# Full Report

## Proposal development for the revision of health screening programme as part of the Health Insurance Card Scheme for migrants in Thailand

World Health Organization

HITAP
Health Intervention and Technology Assessment Program

# Proposal development for the revision of health screening programme as part of the Health Insurance Card Scheme for migrants in Thailand

Thanaporn Bussabawalai

Danai Chinnacom

Suppawat Permpolsuk

Maneechotirat Santi

Pattara Leelahavarong

Rapeepong Suphanchaimat

Netnapis Suchonwanich

Health Intervention and Technology Assessment Program (HITAP)

International Health Policy Program (IHPP)

# Acknowledgements

The researchers would like to acknowledge the help, contribution, and support of the stakeholders and partners who participated during our proposal development, diseases prioritization process and in-depth interviews, including government officers/decision-makers, healthcare providers, academics, and civil societies, all of whom provided valuable input and suggestions about the current aspect of the proposal development for migrant health screening. This study is funded by the World Health Organization (WHO). The Health Intervention and Technology Assessment Program (HITAP) is funded by the Thailand Research Fund under the senior research scholar on Health Technology Assessment [Grant RTA59800011]. The findings, interpretations, and conclusions expressed in this study do not necessarily reflect the views of the funding agencies.

# Executive Summary


## Background and objective

In 2004, the Ministry of Public Health introduced the Health Insurance Card Scheme (HICS) for migrants who were not covered by the Social Security Scheme (SSS). The applicants need to pay the card premium to be insured by the HICS. Additionally, they must pay for and pass the health screening procedures before being insured and granted work permits. The health screening package covers tuberculosis, leprosy, filariasis, syphilis, drug addiction, alcoholism, and psychosis; diseases prohibited migrants from residing or working in Thailand according to the Immigration Act and the Alien Work Act. However, the health screening regulation was set up around 10 years ago and has not been changed since then. Therefore, this study aims to review and develop an appropriate health screening package for migrants in Thailand considering the current situation, based on scientific evidence, and a participatory process.

## Methods

Document reviews were performed on serveral topics including burden of disease, migrant health screening reports from the One-Stop Service (OSS) Center, National Disease Surveillance (Report 506), and a study on migrant health service utilization. The document reviews aim to investigate migrant health problems in Thailand. The database of the Division of Health Economics and Health Security, MoPH, Thailand, was also analysed. A meeting with stakeholders including government officers/decision-makers, healthcare providers, academics, and non-governmental organizations was arranged with the purpose to prioritize the first 20 most important health problems of migrants, based on the information derived from document reviews and secondary data analysis. Literature and document reviews on the effectiveness and cost-effectiveness of screening interventions for those prioritized health problems were then conducted. Literature and documents on effectiveness were from national Clinical Practice Guidelines (CPG), and information on cost-effectiveness were derived from Health Intervention and Technology Assessment Program (HITAP) database, and Health technology assessment (HTA) database in Thailand. Inputs from the in-depth interviews with six key informants on migrant health were also incorporated with the information from the document reviews in order to develop and revise the health screening package for migrants.

**Results**

According to the reviews and prioritization of migrant health problems, 10 communicable and 10 non-communicable diseases/conditions were selected. The communicable diseases/conditions comprised tuberculosis, HIV/AIDS, immunizations (Vaccine preventable diseases: VPDs), syphilis/gonorrhoea, diarrhoea, dengue fever, filariasis, leprosy, hepatitis, and malaria. For the 10 non-communicable diseases/conditions, pregnancy, diabetes, newborn disorders, hypertension, drug addiction/chronic alcoholism, work injury, head injury, mental disorders, breast cancer, and cervical cancer were selected.

The screening interventions in terms of effectiveness and cost-effectiveness derived from literature and document reviews as well as expert opinions on health screening package for migrants for the selected diseases/conditions are shown as follows:

**Reviewed screening interventions and expert opinions on health screening for migrants**

| Diseases | Reviewed screening intervention | Expert opinions on health screening for migrants | |
|---|---|---|---|
| | | Screen or not | Reasons |
| Tuberculosis | Chest x-ray and questionnaire, then sputum testing is expected to perform if chest x-ray indicates traits of TB and/or TB symptoms are observed. | √ | Communicable and easily spread |
| | | ± | Chest x-ray (without sputum testing) is not effective. Sputum testing has more sensitivity than a chest x-ray but is less practical. However, if the screening is obligated by laws, the screening shall be applied only as a precondition to acquire work permits, and not a precondition to be insured by HICS. Migrants will be entitled to be insured regardless of the results. |
| HIV/AIDS | HIV Ag, HIV-Ab | X | HIV/AIDS screening may lead to stigmatization and discrimination. |
| Syphilis | VDRL, RPR, TPHA, TPPA, FTA-ABS | √ | Practical to be screened and treated. |
| | | X | Not highly contagious. Also, prevalence in migrants may not be different from Thais as the disease is subject to individual health risk. |
| Gonorrhea | Gram stain | √ | Practical to be screened (by physical examination) and treated. |
| | | X | Not highly contagious, and causes more workload if screening by gram stain. |
| Dengue fever | Tourniquet test and CBC | X | Acute disease, and also found in Thais. |

