web sites of the World Health Organization (WHO), International Diabetes Federation and Google.

Inclusion criteria

To evaluate the effectiveness of the diabetes screening program, only primary interventional studies are chosen to evaluate the effectiveness of the community interventions on health outcome, awareness, and lifestyle. These studies must have the steps of implementing study similar to the steps of the program including:

- Checking blood glucose levels for all participants aged 45 years and above before and after interventions,
- Manage pre-diabetes and diabetes cases and providing information on the prevention and control of diabetes through good nutrition and physical activities for participants in the intervention group.

Exclusion criteria

The documents, studies on gestational diabetes, type 1 diabetes, reviews, and articles duplicated from other articles will be excluded.

For the purpose of providing recommendations for the improvement of the diabetes screening program, the studies before 2010, the time that diabetes screening program has implemented, will be excluded. The studies with a population aged < 45 years old will also be removed from this study.

2.4 Data collection

The results of the literature search for coverage of the diabetes screening program were included diabetes statistics, administrative records, observations documents of government, WHO, CDC, IDF, and NGOs. All documents which were published on the internet were included as means of describing the T2D program and measuring the coverage (screening, diagnosis, treatment, and follow-up) will be reviewed.

A process for selecting studies to evaluate the effectiveness of community interventions on diabetes health outcome, awareness and lifestyle are as follows:

1. Merge search results and remove duplicate records of the same report.
2. Examine title abstracts to remove obviously irrelevant reports.
3. Retrieve full text of the potential relevant reports.
4. Link together multiple reports of the same study.
5. Examine full-text reports for compliance of studies with eligibility criteria.
6. Make final decisions on study inclusion & proceed to data collection.

Data and information from articles, theses that met inclusion criteria were systematically reviewed:

- Background data with information including authors, year of study/publication, study design, sample size.
- Data on awareness such as awareness on risk factors, awareness of symptoms, and awareness on prevention.
- Data on lifestyle intervention:
 - o eating habits: sweet food, fat food
 - o eating vegetables every day
 - o eating after 8PM at night
 - o physical activity
 - o smoking
 - o drinking alcohol
 - o Body mass index (BMI)

2.5 Analysis

Data on the study location, study population, sampling technique, T2D classification, prevalence, awareness and risk factors of T2D have been extracted, summarize and entry into excel. The appropriateness has been assessed before combining data into a table, chart or figure.

Analysis objective 1: To describe the coverage of Vietnam national diabetes mellitus screening program on screening, diagnosing, treatment and follow-up.

Knippenberg/Tanahashi model is used to describe the utilization national diabetes screening program^{44, 45}. This review focuses on actual coverage: target population, screening (utilization), diagnosing (utilization), treatment (adequate coverage) and follow-up (effective coverage). Potential coverage including geographical accessibility and availability of resources was not reviewed due to lack of data. For geographical accessibility, the percentage of people who live within one hour walk from a health center are

needed. For availability, the number of working days sufficient staff available/expected number of working days are needed. The potential coverage indicators were not in the list indicators for monitoring and evaluating the non-communicable diseases activities of Ministry of Health⁴⁶. Therefore, data on geographical accessibility and availability of resources were not collected by the diabetes screening program implementers.

Knippenberg model

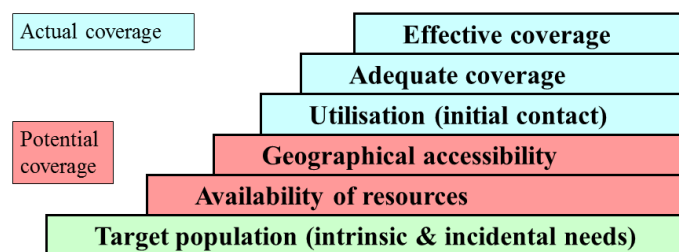


Figure 3: Knippenberg/Takahashi model

According to the Vietnam national diabetes screening program, the specific components of Knippenberg/Tanahashi model are defined adapted to national diabetes screening program as follow:

Target population: Number of people aged 45 years and above

Utilization (Screening): percentage of high-risk people who are attending health center for a diabetes test.

Utilization (Diagnosing): percentage of diabetes and pre-diabetes people who had been screened.

Adequate coverage (Treatment): percentage of diabetes and pre-diabetes people who received counseling or treatment

Effective coverage (Follow-up): percentage of diabetes and pre-diabetes people who were monitored at the end of the year.

Analysis objective 2 and 3: The PRISMA flow diagram was used to illustrate the systematic search results⁴⁷. The full text of eligible articles and theses have been evaluated and synthesized. The table of characteristics of included studies will also be presented.

2.6 Timeline 2016

This study was conducted from 15 January to 6 September 2016 (See Annex 7 for timeline).

Chapter 3: Results

3.1 Description of activities of national diabetes screening program

3.1.1 Screening

A screening process consists of three sequential steps. In the first step, The Health Network in the local province sends a letter and questionnaire to all adults aged 45 years and above, asking people to self-identify risk factors for diabetes and return the completed questionnaire to the Network. In step 2, people selected in the first step were requested to attend the health center, where blood glucose levels were checked for at-risk patients for the diagnosis of diabetes or pre-diabetes. In step 3, a single health consultation was conducted with each patient diagnosed with diabetes or pre-diabetes. Patients with diabetes were provided therapy. All patients were provided with information on the prevention and control of diabetes through good nutrition and physical activity^{48, 49}.

3.1.2 Treatment and Management

On-going consultations for the management of diabetes were undertaken in the communes where the screening program was implemented. Consultation rooms were established in local areas⁴⁸. The annual report in 2014 noted that more than 90% of facilities in the network provide counseling on diet and physical activity for diabetes prevention and management. The remaining provinces have not been able to set up counseling clinics due to staff shortage⁵⁰.

People with diabetes and pre-diabetes were recalled for consultation every 3 months. In fact, these people used to examination and consultation for every 6 months⁵¹. At each consultation, fasting blood glucose, blood pressure, and weight and height were measured. Pharmaceuticals were provided at these consultations for patients diagnosed with pre-diabetes (ie with fasting venous blood glucose in the range 5.4-6.9 mmol/l) or diabetes. The consultations included discussion on diet (including salt intake), physical activity, smoking and alcohol consumption. These consultations are provided free of charge to the diabetes patients. The local health center was paid 5,000 VND (around US\$ 2) for each consultation, which does not cover the costs of the consultation⁴⁹.

There is no routine procedure for follow-up of patients who do not attend consultations. No information was available on the sustainability of this activity if patients were required to pay for the service⁴⁸.

3.1.3 Behavior change communication

Health education for the commune was provided in all provinces to promote prevention and control of type 2 diabetes. From 2009, diabetes screening program has organized a series of communication activities on media mass, distribution images, and documents in the community. This activity was a combination with direct counseling for people at risk of diabetes and diabetes patients^{48, 51}.

The evaluation of the results of diabetes screening program showed that the direct counseling and communication in 2011 and 2012 had tripled compared to 2009 and 2010⁵¹.

The diabetes clubs were also organized, in which pre-diabetics or diabetics were the communicators. However, this activity was very limited to provinces⁵¹.

3.2 Achieved coverage

In 2009-2010 population screening for early detection was undertaken in 1-2 communes, of 30 provinces⁴⁸. Since 2011, diabetes screening program has implemented in all 64 provinces. However, the program activities only engaged in 18.5% of the total of communities in the period of 2009-2012⁵¹. Every year, National Hospital of Endocrinology chooses the screen sites at communes randomly²⁴. These communities were selected based upon anecdotal information that the community may contain an elevated prevalence of people at risk of developing diabetes⁴⁸. Screening moves from screening site to screening site every year.

The result from evaluating national diabetes control program from 2009-2012 showed that 42.1% of 1,443,438 people aged 45 years and above were given risk assessment questionnaire was classified as high-risk group⁵¹. Therefore, this study assumed that 42% of the population at the aged 45 years and above were at risk of diabetes. From the percentage of risk population, the coverage is calculated (*Table 3*).

Table 3: Coverage of Vietnam national diabetes screening program

	2009	2010	2011	2012	2013	2014	2015
growth rate ⁵²	1.06	1.07	1.05	1.08	1.07	1.08	1.08
pop >=45 ^{1*}	20,300,345	20,517,559	20,726,652	20,958,076	21,169,200	21,396,564	21,615,807
screening ^{23, 24**}	51,196	222,194	248,466	268,373	266,480	116,542	121,439
diabetes ^{23, 24}	2,104	13,935	18,738	19,778	19,026	8,974	10,079
pre-diabetes ^{23, 24}	5,636	33,016	38,315	36,123	45,966	23,851	27,445
No. managed cases ^{23***}				91,708	74,994	69,784	66,384
Counseling count ²³				111,743	119,896	117,276	110,123
Developed diabetes ²³⁺				11,913	14,673	10,243	9,241
Still pre-diabetes ²³⁺⁺				39,904	46,558	38,694	33,986
Death ²³				29	32	26	21
Lost follow-up ²³				6,207	10,740	13,143	12,456
Pop at risk (assume 42%)	8,526,145	8,617,375	8,705,194	8,802,392	8,891,064	8,986,557	9,078,639
Coverage of screening (%) ⁺⁺⁺	0.60	2.58	2.85	3.05	3.00	1.30	1.34
Coverage of diagnose (%) [±]	0.09	0.54	0.66	0.64	0.73	0.37	0.41
Coverage of treatment (%) ^{±±}				1.04	0.84	0.78	0.73
Coverage of follow-up (%) ^{±±±}				0.97	0.72	0.63	0.59

*Population from 2010 to 2015 calculated using the formula: $P_t = P_o (1+r)^n$ where P_t is the population in time t and P_o is the base population in 2009. The annual growth rate r is a derivative from the equation while n is the number of years between the base and year t ⁵³.