| Diseases | Reviewed screening intervention | Expert opinions on health screening for migrants | |
|---|---|---|---|
| | | Screen or not | Reasons |
| Filariasis | Blood smear | √ | Myanmar is still a filariasis endemic country. However, healthcare providers may face difficulties as filarias are more likely to be detected at nighttime by blood test. |
| Leprosy | Medical history/skin examinations | √ | Practical and no additional cost if screening by physical examination. However, if slit-skin smear is done, there would be an additional cost. |
| Hepatitis B/C | HBsAg, Anti-HBs, Anti-HCV | X | Additional cost and much workload. |
| | | ± | May have additional benefit. Hepatitis B screening is cost-effective. |
| Malaria | Malaria microscopy via thick film and thin film | √ | Screen in migrants with fever and then give treatment. |
| | | X | Acute disease, and not practical to screen as patients with symptoms normally come to a hospital's OPD. |
| Pregnancy | -* | √ | Test to determine whether they should receive certain medication or services that are specific to pregnant women. |
| | | X | Additional cost and much workload. |
| Diabetes | FPG, FCBG, OGTT | √ | Screen depending on risk factors in order to get early treatment. |
| | | X | Additional cost and workload. |
| Hypertension | Blood pressure measurement | √ | Normally included in physical examination, and for early treatment. |

| Diseases | Reviewed screening intervention | Expert opinions on health screening for migrants | |
|---|---|---|---|
| | | Screen or not | Reasons |
| | | X | Should not be tested as a precondition for acquiring work permits or being insured but should be tested and treated after being insured under the HICS. |
| Drug addiction | Urine examination | √ | Screening according to the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551). |
| | | ± | Incurs additional costs and cannot solve the fundamental problem. However, it may be difficult to amend the laws. |
| Chronic alcoholism | ASSIST/AUDIT questionnaire | √ | Screening according to the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551). |
| | | ± | Not practical but difficult to amend the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551). Patients with chronic alcoholism should not be granted work permits but should be insured and treated under the HICS. |
| Mental disorders | Questionnaire | √ | Screening (psychosis) according to the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551). |
| | | X | Psychosis is not easily to be screened compared to major depression. |

| Diseases | Reviewed screening intervention | Expert opinions on health screening for migrants | |
|---|---|---|---|
| | | Screen or not | Reasons |
| Breast cancer | Breast self-examination or clinical breast examination | √ | Screen depending on risk factors. It is not practical but can be screened on a voluntary basis. |
| | | X | Not practical but should be screened and treated after being insured under the HICS. |
| Cervical cancer | Pap smear, VIA | √ | Screen depending on risk factors. It is not practical but can be screened on a voluntary basis. |
| | | X | Not practical but should be screened and treated after being insured under the HICS. |

√ Should be screened X Should not be screened ± May or may not be screened

* No information was found for pregnancy screening intervention.

In addition to the effectiveness and cost-effectiveness, certain criteria were taken into account by experts as addressed in expert opinions in the above table. Aforementioned criteria include cost of intervention, workload of healthcare providers, risk of stigmatization, operational feasibility, characteristics and epidemiologies of diseases, and relevant laws. Moreover, experts suggested that these health screenings should not be used as a precondition to be insured by HICS as they were designed for the purpose of employment.

Additional problems regarding the screening of migrants' health should also be considered including the screening conducted by some hospitals have not been consistent with the Ministry of Public Health's Announcement, a lack of clear guidelines in the Announcement, quality of equipment used in health tests, no standard in disbursing HICS cards, poor quality in aggregating health screening data of migrants, and a lack of system for follow-ups migrants after the initial tests.

**Conclusion**

Migrants' health screening defined in the Ministry of Public Health's Announcement on Measures and Guidelines for Health Screening and Health Insurance for Migrants should not be imposed as a precondition for them to be insured by the HICS. Moreover, the list of health screenings may be considered revising as follows:

- Health screening may be done on diseases as required by the laws and the Ministry of Public Health's Announcement (the current list). This list consists of tuberculosis, syphilis, filariasis, leprosy, pregnancy test, drug addiction, chronic alcoholism, and psychosis. Screening for these diseases range between 500- 840 baht per person, depending on tests received.
- Health screening tests that are not effective or not practical may be removed from the current list. These include tests for syphilis, pregnancy test (no need to be done by using urine test in all migrants), drug addiction, chronic alcoholism, and psychosis.
- Other screening tests may be added to the current list since they will have little to no additional cost, that is, gonorrhea, hypertension, and major depression, to the current list. Hepatitis B, malaria, and diabetes screening can be added to the list but would incur an additional cost, so testing might depend on migrants' risk factors or symptoms.

In addition to the revised list, the Announcement should clearly define screening measures for each health problems/conditions based on this study's reviews so that all hospitals would have the same standard to follow.

# Contents

# 1. Introduction

## 1.1 Rationale

According to data from the Foreign Workers Administration Office, Ministry of Labour, the number of migrant workers in Thailand continues to increase, with 1,339,834 migrant workers legally working as of December 2014 (1). Migrant workers generally come to work in the so-called "3D jobs" (difficult, dangerous, and dirty) such as ones in the fishing industry – which Thai workers mostly refuse to take (2). Additionally, they have less access to health services and social welfare, including a lack of knowledge about basic healthcare. These are some reasons that cause migrants to be more vulnerable to health problems than other people (3). Therefore, it is important to have effective measures or policies to protect the health of migrants.

Migrants who are granted work permits have the same rights as Thai workers to join and access health services under the Thai social security scheme, with contributions coming from themselves, their employers, and the government; however, in 2011, less than 9% of estimated migrant workers were covered by the scheme (4). Apart from the social security scheme, in 2004, the Ministry of Public Health introduced the Health Insurance Card Scheme (HICS) for migrants who were not covered by the social security scheme. At present, in theory, this scheme has since expanded its coverage to all migrants regardless of their status (5). The applicants need to pay the card premium to be insured by the HICS. Additionally, they must pay for and pass the health screening procedures before being insured and granted work permits. The health check-up or screening covers chest x-rays for tuberculosis, and screenings for syphilis, microfilaria, leprosy, etc. (6).