**Screening: number of high-risk people attended the health center, where blood glucose levels were checked for the diagnosis of diabetes or pre-diabetes²⁴

***Number of manage cases: number of pre-diabetes cases were managed²⁴.

+ Developed diabetes: number of managed pre-diabetes cases develop diabetes

++ Still pre-diabetes: number of managed pre-diabetes cases were still in pre-diabetes status

+++ Percentage of high-risk people who are attending health center for a diabetes test.

± Percentage of diabetes and pre-diabetes people who had been screened divided by population at risk.

±± Percentage of diabetes and pre-diabetes people who received counseling or treatment divided by population at risk.

±±± Percentage of diabetes and pre-diabetes people who were monitored at the end of the year divided by population at risk.

3.2.1 Coverage of screening

Coverage of the whole population

The coverage of screening was very low, 0.6% in 2009, increased to 2.6% in 2010, 2.9% in 2011, 3.0% in 2012 and 2013 and then reduced to 1.3% in 2014 and 2015^{23, 24} (Table 3).

A report of diabetes screening program 2012 estimated that the program needs more than 10 years to evaluate risk factors for diabetes for the high-risk group. It was also mentioned the need to calculate scores of each risk factor for type 2 diabetes. The result of analysis data showed that the prevalence of diabetes in a population with 1 and 2 risk factors was 3.2% and 5.1% respectively. However, when the group of people with 1 risk factor divided into 2 different age group, the proportion of diabetes increased significantly with age²⁴.

A review of Catherine Harper on the Vietnam non-communicable disease prevention and control program 2002-2010 also showed that less than 1% of the target age group in Vietnam were screened in 2009-2010⁴⁸.

A report of the Department of Health in Kon Tum province noted that the proportion of people benefiting from the diabetes project was low and only reach 9 communities in a total of 102 communities⁵⁴.

An evaluation of the diabetes control program from 2009-2011 also showed that only 1.6% population were covered by the program⁵¹.

Coverage of the population at implemented community of program

Table 4: Coverage of screening and diagnosis of diabetes screening program 2009-2012 (real implemented communes)

Characteristics	Number
Population at risk in Vietnam*	8,662,776
Total communes in the whole country ⁵⁵	11,161
Communes screening	1,982
Population at risk of 1982 communes	1,538,359
High-risk people	607,060
People who were screened	668,476
Pre-diabetes cases	96,532
Diabetes cases	36,830
Coverage of screening program (%)	43.5
Coverage of diagnosed diabetes and pre-diabetes (%)	8.7

* Average population at risk from 2009-2012 from table 2.

The coverage of screening activity on implemented communes was calculated as the percentage of people who was screening (population at risk is denominator) of 1982 communes from 2009 to 2012. The result was only 43.5% population at risk attended health facilities for screening.

3.2.2 Coverage of diagnosing

According to guidelines of the Ministry of Health, the diabetes status is diagnosed as follows: Pre-diabetes: 2h_ OGTT 7.8-<11.1mmol/l or fasting plasma glucose 5.6-<7.0mmol/l or HbA1c 5.7-<6.5%; Diabetes: 2h-OGTT ≥11.1mmol/l; or fasting plasma glucose ≥7.0mmol/l; or HbA1c ≥6.5%³⁹.

The coverage of the diagnose of the national diabetes mellitus control project from 2009 to 2015, as the percentage of diabetes and pre-diabetes people who had been screened divided by population at risk, is 0.1%, 0.5%, 0.7%, 0.6%, 0.7%, 0.4% and 0.4%, respectively (*Table 3*).

3.2.3 Coverage of treatment

There was no guideline to calculate the indicator of the diabetes project objectives to determine its success. According to the Khuong Anh Tuan et al investigation, data on treatment management was inadequate from 2009-2011⁵¹. Therefore the indirect indicators were subjectively used to calculate the coverage of treatment as % of managed cases per total target of the population from 2011-2015.

In diabetes screening program, the treatment intervention was implemented for delaying or preventing the progression of pre-diabetes to T2D. From 2011 to 2015, coverage of treatment, as percentage of diabetes and pre-diabetes people who received counseling or treatment divided by population at risk, is 1.4%, 0.8%, 0.8% and 0.7%, respectively.

Diabetes care is expensive and health care coverage inadequate. Treatment adherence is an issue, especially for those residing in the countryside⁵⁶.

3.2.4 Coverage of follow-up

The coverage of the follow-up from 2011 to 2015, as percentage of diabetes and pre-diabetes people who were monitored at the end of the year divided by people at risk, was 1%, 0.7%, 0.6% and 0.6%, respectively. The long-term follow-up was not monitored in the screening program.

3.2.5 Cumulative coverage

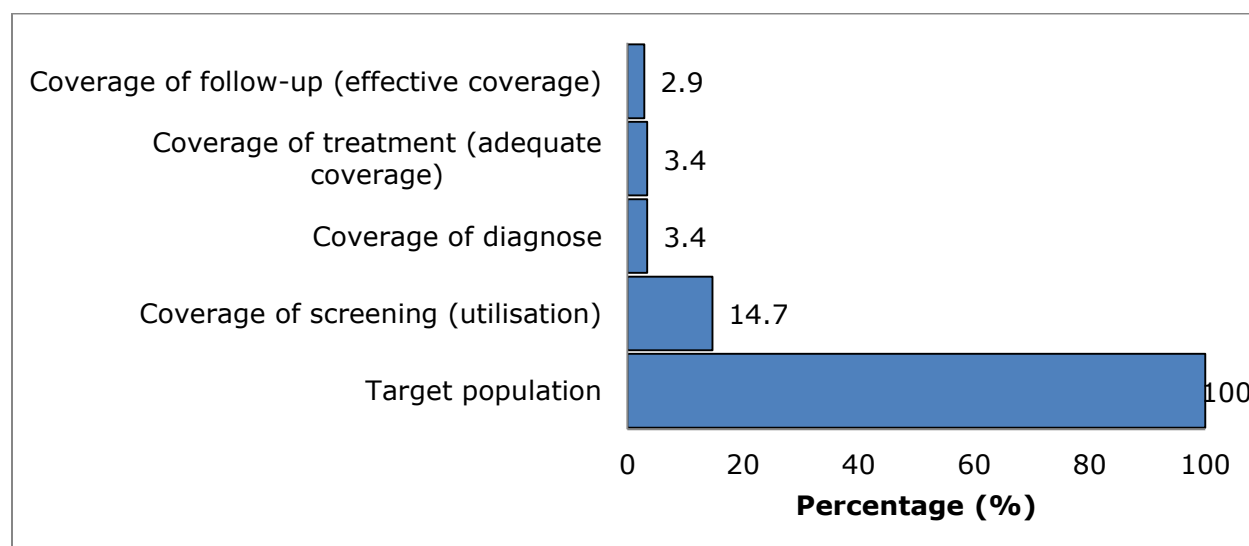


Figure 4: Cumulative coverage of the Vietnam national diabetes screening program 2009-2015

The cumulative coverage of the national diabetes screening program from 2009 to 2015 was summarized from *Table 3*. The results showed that the cumulative was low. The coverage of screening (utilization) accounted for 12.6%. There is a natural gap between target population for screening and diagnosed people, as not all people with risks are actually having diabetes. The coverage of diagnosis, treatment and follow-up were 4.3 times, 4.8 times and 5.6 times lower than the coverage of screening (*Figure 5*).

3.3 Health system for diabetes

The components of the health system that related to coverage were leadership/governance; health care financing; health workforce; medical products, technologies; information and research and service delivery⁴³.

Health Service Delivery

The diabetes screening program provided services from communes to districts and provinces levels. All of the services were provided by public facilities²³.

In the field of public health providers, the collaboration between treatment facilities and preventive agencies is weak. The preventive medicine system is responsible for screening and counseling the high risk of diabetes. Meanwhile, treatment facilities re-diagnosed and provide treatment for people with diabetes. This created a gap between detection and treatment. People with diabetes and pre-diabetes after screening are referred to treatment facilities. These treatment facilities were either private or public. Reporting of newly diagnosed and follow-up cases of T2DM is poorly done, new cases from health facilities are not routinely reported to the national diabetes screening program by detecting health facilities⁵¹. This also showed the lack of collaboration between the health facilities and the diabetes control program committee.