Measures and guidelines for health screening and health insurance for migrants are periodically adjusted according to Cabinet resolutions, and this can be seen in the modification of migrant card prices as shown in Figure 1 (5). However, the health screening under the HICS have not changed much throughout the last 10 years (7, 8). Therefore, a study should be conducted to revise the health screening under the HICS in accordance with the current situation, and these policies should be developed based on scientific evidence and a

participatory process in order to provide comprehensive and effective health services for migrants in Thailand.

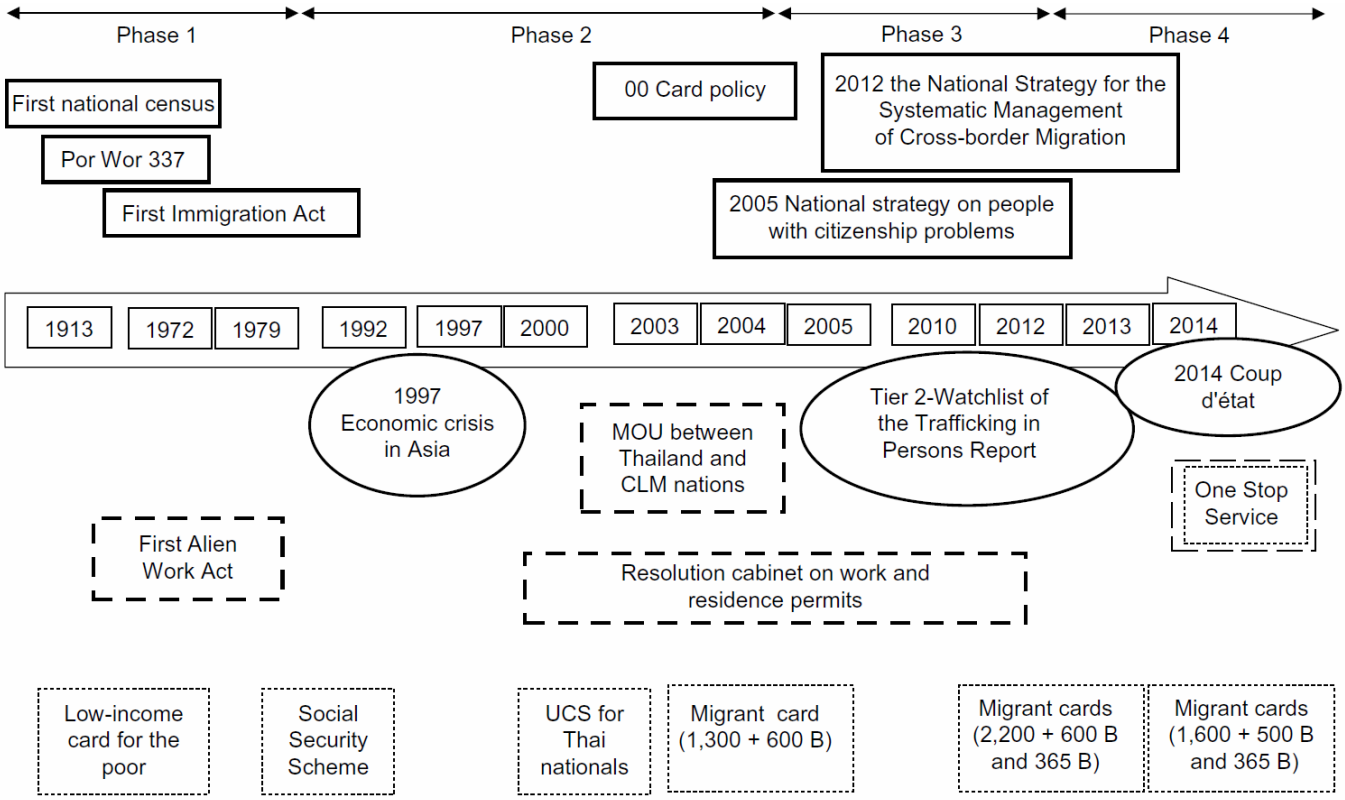


**Figure 2** Evolution of migrant policies in Thailand.
**Notes:** Bold line, security policies; dashed line, employment policies; dotted line, health insurance policy; oval, external factors.
**Abbreviations:** B, Baht; CLM, Cambodia, Lao PDR, and Myanmar; UCS, Universal Coverage Scheme.

**Figure 1** Evolution of migrant policies in Thailand (5)

## 1.2 Literature review

### Definition of migrants and categories

The Foreigners' Working Management Emergency Decree B.E. 2560 (2017) defines an "alien" as any natural person who is not of Thai nationality (9). Moreover, the Ministry of Social Development and Human Security has divided the types of migrants into two groups: documented/legal migrants, and undocumented/illegal migrants (10).

**Documented/legal migrants** mean migrants who have legal documents issued by their home state such as a passport, temporary passport, or certificate of identity, and were issued a visa by the Thai Embassy or Consulate in that country. They can be classified as follows:

**Section 9** means migrants who have entered the Kingdom temporarily based on immigration law, comprising:

1) General – this means migrants (1) who are skilled and are in relatively senior positions, are sent from the head offices in their home countries to invest in Thailand or are temporarily working in jobs which require high levels of skills and technologies; (2) who have special skills or expertise in specific areas or languages for which a Thai national cannot be substituted; and (3) who enter and work in their own business or spouse's business or joint business which are invested in by the owners.

2) Lifetime – this means migrants who have received permission to work according to the Revolutionary Party Announcement No. 322, which states that "permits which are issued to migrants who reside in the Kingdom according to the Immigration Law and have been working prior to 13 December 1972 will be valid for lifetime unless there is a change in career."

3) Memorandum of Understanding (MOU) of Employment Agreement between Partner Countries, which can be separated into two groups:

- **Nationality verification** – this means illegal migrants from Myanmar, Laos, and Cambodia who have been reclassified as legal migrants after reporting themselves to be verified and registered in the immigration system. To qualify for reclassification, migrants must be verified by their country of origin's authorities using either a temporary passport or a certificate of identity.
- **Imported labour** – this means migrants to enter to work according to the MOU with partner countries, which currently consists of Laos and Cambodia.

**Section 12** means migrants who have entered the Kingdom of Thailand to work according to the Investment Promotion Act or other relevant laws.

**Undocumented/illegal migrants** mean migrants who fall under Section 13, classified into two types:

Ethnic minorities, or migrants who (1) have been deported; (2) are awaiting deportation from the Kingdom of Thailand according to the Immigration Act; (3) have had their nationalities revoked; (4) have not been naturalized according to National Executive Council's announcement; and (5) have not been naturalized according to the Nationality Act

Migrant workers from three countries (Myanmar, Laos, and Cambodia) who have entered the country illegally: the Thai Cabinet recently passed a resolution to grant temporary clemency to this group while waiting to return them to their countries of origin. However, the Cabinet also passed a resolution to have this group (1) report and register themselves with the Department of the Interior, and (2) go through a medical examination and obtain health insurance from the Ministry of Public Health. These migrant workers can request for permission to legally work in two fields: labourers and domestic helpers.

Data from the Foreign Workers Administration Office, Department of Employment, Ministry of Labour shows that the number of migrant workers granted work permits in Thailand was amounted to 1,339,834 migrants in 2014, 1,443,474 migrants in 2015, 1,489,932 migrants in 2016, and 1,613,269 migrants in 2017 (1, 11-13).

**Health insurance of migrants in Thailand**

There are three main health insurance schemes in Thailand: the Civil Servant Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), and the Universal Coverage Scheme (UCS). The CSMBS is the scheme for government employees and their dependents consisting of parents, spouses, and children under 20 years of age; general taxation managed by the Ministry of Finance (MoF) is used as the major source of funding for this benefit (14). The SSS is the scheme for those who work under formal private sectors, is supervised by the Ministry of Labour (MoL), and is funded based on payroll taxes from three benefactors: employers, employees, and government (15). Meanwhile, the UCS is the scheme for supporting Thai-born populations who are uninsured by the CSMBS and SSS; this scheme is administered by the National Health Security Office (NHSO), which plays the role of a representative buyer for all beneficiaries under government funding (16).

In principle, registered migrant workers who legally enter Thailand and engage in the works in formal sector are insured under the SSS. They receive the same benefits from the scheme as Thai citizens, e.g. injury or sickness benefits, maternity benefits, invalidity benefits, death benefits, child benefits, and unemployment benefits. In addition, migrants can also be included under the CSMBS if their spouse or parents are Thai civil servants (17). However, only few migrants are covered under the SSS and CSMBS.

In 2004, the Ministry of Public Health (MoPH) introduced the nationwide Health Insurance Card Scheme (HICS) for migrants who were not covered by the SSS. In theory, this scheme has since expanded its coverage to all migrants at present, regardless of their status (5). Migrants pay a premium to be insured under the HICS. An announcement made by the MoPH in 2015 regarding health screening and health insurance of migrants identified the types and service rates of the HICS as presented in Table 1 (6).

**Table 1 Types and service rates of the HICS in 2015**

| Target | Coverage duration | Rate per person (Baht) | Remarks |
|---|---|---|---|
| Migrant worker and dependent | 1 year | 2,100 | 500 baht for health screening<br>1,600 baht for health insurance |
| Migrant worker and dependent | 6 months | 1,400 | 500 baht for health screening<br>900 baht for health insurance |
| Migrant worker and dependent | 3 months | 1,000 | 500 baht for health screening<br>500 baht for health insurance |
| Migrant | 1 year | 2,700 | 500 baht for health screening<br>2,200 baht for health insurance |
| Child of migrant aged under 7 years | 1 year | 365 | No health screening fee<br>365 baht for health insurance |

In 2016, according to the Cabinet resolution on the management of migrant workers, some revisions were made pertaining to the MoPH announcement regarding health screening and health insurance of migrant workers, particularly on the service rates and insurance coverage duration of certain types of migrant workers. The new rate of the HICS is 3,700 baht per person for a two-year coverage, which includes 3,200 baht for health insurance and 500 baht for health screening in the first year (another 500 baht can be charged for screening in the second year). For child of migrant workers aged under 7 years, the rate is now 730 baht per person for health insurance (no screening fee) for a two-year coverage (18).

Health screening and health insurance should be conducted at the same health facilities located in migrants' settlement – except for migrants in fishery or construction industries, who can access any health facility in the 22 coastal provinces. Migrants must pass health screening procedures prior to being insured under the HICS and granted work permits. Table 2 summarizes the health screening package of migrants.

**Table 2 Health screening of migrants**

| Diseases/health problems | Screening intervention |
|---|---|
| Tuberculosis | Perform chest x-ray. If abnormal chest x-ray consistent with TB is found, perform a sputum examination. |
| Syphilis | Blood examination. |
| Filariasis | Blood examination. A single dose of Diethylcarbamazine (DEC) 300 mg is prescribed to Myanmar migrants before conducting blood examination. |
| Drug addiction | Screen for amphetamines in all migrants via urine examination. |
| Pregnancy | Perform a urine test in migrant women before prescribing DEC and x-ray. |
| Leprosy | Screening intervention is not identified. |
| Intestinal parasites | Albendazole 400 mg is prescribed to control intestinal parasites in all migrants or depending on physician's recommendations. |
| Other physical examinations depending on physician's recommendations | - |
| Children health screening | Based on physician's recommendation.<br>• Newborn – 15 years: general physical examination, growth and development assessment, nutrition assessment, and dental check-up.<br>• Child between 7 – 15 years: if the child was born in Thailand and completed vaccination, health screening for diseases when there are medical indications only.<br>• Other screenings depending on physician's recommendation. |

The results of health screening are divided into three groups: migrants with normal results (Group 1), migrants who passed the screening test but were infected or had some health problems (Group 2), and migrants who not pass the screening test (Group 3). Only migrants in Groups 1 and 2 are eligible to obtain work permits and take part in the HICS. The details of each group are shown in Table 3.