Health Workforce

The coverage was also affected by the health workforce concerning both quality and quantity. Most of the health staff, working in the program, they work according to the preventive medicine system. These people had to manage other control disease programs at the same time. Only 27.3% of health staff at the provincial level get training on diabetes and only 4.4% of health staff at both district and commune levels get training on diabetes⁵¹. With this low percentage of trained staff on diabetes, the counseling, treatment, and follow-up management will be jeopardized.

Health Information

There was a lack of guidelines for exchange and managing health information between treatment facilities and the program committee⁵¹. This kind of information based on need, system performance and increased funding is crucial for the improve coverage of diabetes screening program.

The diabetes screening program uses an electronic reporting system. However, the challenges of gathering health information in Vietnam poses problems¹⁴. Experiences from Eivind AndersBerg shows problems encountered during the electronic reporting system implementation. These

problems include problems with hardware and software, problems adapting to the new approach, extra burden due to huge amounts of data to be reported and problems due to staff shortages¹⁴.

Essential Medicines

According to the Department of Health in Kon Tum, the limitation of medical supplies has contributed to the low treatment coverage⁵⁴. Due to the lack of medicine available in the national program at the local level, people with diabetes after screening would go to the medical facility for treatment and follow-up. Until recently, there was no guideline for the collaboration between treatment facilities and the diabetes project committee for the surveillance and monitoring of diabetes and pre-diabetes cases⁵¹. The consequences were that the data for the screening program only came from agencies on the preventive side of the MOH organogram (*Figure 1*). Data of patients who received treatment from medical facilities are not routinely reported.

Health Financing

The financing for the type 2 diabetes screening program was reduced in 2014 to 65% compared to 2013²³, this was because the government of Vietnam had other priorities. This had an immediate effect on the coverage of the program because the result dropped more than half, compared to previous year (*Table 2*). In some provinces, the authority at the province supports a budget for the diabetes control program in addition to the national support they receive²⁴. The Health Insurance Law of The National Assembly of Vietnam made provisions for the treatment of persons with diabetes but not for people with pre-diabetes and not for counseling activities⁵⁷.

Leadership and Governance

The type 2 diabetes risk assessment form of Vietnam was established according to the guidelines of the ministry of health³⁹.

3.4. Evidence that the diabetes screening program with treatment and management improves awareness and lifestyles among adults aged 45 and above

3.4.1 Selection procedure for evaluating the effectiveness of the national diabetes screening program on the improvement of awareness and lifestyles

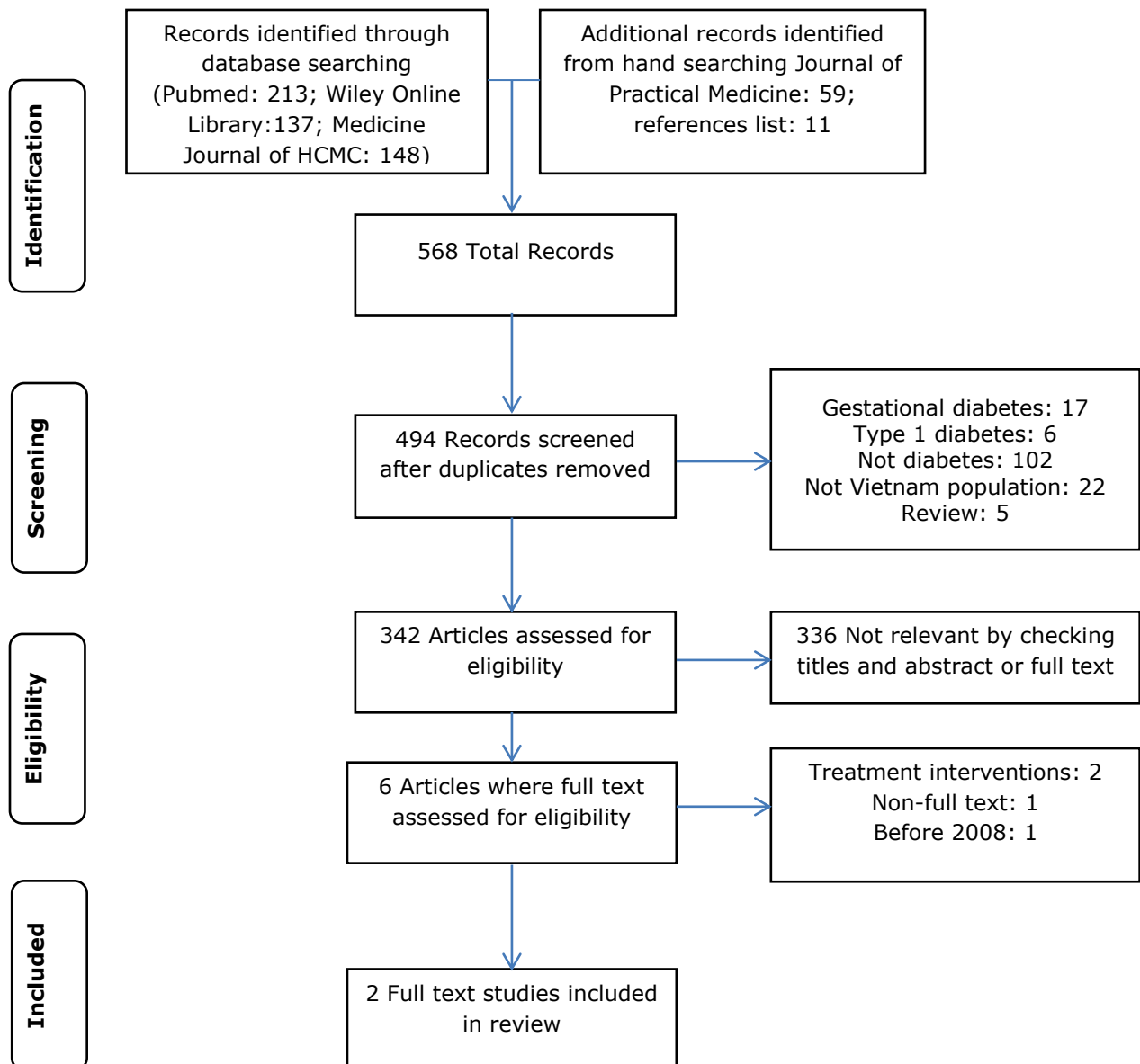


Figure 5: PRISMA flow diagram for study selection in the systematic review on the effectiveness of diabetes intervention in Vietnam

A total of 568 papers were identified through database searching and other sources, 342 papers were found that related to diabetes in Vietnam after initial screening and excluding duplicates. These papers were checked by titles and abstract or even full-text for inclusion and exclusion criteria. The papers whose titles and abstracts matched the criteria were evaluated full-text to determine for inclusion and exclusion criteria again, 2 intervention studies on treatment and 1 non-full text study and 1 study collected data before 2008 were excluded. Finally, only 2 original full-text studies were included for this review (*Figure 6*). Both were from the reference list in articles identified from database search.

3.4.2 Characteristics of included studies

Table 5: Characteristics of included studies

Author, Year Province Study Design Study Name Follow-up	Intervention and Comparison	Population	Diagnostic criteria	Health Outcomes
<ul style="list-style-type: none"> - Cao My Phuong (2012)⁵⁸ - Cau Ngang, Tra Vinh - Cross-sectional and community-based intervention - Prevalence and risk factors of pre-diabetes and diabetes in Cau Ngang, evaluating community intervention results - 9/2009-2/2011 	<ul style="list-style-type: none"> - Establish diabetes prevention network at commune and helmet levels; manage diabetes and pre-diabetes at health commune center; follow-up, treatment, and early detection; individual lifestyle counseling aimed changing behavior; health communication on diabetes prevention (n=1189) - usual care (n=1161) 	<ul style="list-style-type: none"> - People age 45 years old and above - Kinh ethnic: 67% - Khme ethnic: 33% 	ADA 2010 Pre-diabetes: 2h_ OGTT 7.8- <11.1mmol/l or fasting plasma glucose 5.6- <7.0mmol/l or HbA1c 5.7-<6.5% Diabetes: 2h-OGTT ≥11.1mmol/l; or fasting plasma glucose ≥7.0mmol/l; or HbA1c ≥6.5%	<ul style="list-style-type: none"> - Prevalence of diabetes after and before in intervention group compared with control group (7.2 and 9.6 vs. 9.3 and 9.5) - Prevalence of pre-diabetes after and before in intervention group compared with control group (14.2 and 21.7 vs. 17.9 and 21)
<ul style="list-style-type: none"> - Nguyen Van Lanh (2014)⁵⁹ - Hau Giang - Cross-sectional and community-based intervention - Status of pre-diabetes and diabetes in Khmer people and evaluating intervention results - 9/2011-9/2013 	<ul style="list-style-type: none"> - Establish diabetes prevention network at commune and helmet levels; manage diabetes and pre-diabetes at health commune center; follow-up, treatment, and early detection; individual lifestyle counseling aimed at changing behavior; health communication on diabetes prevention (n=302) - usual care (n=369) 	<ul style="list-style-type: none"> - Khme ethnic people age 45 years old and above 	ADA 2010 Pre-diabetes: 2h_ OGTT 7.8- <11.1mmol/l or fasting plasma glucose 5.6- <7.0mmol/l or HbA1c 5.7-<6.5% Diabetes: 2h-OGTT ≥11.1mmol/l; or fasting plasma glucose ≥7.0mmol/l; or HbA1c ≥6.5%	<ul style="list-style-type: none"> - Prevalence of diabetes after and before in intervention group compared with control group (9.9 and 12.3 vs. 10.1 and 10.8) - Prevalence of pre-diabetes after and before in the intervention group compared with the control group (12.5 and 22.3 vs. 16.9 and 17.9)

Two studies were included in this review. For the purpose of this review, only the results of commune-based intervention design were synthesized. The study methods of these studies are similar to the national diabetes screening program. Both used the combination of cross-sectional and intervention study design. The participants of both studies were people aged 45 years and above. The intervention method of both studies was

established diabetes prevention networks at commune and hamlet levels; to manage diabetes and pre-diabetes at the health community center; the follow-up, treatment, and early detection; individual lifestyle counseling aimed at changing the behavior; health communication on diabetes prevention^{58, 59}.

The American Diabetes Association 2011 diagnosis criteria⁶⁰ were used for both studies^{58, 59} as follows: Pre-diabetes: 2h_ OGTT 7.8-<11.1mmol/l or fasting plasma glucose 5.6-<7.0mmol/l or HbA1c 5.7-<6.5%; Diabetes: 2h- OGTT ≥11.1mmol/l; or fasting plasma glucose ≥7.0mmol/l; or HbA1c ≥6.5% (*Table 5*).

The sample size, follow-up duration, ethics of the two studies was slightly different. Study of Cao My Phuong in 2012 had 2300 participants of Kinh and Khmer ethnics. This study was follow-up 1 year⁵⁸. The study of Nguyen Van Lanh in 2014 was two years follow-up. The sample size of this study was 671 participants of Khmer ethnic⁵⁹ (*Table 5*).

There was an inappropriate formula to calculate the impact of the commune-based intervention for both two studies. The authors of two studies had used the formula of attributable risk to calculate the efficacy of the intervention. This formula requires the indicators of incidence in the exposed and unexposed group. The two studies did not collect incidence data. Instead of collecting incidence data, the authors collected pre- and post-prevalence data on diabetes, pre-diabetes, awareness on diabetes, and lifestyle indicators. In this situation, the formula on the difference-in-differences method, as described in the book "Impact Evaluation in Practice", was appropriate to be used to calculate the impact of these intervention studies. This formula allowed researchers to take into account differences between the treatment and comparison groups that are constant over time. The impact of the intervention program is calculated as the difference between two differences: DD impact = (B-A) - (D-C), in which A is the treatment group before intervention and B are the treatment group after intervention, C is the comparison group before the intervention and D are the comparison group after the intervention⁶¹. Therefore, to determine the impact of the community-based intervention, this review was used with the formula of the difference-in-difference method to be calculated.

3.4.3 Pieces of evidence that the diabetes screening program reduces diabetes and pre-diabetes morbidity

In two included studies, the fasting plasma glucose test was used as screening test for diabetes. HbA1C test and oral glucose tolerance test (OGTT) were used for participants who were diagnosed as pre-diabetes by fasting plasma glucose test.

Table 6: Difference of diabetes and pre-diabetes prevalence of intervention and the comparison group

Author	Diabetes diagnosis*	Intervention		Control		DD impact**
		After (B) n (%)	Before (A) n (%)	After (D) n (%)	Before (C) n (%)	
Nguyen Van Lanh ⁵⁹	Diabetes	30 (9.9)	37 (12.3)	37 (10.1)	40 (10.8)	-1.7
	Pre-diabetes	34 (12.5)	59 (22.3)	54 (16.9)	59 (17.9)	-8.8
Cao My Phuong ⁵⁸	Diabetes	83 (7.2)	114 (9.6)	107 (9.3)	110 (9.5)	-2.2
	Pre-diabetes	152 (14.2)	233 (21.7)	187 (17.9)	221 (21.0)	-4.4

*: The American Diabetes Association 2011 diagnosis criteria⁶⁰ were used for both studies^{58, 59} as follows: Pre-diabetes: 2h_ OGTT 7.8-<11.1mmol/l or fasting plasma glucose 5.6-<7.0mmol/l or HbA1c 5.7-<6.5%; Diabetes: 2h-OGTT ≥11.1mmol/l; or fasting plasma glucose ≥7.0mmol/l; or HbA1c ≥6.5% (Table 3).

** : DD impact = (B-A) – (D-C), in which A is the treatment group before intervention and B are the treatment group after intervention, C is the comparison group before the intervention and D are the comparison group after the intervention

The impact of the intervention on people with diabetes and pre-diabetes showed the effectiveness. The prevalence of diabetes was reduced by 1.7% and 2.2%. The pre-diabetes prevalence was reduced by 8.8% and 4.4%.

3.4.4 Pieces of evidence that diabetes screening program improves the awareness in adults with T2D and pre-diabetes.

Table 7: The difference of diabetes awareness between the intervention and the comparison group

Awareness	Author	Intervention		Control		DD impact*
		After n (%)	Before n (%)	After n (%)	Before n (%)	
Risk factors	Nguyen Van Lanh ⁵⁹	240 (79.5)	13.9 (46.0)	200 (54.2)	15.5 (42.0)	21.3
	Cao My Phuong ⁵⁸	409 (35.6)	201 (16.9)	89 (7.7)	170 (14.6)	25.6
Symptoms	Nguyen Van Lanh ⁵⁹	243 (80.5)	54 (51.0)	204 (55.3)	140 (37.9)	12.1
	Cao My Phuong ⁵⁸	239 (20.8)	72 (6.1)	198 (17.2)	84 (7.2)	4.7
Prevention	Nguyen Van Lanh ⁵⁹	181 (59.9)	38 (52.3)	58 (15.7)	53 (14.4)	6.3
	Cao My Phuong ⁵⁸	299 (26.6)	97 (8.2)	191 (16.6)	90 (7.8)	9.6

*: Awareness on risk factors: know at least one risk factors for diabetes; Awareness on symptoms: know at least one symptom of diabetes; Awareness on prevention: know at least one method to prevent diabetes

** : DD impact = (B-A) – (D-C), in which A is the treatment group before intervention and B are the treatment group after intervention, C is the comparison group before the intervention and D are the comparison group after the intervention

The results show the differences after intervention on diabetes awareness or risk factors, symptoms and prevention. The differences in the proportion of a one-year follow-up study on awareness of risk factors and prevention were higher than the two-year follow-up, 25.6% vs. 21.3% and 9.6% vs. 6.3% respectively. On the contrary, the difference of proportion of the two-year follow-up study on the awareness of symptoms was 2.6 times higher than of the one-year follow-up (12.1% vs. 4.7%).

In other words, results from two included studies showed that the intervention increased the proportion of awareness on diabetes risk factors to 25.6% and 21.3% and proportion methods to 6.3% and 9.6%. The intervention also increased the proportion of awareness of diabetes symptoms to 12.1% and 4.7%.

3.4.5 Pieces of evidence that diabetes screening program changed the lifestyles of adults with T2D

The two studies have the same definition of lifestyle variables which include:

- Smoking: a person is currently smoking or had smoked in the past.
- Drinking alcohol: drinks a cup/day for a woman and 2 cups per day/man.
- Eating sweet food: eat sweet food 4 days/week.
- Eating fat food: eat fat quantity more than the head of the thumb finger per day.
- Eating vegetable: eat vegetable $\geq 300\text{g/person/day}$ and/or $\geq 4\text{day/week}$
- Physical inactivity: walking or physical activity ≥ 30 minutes/day, ≥ 4 day/week, or 150 minutes/week
- BMI: overweight and obesity if BMI $\geq 23 \text{ kg}/^2$

Behavior change communication was conducted as follow:

- Provided and distributed leaflet for community health center every 3 months.
- Communicated for people in hamlet once a month.
- Counseling at the household or at community health center once a month by individual face to face contacts. This counseling encourages people to do healthy lifestyle such as increased physical activity, quit unhealthy habits which prevent the development of diabetes.
- Health staff interviewed and supervised the physical activities of participants every 6 months.