**Table 3 Results of health screening categorized into 3 groups**

| | |
|---|---|
| **Group 1** | Migrants with normal results |
| **Group 2** | Migrants who passed the screening test but were infected with diseases such as tuberculosis, leprosy, filariasis, syphilis, and intestinal parasite. Follow-ups and treatment should be conducted. |
| **Group 3** | Migrants who did not pass the screening test because they were not fit for work or were infected with diseases such as active tuberculosis, obvious leprosy or filariasis, stage 3 syphilis, narcotic drug addiction, alcoholism, and psychosis. This group is not permitted to work and repatriated to their country of origin. |

The benefits package of HICS covers medical services for general illnesses, emergency services, medical referrals, health promotion and prevention, and disease surveillance. However, the package does not cover certain medical services such as treatment of psychosis, dialysis for chronic renal failure.

**Health screening of migrants in other countries**

When working or immigrating to other countries, migrants are required to undergo health examinations before obtaining work permits or visas. They need to undergo health screening in their home countries before departure, which is conducted by panel physicians appointed by that country's agency, and/or screened after arriving at their destination. For example, health examinations are required for visa applications in Australia. For temporary visa, health examinations depend on factors, e.g. type of visa, length of stay, country level of TB risk, etc. Chest x-rays (aged 11 or more years) is screened in only countries with high levels of TB risk and if the applicants intend to stay for six months or more. Additional health examinations might be requested, e.g. chest x-rays, medical examinations, and blood tests for HIV, hepatitis B and C are required for those intending to work as or study to be a doctor, dentist, nurse or paramedic (19).

In the United States, these following conditions cause an alien to be inadmissible: (1) have communicable diseases, i.e. TB, syphilis, gonorrhea, Hansen's disease (leprosy), quarantinable diseases (i.e. cholera, diphtheria, infectious TB, plague, smallpox, yellow fever, viral haemorrhagic fevers, severe acute respiratory syndromes, and pandemic flu), and public health emergencies of international concern (PHEIC) (i.e. polio, smallpox, SARS, influenza, and other public health emergencies of international concern); (2) fail to present documentation of

having received vaccination for diseases such as mumps, measles, rubella, polio, tetanus and diphtheria toxoids, pertussis, Haemophilus influenzae type B, rotavirus, hepatitis A, hepatitis B, meningococcal disease, varicella, influenza, and pneumococcal pneumonia; (3) have or have had a physical or mental disorder with harmful behaviour; and (4) drug abuser or an addict (20, 21).

Medical examination form for foreign workers in Singapore includes these following diseases: cardiovascular system (*blood pressure/ heart disease/ ECG/ severe varicose veins*), anemia, respiratory system, abdomen (*hernia/ enlarged liver/ enlarged spleen/ genito-urinary system*), skin-chronic disease (e.g. leprosy, widespread eczema, psoriasis, etc), locomotor/ neurological, endocrine disorders (e.g. thyrotoxicosis), mental state, chest x-ray, urine (albumin/ sugar/ pregnancy), VDRL, hearing, vision (vision acuity/ colour vision/ any organic eye disease), blood film for malaria, HIV (AIDS) (22).

WHO recommendations on the screening of refugees and migrants state that screening should not be compulsory, and the results must not be used for repatriating refugees and migrants, because there is no evidence on the benefits and also on the association between migration and infectious diseases import. Nevertheless, the WHO recommends providing health check-ups for both communicable and non-communicable diseases to all refugees and migrants with the aim of ensuring access to healthcare services. Additionally, the WHO also recommends triaging at points of entry to identify migrant health problems, and that appropriate treatment must be provided regardless of their legal status (23).

Evidence-based clinical prevention guidelines for immigrants and refugees to Canada were developed in order to improve their health outcomes related to preventive services. The guidelines focused on the first five years of settlement in Canada for immigrants and refugees. It includes information about each priority condition or health problem i.e. burden of disease in immigrants and refugees, effectiveness of screening and interventions, clinical considerations, and recommendations and research gaps. The guideline development process started with a selection of 20 high-priority and potentially preventable and treatable conditions by using a modified Delphi consensus process, with forty-five primary care practitioners invited to participate in the selection process; the criteria for priority-setting included importance, usefulness, and disparity. As a result, the top 20 conditions selected were divided into four

groups, i.e. infectious diseases, mental health and maltreatment, chronic and non-communicable diseases, and women's health. Literature reviews were then conducted, and recommendations provided (24).

In Australia, there is also a guideline for post-arrival health assessments which focuses on new arrivals and for people from refugee-like backgrounds who have not had a previous health assessment. This assessment is conducted on a voluntary basis and the results cannot be used for deportation. The guideline provides recommendations on diagnosis, investigation, and management of health conditions for healthcare providers. Australian and international data and published consultations were used for prioritizing health conditions. Recommendations of each health conditions were based on reviews of available evidence. The drafts of this guideline were reviewed by interdisciplinary experts and external stakeholders (25).