Table 8: The difference of lifestyle and BMI prevalence of the intervention and the comparison group

Evidence of lifestyle changing	Author	Intervention		Control		DD impact*
		After n (%)	Before n (%)	After n (%)	Before n (%)	
Smoking	Nguyen Van Lanh ⁵⁹	49 (16.2)	96 (31.8)	145 (39.3)	148 (40.1)	-14.8
	Cao My Phuong ⁵⁸	259 (22.5)	276 (23.2)	254 (22.1)	272 (23.4)	0.6
Drinking alcohol	Nguyen Van Lanh ⁵⁹	34 (11.3)	141 (46.7)	152 (41.2)	173 (46.9)	-29.7
	Cao My Phuong ⁵⁸	184 (16.1)	218 (18.3)	254 (22.1)	198 (17.1)	-7.2
Eating sweet food	Nguyen Van Lanh ⁵⁹	85 (28.1)	131 (43.4)	219 (59.3)	208 (56.4)	-18.2
	Cao My Phuong ⁵⁸	145 (12.6)	200 (16.7)	190 (16.5)	170 (14.6)	-6
Eating fat food	Nguyen Van Lanh ⁵⁹	68 (22.5)	83 (27.5)	106 (28.7)	129 (35.0)	1.3
	Cao My Phuong ⁵⁸	124 (10.8)	169 (14.2)	171 (14.9)	159 (13.4)	-4.9
Eating vegetables everyday	Nguyen Van Lanh ⁵⁹	214 (70.9)	131 (43.4)	173 (46.9)	208 (56.4)	37
	Cao My Phuong ⁵⁸	534 (46.4)	433 (36.4)	421 (36.6)	414 (35.7)	9.1
Eating after 20PM	Nguyen Van Lanh ⁵⁹	197 (53.4)	271 (73.4)	218 (72.2)	150 (49.7)	-42.5
	Cao My Phuong ⁵⁸	109 (9.5)	94 (7.9)	166 (14.4)	134 (11.5)	-1.3
Physical inactivity	Nguyen Van Lanh ⁵⁹	258 (85.4)	220 (72.8)	281 (76.2)	279 (75.6)	12
	Cao My Phuong ⁵⁸	435 (37.8)	648 (54.5)	621 (54.0)	618 (51.2)	-19.5
BMI	Nguyen Van Lanh ⁵⁹	87 (28.8)	110 (36.4)	187 (50.7)	145 (39.3)	-19
	Cao My Phuong ⁵⁸	237 (20.9)	347 (29.6)	309 (27.2)	239 (28.6)	-7.3

*: $DD\ impact = (B-A) - (D-C)$, in which A is the treatment group before intervention and B are the treatment group after intervention, C is the comparison group before the intervention and D are the comparison group after the intervention

On smoking, there were different results. The intervention in Khmer ethnic group had an impact on the decrease in the prevalence of smoking to 14.8%. Meanwhile, the study in both Kinh and Khmer ethnic showed no impact or even an unexpected impact with the increase of 0.6% prevalence of smoking.

On drinking, the impact of intervention reduced the prevalence of drinking to 7.2% and 18.2%.

On eating sweet food, the results were the same with drinking alcohol, the impact of intervention reduced eating sweet food to 18.2% and 6%.

On eating fatty food, the study of Nguyen Van Lanh showed negative impact, while Cao My Phuong study showed positive impact with 1.3% and -4.9% respectively.

On eating vegetables every day and eating after 20PM, the results showed a positive impact with the increase of 37% and 9.1% and a decrease of 42.5% and 1.3% respectively.

On physical inactivity, a study on Khme ethnic group showed an increase in physical inactivity to 12%. On the other hand positive impact was shown in a study on both Kinh and Khme ethnic with a decrease in physical inactivity to 19.5%.

On BMI, the positive impact was very clear with a decrease in both studies for overweight to 19% and 7.3%.

Chapter 4: Discussion

This chapter discusses findings from the study. The study identified gaps in the Vietnam national diabetes screening programs at the levels of input, activities immediate and long-term outcomes that limit the achievement of the objectives of the national program to increase screening in the communes, manage 60% of pre-diabetics and 50% of diabetics. Key findings are discussed below:

4.1. Input

The health service delivery for diabetes has been organized by a bottom-up approach starting at the commune in public facilities. The reporting and feedback to treatment facilities and vice versa are poorly coordinated leaving many potential clients lost to follow-up. Also, there is the delay in the initiation of treatment for those screened positive for diabetes.

Furthermore, there are shortages of the health workforce. Health workers in the program focus mainly on prevention and not treatment. The curative aspect is left to health facilities outside the national diabetes program. There is a challenge with the quality of available human resource for diabetes management, only 27.3% and 4.4% of health staff at provincial and district/commune levels respectively gets trained on diabetes. This is not a sustainable way to ensure adequate human resource for a chronic condition like T2DM.

The electronic reporting system for managing health information adopted by the Vietnam national diabetes program is laudable, since it's meant to improve efficiency of the program however there is more required to be done to make this choice work and curtail shortcomings associated with lack of technical capacity, shortages of human resources, problems with hardware and software.

Erratic medical supply for diabetes control results in low treatment coverage rates for diabetics, this results in client's loss of confidence in the program and potential losses to follow-up along the referral chain.

4.2 Activities and process

The screening process of the Vietnam diabetes control program is in 3 steps. The first step where people are asked to self-identify risk factors for diabetes before selecting for the next step may raise issues of systematically excluding some population. For example, people who may not be able to read, write or understand the content of the questionnaire. Also, self-reporting of risk may cause some bias, since it's an objective measure that

relies on individual's perception of their risk. In this case, many people who need to get to step 2 may be excluded, while those not needing to reach this step may be included.

The treatment facilities available for screening in the community (sites which implemented screening program) have a high coverage of 90% but with limited capacity for providing counseling and treatments. This means many people who should be in the program will be missed. The provision of free screening services removes barriers of cost for the patients and quite encouraging, however, funding for the program has been on a decrease and this will affect the sustainability of the program if this trend is not reversed.

The use of behavioral change communication is prominent in the national diabetes program and an important aspect of a diabetes control program. This preventive strategy aims to modify Vietnamese lifestyle to reduce the risk for diabetes. The program has so far seen an increasing trend in the use of direct counseling and communication; however, there is a lack of adequate monitoring and evaluation of the program to determine the impact of this aspect of the national program.

4.3. Immediate Outcome/ The national diabetes screening program coverage.

As mentioned in the above theory of change, the coverage of the diabetes screening program affected directly the activities of the program, including screening, management, and treatment. But the root cause for the success of the program activities is the health system. In this review, the coverage of the screening program was very low.

The objective of the program was to increase screening in the community and manage 60% of pre-diabetes and 50% diabetes people in the end of 2015. This objective could not be achieved for the whole population due to limited resources.

Figure 4 summarized the cumulative coverage of diabetes screening program from 2009 to 2015. In this figure, the bottleneck of the program appears as a sharp shift at the bottom part of the Knippenberg/Tanahashi model. This bottleneck showed the poor allocation and deployment of resources and facility, and poor appreciation of service by the public. In the period of 2009-2015, only 14.7% of population at the aged 45 years and above at risk of diabetes had access for screening. In addition, an evaluation of national diabetes screening program 2009-2012 showed that only 43.5% people of 45 years and above at high risk of diabetes had access for screening. This result showed a gap between the demand for screening and utilization of diabetes screening program. This gap was due to low availability of screening.

Availability coverage of diabetes screening for population at the aged 45 years and above at risk of diabetes includes health service delivery, human resources for health, medicine supplies and equipment, health financing, health information, and leadership & governance. These resources are always required in order to provide and improve health services. The national diabetes screening program provides health service by randomly selecting 1-4 out of 100 communes at each province every year. The program could not cover all communes due to limited resources. However, the randomly selecting process allowed the program expanded service into rural areas.

There is a gap between utilization and adequate coverage and effective coverage. In fact, not all people at risk have diabetes, so there is always a gap between people who need treatment and people at risk. In this study, only 3.4% and 2.9% population at the aged 45 years and above at risk of diabetes received treatment and fully follow-up, respectively.

To evaluate contact coverage and effective coverage, data on management cases were needed. However, these data did not fully report due to lack of cooperation between treatment and the preventive system, as well as between private and public sectors. A big part of diabetes patients seeking care at health facilities were not reported to diabetes screening program. Therefore, the coverage of treatment and follow-up of the diabetes screening program in this review could be lower than in real life.

To increase the coverage of the program, there is a need to use risk assessment form to calculate the risk score. The sensitivity of definition of a high-risk case of diabetes was very high but the specificity was very low– a person aged 45 years and above with one of the risk factors such as obesity or a family history of diabetes. In diabetes screening program, the sensitivity is measured as the percentage of diabetes detected by the program. The specificity is the percentage of people without diabetes. In the context of a limited budget, the specificity of risk assessment form needs to be improved for the purpose of an increased coverage. The type 2 diabetes risk assessment form of the Finnish Diabetes Association (*Annex 9*)⁶², which was the program applied for the prevention of type 2 diabetes in Finland should be considered as an alternative. This form is similar to the Vietnam form but the specificity is high because it calculates risk scores. For example, a person aged 45-54 years with obesity only has 5 points. The Finnish diabetes association advised that a person having a score of 15 and above should apply for screening. At this score, the risk of developing T2D within 10 years is very high, estimated 1 in 3 will develop disease.

The successful story from the HIV/AIDS program could be applied for diabetes. HIV/AIDS and NCDs in general or diabetes, in particular, are not

curable diseases. They all have current treatment options and require lifelong treatment. Learning from the HIV/AIDS experience, to improve the diabetes interventions, showed that timely diagnosis, referral to appropriate treatment, access to medicines and the importance of adherence were the success stories and best practices⁶³. The success stories of the Vietnam HIV/AIDS national program showed that HIV treatment and care costs were economical and the voluntary counseling and testing (VCT) was successful^{64, 65}. The HIV/AIDS program in Vietnam has a strong collaboration between the treatment and preventive system. This program also uses the support of profit and non-profit organizations and clubs in communities. Therefore, lessons from the HIV/AIDS program could be useful for the improvement of the diabetes screening program.

4.4 Immediate and long-term outcomes

4.4.1 Morbidity of diabetes and pre-diabetes/ Long-term outcomes

There was evidence, from two community-based intervention studies, that the collaboration of screening, management, and treatment of diabetes reduced the prevalence of diabetes and pre-diabetes. This result was different with studies from other countries. A systematic review on screening for type 2 diabetes showed that screening alone was not adequate compared to no screening in reducing risks for all-cause mortality⁶⁶. The explanation for these differences is the difference in operating the diabetes screening program. In Vietnam, the diabetes screening program is a combination of activities of 3 prevention methods (primary, secondary and tertiary prevention). Meanwhile, in other countries, the screening is only the activities of secondary prevention. The two studies evaluated the effects of diabetes screening versus no screening on mortality of the systematic review and these studies were conducted in the United Kingdom⁶⁶. Therefore, the conclusion that screening had no effect on reducing mortality is unsure. More results from similar studies should be reviewed for stronger evidence.

This study showed the evidence on reducing prevalence of diabetes and pre-diabetes after 1 and 2 years implemented intervention. In other countries, the treatment for screen-detected early diabetes and diabetes, as well as lifestyle interventions, showed the positive impact on the delay or the prevention of progression to diabetes⁶⁶.

Recently, randomized control trial studies, with long-term follow-up on the effectiveness of the screening program on the outcome of diabetes, have not been conducted in Vietnam.

4.4.2 Intermediate outcome on improving awareness and reducing harmful lifestyles/ Immediate outcomes

There was evidence that showed a good impact on the improved diabetes awareness. The activities of the national diabetes program to improve the awareness were implemented including changing diabetes village and world diabetes awareness day walk, poster and leaflet, diabetes club and media broadcasting. The changing diabetes village and world diabetes awareness day walk were only organized in two cities (Ha Noi and Ho Chi Minh) and its impact was not evaluated. The poster and leaflet showed the lack of comprehension or effective exposure. However, the diabetes club and media broadcasting showed a positive impact. The limitations of these activities were the lack of money and the association of Diabetes clubs ⁶⁷. The study on evaluating activity results of national diabetes prevention program 2009-2011 also showed the lack of effectiveness of the communication program. To achieve the objectives of the national diabetes mellitus control project; that 50% of the people in the community had awareness on diabetes and its risk factors, could be unattainable⁵¹. Therefore, a change in the communication strategy is very necessary. Specifically, the budget on the poster and leaflet program should reduce and focus on diabetes clubs and broadcasting.

In general, the intervention showed positive results on reducing a harmful lifestyle. However, there were the inconsistent results of smoking, eating fatty food and physical inactivity between the two studies. According to the World Health Organization, most of the risk factors for diabetes in Vietnam, are related to a lifestyle including smoking, alcohol abuse, unhealthy diet, physical inactivity and obesity⁴⁸. Therefore, an intervention in the lifestyle, as a risk factor for diabetes, is a crucial intervention method for the success of the diabetes program. Furthermore, studies on the effectiveness of lifestyle intervention of the diabetes screening program should be conducted to provide evidence for the improvement of the program.

4.5 Limitations

This review showed that the accessibility and availability of services were the big problems for the coverage of diabetes screening program. However, the inadequate of available data was not allowed to evaluate the accessibility and availability indicators. These indicators require a primary study to ensure the quality of data. The indicators for accessibility needed are, the percentage of population within 5 km of health facility, time taken to reach the facility, physical access to the health facility (transportation). The indicators for the availability of services could be the availability of supplies, staff, and health care.

This review only included two studies in Vietnamese which were conducted in Mekong Delta of Southern of Vietnam. There was no study on the diabetes intervention in the Southeast region while this area accounted for the highest prevalence of diabetes and pre-diabetes in Vietnam. Two intervention studies in English were found, but excluded, because one study was on metabolism and before 2008; one study was conducted in Northern areas but has no full text. Moreover, major population ethnic minorities live in Highlands areas of Northern and Central regions. Therefore, studies in Northern and Central areas are needed to provide further evidence for the development of the program in the whole country.

The results showed the conflicts on evidence of two included studies. Therefore, more studies should be reviewed to confirm the evidence of the awareness and lifestyle. Furthermore, the duration of two included studies was from one to two years. For a substantial intervention, studies with long-term follow-up are needed.

Further studies on lifestyle intervention and its effectiveness in delaying or preventing progression, from pre-diabetes to diabetes in a person with pre-diabetes, should also be conducted. For strong evidence, randomized methods should be applied in these studies.

Chapter 5: Conclusions

In the period of 2009-2015, the coverage of the screening program, both expected coverage and implemented coverage, was low compared to the demand for health services, as diabetes morbidity is in increasing trend. In addition, the program had many problems affecting the coverage. In the input of diabetes screening program, the problems came from the poorly coordination between the program and treatment facilities on reporting and feedback; the shortages of the health workforce; the risk assessment form did not calculate the risk score; and government budget cutting. In the activities and process of the program, the problems are self-identify risk factors for diabetes by people aged 45 and above; and lack of adequate monitoring and evaluation on the impact of behavioral change communication.

To attain a universal health coverage goal “all people should obtain the health services they need without suffering financial hardship when paying for them”, strengthening the health system (input) is necessary to improve the coverage of the diabetes screening program. The collaboration in education, to improve quality and quantity of health workforce, should be promoted. To improve the information system, the guideline for the cooperation between treatment and prevention should be established and implemented with regular monitoring and prevention. In the research field, the collaboration between the diabetes program and the university should also be promoted.

The screening program model intervention showed the positive effects. Two community-based intervention studies showed the reducing of diabetes and pre-diabetes prevalence. There were evidences on the improved diabetes awareness and reduced harmful lifestyle. However, there were still inconsistencies in the outcomes of the program on lifestyle such as smoking, eating fatty food and physical inactivity.

On the coverage outcome, this review did not have enough information to evaluate the accessibility and availability indicators. This study also could not deeply review all the aspects of the WHO health system framework on the coverage of the screening program. To evaluate this need an original research with strong design methods should be conducted.

On the awareness and lifestyle outcome, only two studies with 1 and 2 year follow-up included. These studies conducted in 2 out of 54 ethnics in Vietnam.

Chapter 6: Recommendations

To improve the effectiveness of national diabetes program, the policy makers and program implementers should follow recommendations below:

Policymakers

Establish guideline for the collaboration between treatment and prevention system with regular monitoring and surveillance.

Create the network based on HIV/AIDS successful stories for diabetes prevention because of their similarity.

Promote the research capacity on diabetes intervention studies, the intersectoral collaboration should be established, such as the cooperation between the diabetes screening program and medical universities. This collaboration aims at conducting studies on monitoring and evaluation, financial and social risk protection and clients' satisfaction outcomes. Besides that, long-term studies of the program and peer-review publications especially encourage to provide strong evidences on the effectiveness of the program and improvement of study quality.

Program implementers

Diabetes screening program is a costly program. Besides that was the financial cutting at national and provincial level. Therefore, funding from domestic and international donors for the program is an emergency matter.

Intersectional collaboration in the community for the improve awareness and changing lifestyle should be encouraged.

Pushing communication health campaign through diabetes clubs, diabetes patients as community health workers could be a new strategy to improve the quality of care. This could also be a solution for the lack of health staff at the community level.