### 1.3 Objectives

**General objective**

To review and develop an appropriate health screening package for migrants[1] in Thailand

**Specific objectives**

1) To investigate the current health problems of migrants in Thailand.
2) To review and identify screening interventions that are effective and good value for money based on academic evidence and address the current health problems of migrants.
3) To analyse the budget impact on health screening interventions developed in the second specific objective.

[1] The target population in this study is migrants who are not covered by the SSS including illegal/undocumented migrant workers, legal/documented migrant workers in an informal sector, and dependents of migrant workers.

# 2. Methods

## 2.1 Health problems of migrants in Thailand

Migrant health problems were investigated by conducting document reviews and database analysis. This information was used as background information for the prioritization of migrant health problems in the next step.

### 2.1.1 Document reviews

Both national and international document reviews related to migrant health problems were performed. The study focused on migrants from Myanmar, Laos, and Cambodia, as they represent the majority of migrant workers under the HICS. The information used was retrieved from the following sources:

- Burden of disease (BOD) from WHO Global Health Estimates (GHE) in 2016: Estimated Disability-Adjusted Life Years (DALYs) in all ages were reviewed.
- Information from relevant government organizations:
    - Migrant health screening reports from the One-Stop Service (OSS) Center in 2014 and 2016, which showed the number of cases detected for the following diseases: tuberculosis, leprosy, filariasis, syphilis, drug addiction, chronic alcoholism, psychosis, and pregnancy.
    - National Disease Surveillance (Report 506) monitored by the Bureau of Epidemiology, Department of Disease Control, MoPH, Thailand. The system showed the number of suspected cases of communicable diseases reported by all public hospitals and some private hospitals. The number of suspected patients and deaths of migrants from the three nationalities in 2017 were selected.
- An unpublished study analysing the number of health service utilization cases and mean charge of service for each disease (both OPD and IPD) from 1 general and 1 community hospitals in 2011-2015. This included information from both insured migrants under the HICS and uninsured migrants. The data was analysed by using

3 digits of the International Classification of Diseases and Related Health Problem 10th Revision (ICD-10) of principal diagnosis (PDx).

2.1.2 Database analysis

Secondary data from the database of the Division of Health Economics and Health Security (DHES), MoPH, Thailand, from January 2013- December 2016 was obtained for analysis. Descriptive analysis was conducted to investigate both OPD and IPD diseases with high expenditure under the HICS for migrants from the three nationalities. The analysis was performed by using 3 digits of ICD-10 of principal diagnosis (PDx) to explore the frequency of reimbursement, mean, and total reimbursement of high-cost care for each disease in each year.

**2.2 Prioritization of migrant health problems**

According to the document review and data analysis of migrant health problems in 2.1), fourty health problems were preliminary identified comprising 20 communicable diseases and 20 non-communicable diseases. The selection criteria for these problems were the top priority health problems causing high services utilization, charges, reimbursement, burden of disease, and diseases that were banned under the law. These health problems were presented to various stakeholders in a meeting held on November 17, 2017, in order to prioritize migrant health problems that should be on the list of health screening[2] and covered appropriately under the HICS. We purposively selected key informants or organizations that were relevant and experienced in the migrant field to participate in the meeting. There were 21 participants from four sectors as detailed in Table 4.

The prioritization was conducted by using a modified Delphi consensus process, which is different from the traditional Delphi method as this process allows participants to deliberate until achieving a consensus in each round. The priority-setting criteria were derived from Pottie K et al. 2011 (24), and consisted of 3 criteria: 1) importance - health conditions that have high prevalence and high burden of illness; 2) usefulness - health conditions that can be practically implemented and evaluated; and 3) disparity - health conditions that have variations in practice between migrants and Thais.

[2]This list of health screening means the health screening before purchasing and being insured under the HICS and obtaining work permits. It does not include health screening in the benefit package under the HICS.

**Table 4 Number of participants in the prioritization meeting**

| Sector | Number of participants |
|---|---|
| Government officers/decision-makers | 10 |
| Healthcare providers | 6 |
| Academics | 2 |
| Non-governmental organizations | 3 |

After being presented forty health problems identified by research team, participants were then asked to deliberate on health problems that were not identified yet and should be added to the list before starting the prioritization process. The aim of the process was to prioritize the first 20 most important health problems of migrants for a total of 10 communicable diseases and 10 non-communicable diseases. This meeting was divided into three sessions: 1) selecting health problems; 2) 1st ranking health problems; and 3) 2nd ranking health problems.

**First round: Selecting health problems.** Participants were asked to select 20 important health problems (10 communicable and 10 non-communicable diseases/conditions). Health problems were listed based on frequency from high to low. Participants were then asked to deliberate on the result.

**Second round: 1st Ranking health problems**. Participants were asked to rank the top 10 important health problems of each category according to the result in the first round by ranking from 1 to 10 – given that 1 is the most important health problem with a score of 10 points and10 is the least important health problem with a score of 1 point. Health problems were listed based on total scores from high to low. Participants were then asked to deliberate on the result.

**Third round: 2nd Ranking health problems.** Participants were again requested to rank and deliberate on the result, similar to the second round.

After deliberation in the third round, the final consensus was then made by the participants to prioritize the top 20 most important health problems of migrants.