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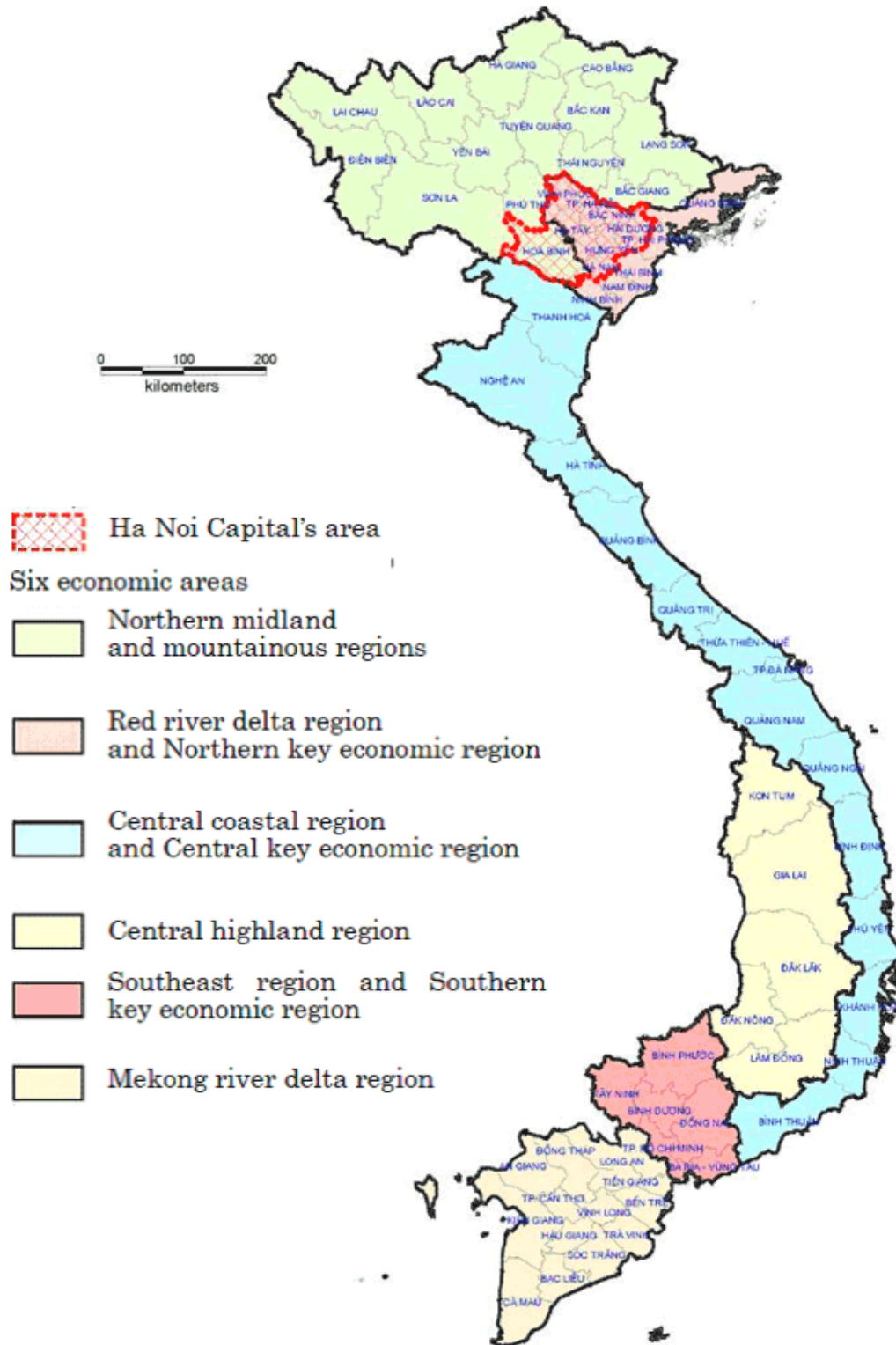
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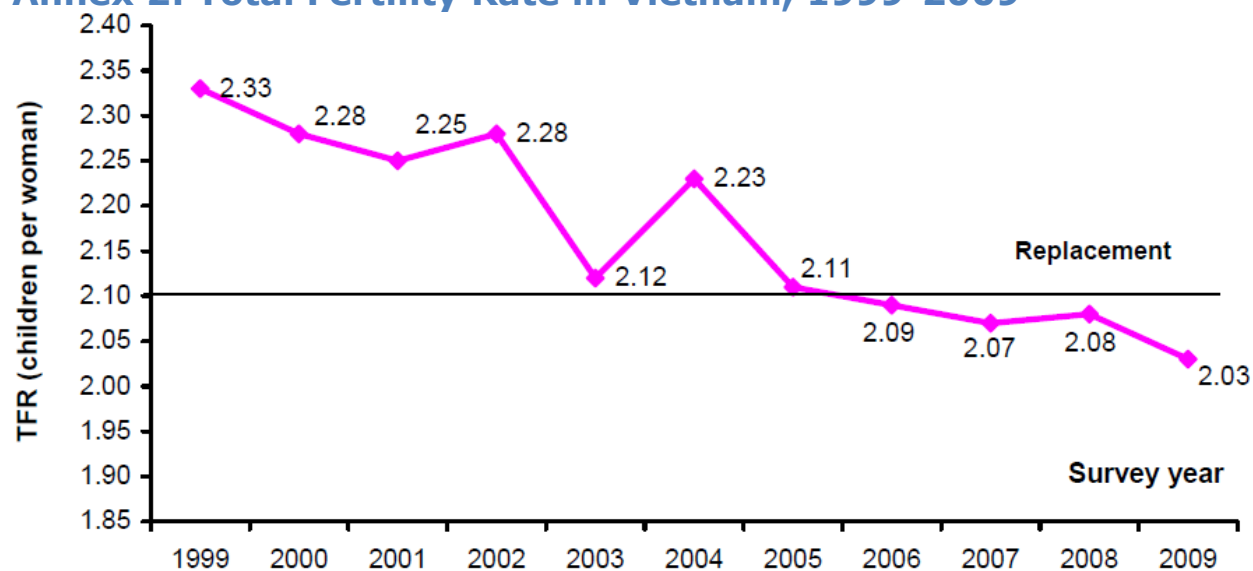
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Annexes

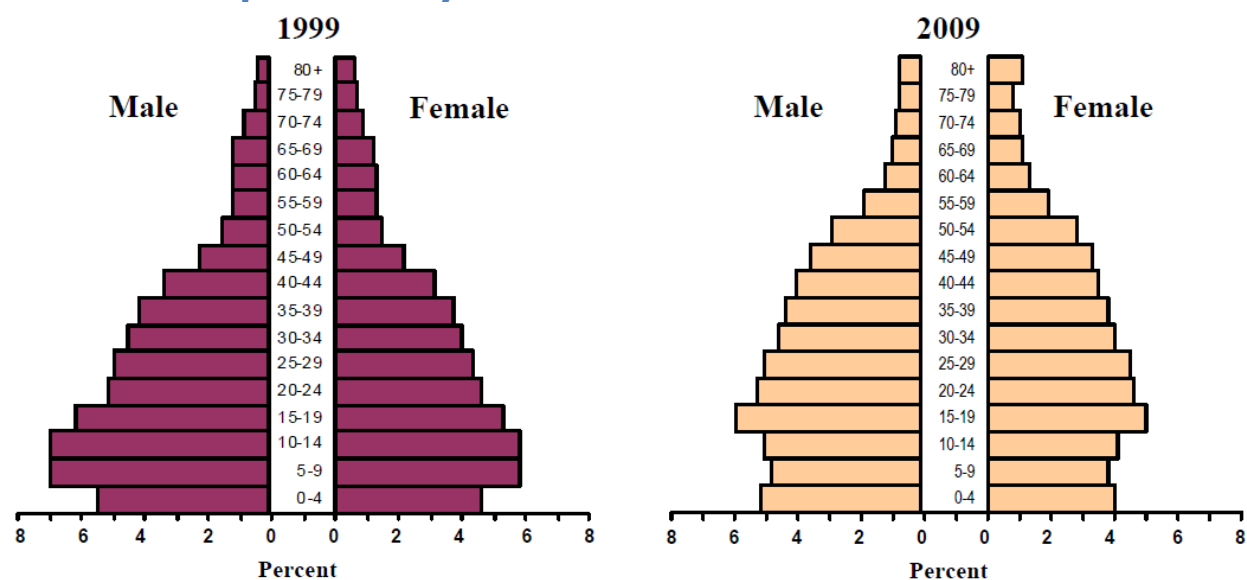
Annex 1: Map of Economic Regions in Vietnam