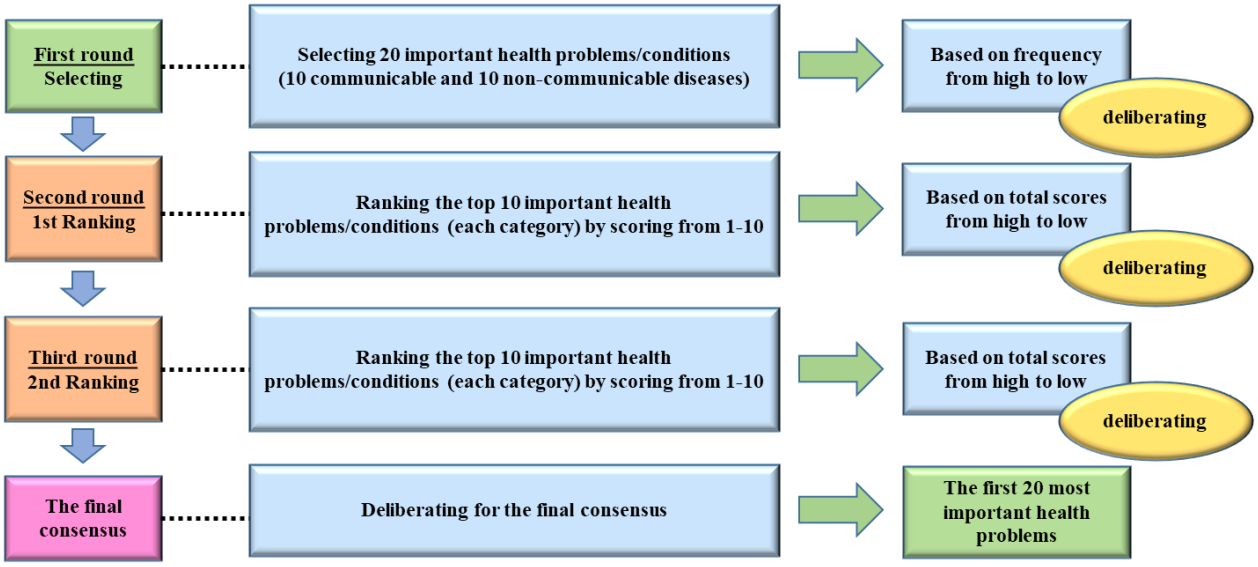


**Figure 2** Prioritization process of migrants' health problems

### 2.3 Development and revising the health screening package of migrants

2.3.1 Review of health screening interventions

Literature and document reviews on the effectiveness and cost-effectiveness of screening interventions for those prioritized health problems were conducted. The topics reviewed included effective screening interventions and target groups recommended by clinical practice guideline in Thailand, cost-effectiveness of screening interventions, and costs of screening. The topics and sources of data for document reviews are shown in Table 5.

**Table 5 Topics and sources of data for document reviews**

| Topics | Sources of data |
|---|---|
| Effective screening interventions and target groups | Clinical practice guideline in Thailand |
| Cost-effectiveness of screening interventions | • Health Intervention and Technology Assessment Program (HITAP) database<br>• Health technology assessment (HTA) database in Thailand |
| Costs of screening interventions | The Comptroller General's Department (CGD) database |

2.3.2 In-depth interviews

Purposive sampling was employed to identify key informants with extensive experience on migrant health. The interviewees consisted of two policymakers in the Ministry of Public Health and four academics. A semi-structured interview guide was used, and consisted of questions, i.e. the current situation of migrant health screening, the appropriateness of the current health screening list and interventions of migrants, interviewees' opinions regarding the health screening list and interventions derived from the prioritization process and the reviews, other barriers and recommendations on health screening of migrants in Thailand. The interviews were conducted in December 2017, with audio recordings being used to transcribe the interview; subsequently, the transcription was analysed through the content analysis approach.

Inputs from the in-depth interviews were incorporated into the information obtained from the document reviews in order to develop and revise the health screening package for migrants. In addition, the cost of the health screening package was also estimated based on the costs of screening interventions from CGD database.

**2.4 Approval of ethical committee**

Ethical approval for this study was obtained from the Institute for the Development of Human Research Protections, Thailand (document number 995/2560). All informants were provided details about the research project, and written consent was obtained prior to participation in this study.

# 3. Results

The study results are divided into 3 parts: health problems of migrants in Thailand; prioritization of migrants' health problems; and developing and revising the health screening package of migrants.

## 3.1 Health problems of migrants in Thailand

### 3.1.1 Document reviews

The WHO Global Health Estimates (GHE) reported that in 2016, diseases which incurred the highest burden in Myanmar, Laos, and Cambodia – countries which are most likely to send migrants into Thailand – comprised strokes, lower respiratory infections, and ischemic heart diseases, respectively. This was determined by taking information on the Disability-Adjusted Life Years (DALYs) of all age group from each country of origin. When analyzing the top 10 diseases from each of the three countries, similarities were found in the rankings. Communicable diseases in the top 10 which were present in all three countries consisted of lower respiratory infections and tuberculosis (26), as shown in Table 6.

**Table 6 Top 10 Burden of Disease in Myanmar, Laos, and Cambodia**

| No. | Myanmar | Laos | Cambodia |
|---|---|---|---|
| 1 | Stroke | Lower respiratory infections | Ischemic heart disease |
| 2 | Lower respiratory infections | Birth asphyxia and birth trauma | Tuberculosis |
| 3 | Tuberculosis | Preterm birth complications | Lower respiratory infections |
| 4 | Preterm birth complications | Tuberculosis | Stroke |
| 5 | Cirrhosis of the liver | Ischemic heart disease | Road injury |
| 6 | Diabetes mellitus | Diarrheal diseases | Preterm birth complications |
| 7 | Ischemic heart disease | Stroke | Iron-deficiency anemia |
| 8 | Birth asphyxia and birth trauma | Neonatal sepsis and infections | Drowning |

| No. | Myanmar | Laos | Cambodia |
|---|---|---|---|
| 9 | Chronic obstructive pulmonary disease | Road injury | Birth asphyxia and birth trauma |
| 10 | Road injury | Liver cancer | Asthma |

According to the implementation report for the One Stop Service (OSS) centers which are set up every two years, the Health Administration Division, Ministry of Public Health, reported that the health problems/conditions which were found the most (from 2,164,674 migrants screened) at the OSS centers in 2014, specifically between 26 June – 29 November, were pregnancy (127,702 cases), and tuberculosis (14,301 cases), respectively. Subsequently, the implementation report for OSS centers in 2016 by the Division of Health Economics and Health Security, Ministry of Public Health, showed that when OSS centers were set up between 1 April – 2 August, the health problems/conditions most commonly found (from 1,147,889 migrants screened) was pregnancy (19,907 cases), followed by tuberculosis (5,003 cases) (27). Details for the rest of the list are found in Table 7.