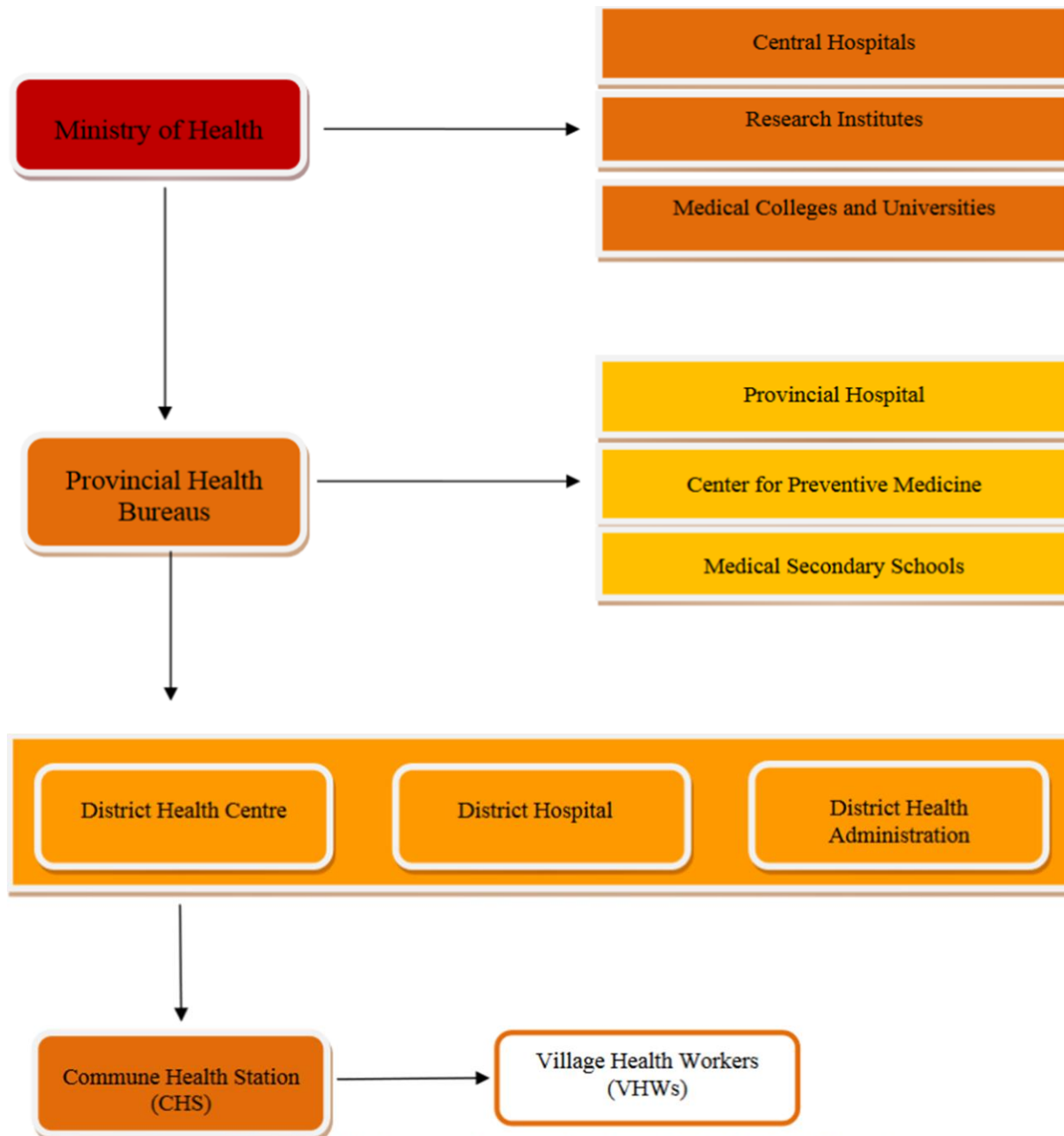
Annex 2: Total Fertility Rate in Vietnam, 1999-2009



Annex 3: Population Pyramid 2009



Annex 4: The administrative structure of the health care system in Vietnam

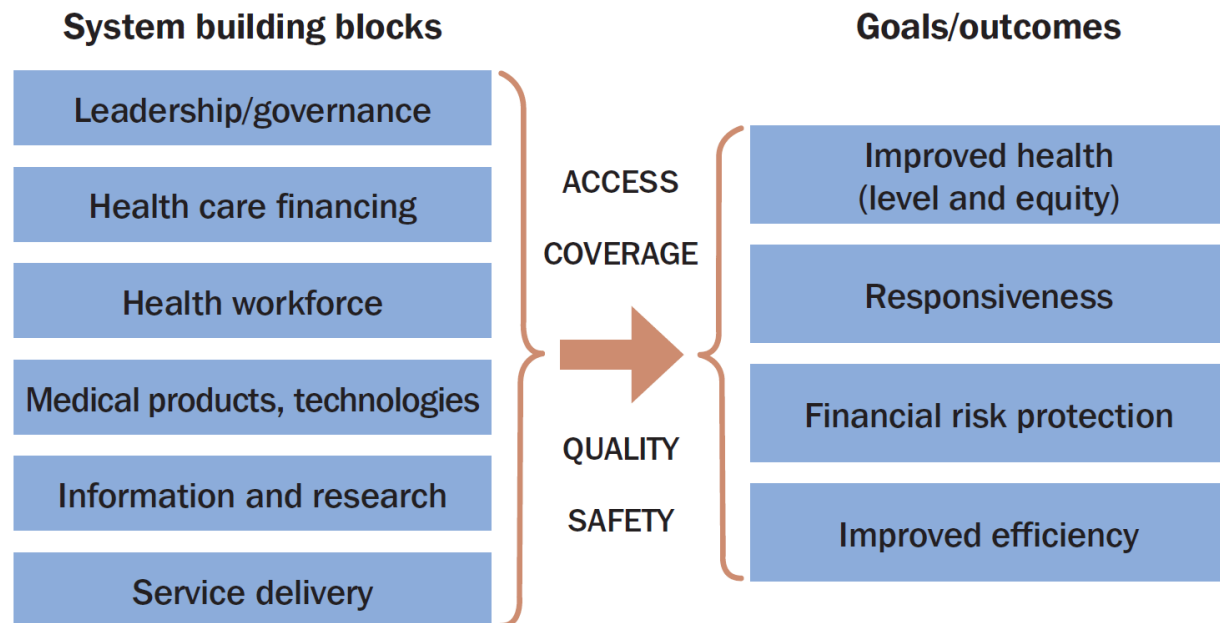


Source: Central for Health System Research, Hanoi Medical University

Annex 5: Trend morbidity and mortality whole country

Nhóm bệnh	1976	1986	1996	2006	2013
<i>Disease chapters</i>					
Dịch lây - <i>Communicable diseases</i>					
Mắc - <i>Cases</i>	55.50	59.20	37.63	24.94	25.33
Chết - <i>Death</i>	53.06	52.10	33.13	13.23	12.23
Không lây - <i>Non-communicable</i>					
Mắc - <i>Cases</i>	42.65	39.00	50.02	62.40	63.50
Chết - <i>Death</i>	44.71	41.80	43.68	61.62	69.63
Tai nạn, ngộ độc, chấn thương - <i>Accident, injury, poisoning</i>					
Mắc - <i>Cases</i>	1.84	1.80	12.35	12.66	11.17
Chết - <i>Death</i>	2.23	6.10	23.20	25.15	18.15

Annex 6: The WHO health system framework



1 World Health Organization (2013). Universal eye health: a global action plan 2014-2019

Annex 7: Timeline 2016

Activities	January		February				March				April				May				June				July				August				Sep
	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
Thesis outline																															
Thesis adviser and back-stopper comments																															
Thesis outline revise																															
Thesis small group discussion																															
Literature review																															
Thesis proposal final																															
Data collection																															
Data entry																															
Data analysis																															
Writing thesis																															
Finishing and copy editing the thesis																															
Thesis presentation																															
Oral exams																															

Annex 8: Type 2 diabetes risk assessment form of Finnish



TYPE 2 DIABETES RISK ASSESSMENT FORM

Circle the right alternative and add up your points.

1. Age

- 0 p. Under 45 years
- 2 p. 45–54 years
- 3 p. 55–64 years
- 4 p. Over 64 years

2. Body-mass index

(See reverse of form)

- 0 p. Lower than 25 kg/m²
- 1 p. 25–30 kg/m²
- 3 p. Higher than 30 kg/m²

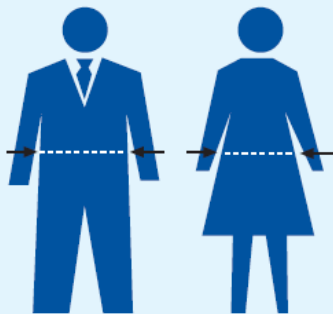
3. Waist circumference measured below the ribs (usually at the level of the navel)

MEN

- 0 p. Less than 94 cm
- 3 p. 94–102 cm
- 4 p. More than 102 cm

WOMEN

- Less than 80 cm
- 80–88 cm
- More than 88 cm



4. Do you usually have daily at least 30 minutes of physical activity at work and/or during leisure time (including normal daily activity)?

- 0 p. Yes
- 2 p. No

5. How often do you eat vegetables, fruit or berries?

- 0 p. Every day
- 1 p. Not every day

6. Have you ever taken antihypertensive medication regularly?

- 0 p. No
- 2 p. Yes

7. Have you ever been found to have high blood glucose (eg in a health examination, during an illness, during pregnancy)?

- 0 p. No
- 5 p. Yes

8. Have any of the members of your immediate family or other relatives been diagnosed with diabetes (type 1 or type 2)?

- 0 p. No
- 3 p. Yes: grandparent, aunt, uncle or first cousin (but no own parent, brother, sister or child)
- 5 p. Yes: parent, brother, sister or own child

Total Risk Score

The risk of developing type 2 diabetes within 10 years is

Lower than 7 Low: estimated 1 in 100 will develop disease

7–11 Slightly elevated: estimated 1 in 25 will develop disease

12–14 Moderate: estimated 1 in 6 will develop disease

15–20 High: estimated 1 in 3 will develop disease

Higher than 20 Very high: estimated 1 in 2 will develop disease

Please turn over