**Table 7 Number of migrant health problems/conditions found by OSS centers**

| Health Problem/Condition | Number of people 26 Jun. – 29 Nov. 2014 | Number of People 1 Apr. – 2 Aug. 2016 |
|---|---|---|
| Pregnancy | 127,702 | 19,907 |
| Tuberculosis | 14,301 | 5,003 |
| Syphilis | 7,493 | 1,933 |
| Drug addiction | 1,940 | 643 |
| Filariasis | 458 | 52 |
| Leprosy | 374 | 5 |
| Psychosis or Mental Retardation | 68 | 3 |
| Chronic alcoholism | 36 | 5 |

In 2017, the National Disease Surveillance Report (Report 506) – an important tool used for keeping track of communicable diseases – reported that the top five health problems or conditions (suspected case) which migrants from Myanmar, Laos, and Cambodia faced were diarrhea (8,736 cases), PUO (4,386 cases), pneumonia (2,308 cases), influenza (1,258 cases), and food poisoning (673 cases) (28). Details are shown in Table 8.

**Table 8 National Disease Surveillance (Report 506) 2017**

| No. | Health Problem/Condition | Number of Cases | No. | Health Problem/Condition | Number of Cases |
|---|---|---|---|---|---|
| 1 | Diarrhea | 8,736 | 11 | Other Sexually Transmitted Diseases | 390 |
| 2 | PUO | 4,386 | 12 | Measles | 245 |
| 3 | Pneumonia | 2,308 | 13 | Scrub Typhus | 242 |
| 4 | Influenza | 1,258 | 14 | Hepatitis B | 188 |
| 5 | Food Poisoning | 673 | 15 | Malaria | 182 |
| 6 | Dengue Fever | 614 | 16 | Gonorrhea | 167 |
| 7 | Hand, Foot and Mouth Disease | 520 | 17 | Tetanus | 159 |
| 8 | D.H.F. | 477 | 18 | Condyloma Acuminata | 67 |
| 9 | Chickenpox | 414 | 19 | N.S.U./V | 65 |
| 10 | Syphilis | 396 | 20 | Dysentery | 59 |

Remarks: AIDS is not included in Report 506, and there were only 3 cases of tuberculosis.

In addition, an unpublished study analyzed the databases of two hospitals from 2011-2015 to determine the utilization of health services of migrants and which health problems/conditions they were being treated for. The results are shown in terms of the number of visits per health problem/condition and average charge per visit – classified by outpatient and inpatient care – as follows:

For outpatient care, the top five migrant health problems/conditions that were most frequently treated for consisted of counselling and medical advice; special examinations and investigations; examination for administrative purposes (e.g. prior to employment, military conscription, etc.); high blood pressure; and surgical follow-up care, respectively. From the perspective of average charge per visit, the top five migrant health problems/conditions which had the highest average charge comprised abnormal findings on diagnostic imaging of the lungs; cystic kidney disease; benign neoplasm of other and ill-defined parts of the digestive system; burns and corrosion of the ankle and foot; and care involving dialysis, respectively. Details for the rest of the problems/conditions based on average charge per visit are shown in Table 10.

**Table 9 Top 20 Migrant Health Problems/Conditions Treated in Outpatient Care (Number of Visits)**

| No. | Health Problems/Conditions | ICD-10 | Number of visits |
|---|---|---|---|
| 1 | Persons encountering health services for other counselling and medical advice | Z71 | 28,838 |
| 2 | Other special examinations and investigations of persons without complaint or report | Z01 | 21,438 |
| 3 | Examination and encounter for administrative purposes | Z02 | 11,449 |
| 4 | Essential (primary) hypertension | I10 | 10,202 |
| 5 | Other surgical follow-up care | Z48 | 9,856 |
| 6 | Supervision of normal pregnancy | Z34 | 9,019 |
| 7 | Dyspepsia | K30 | 5,806 |
| 8 | False labour | O47 | 5,608 |
| 9 | Need for immunization against certain single viral diseases | Z24 | 5,413 |
| 10 | Non-insulin-dependent diabetes mellitus | E11 | 5,261 |
| 11 | Asymptomatic human immunodeficiency virus [HIV] infection status | Z21 | 5,083 |
| 12 | Need for immunization against combinations of infectious diseases | Z27 | 4,606 |
| 13 | Acute upper respiratory infections of multiple or unspecified sites | J06 | 3,308 |
| 14 | Follow-up examination after treatment for conditions other than malignant neoplasms | Z09 | 3,155 |
| 15 | Acute nasopharyngitis [common cold] | J00 | 3,142 |
| 16 | Acute pharyngitis | J02 | 3,095 |
| 17 | Care involving use of rehabilitation procedures | Z50 | 3,065 |
| 18 | Fever of unknown origin | R50 | 3,002 |
| 19 | Respiratory tuberculosis, not confirmed bacteriologically or histologically | A16 | 2,967 |
| 20 | Dizziness and giddiness | R42 | 2,739 |

Remark: Data obtained from two hospital databases between 2012-2015

**Table 10 Top 20 Migrant Health Problems/Conditions Treated in Outpatient Care (Average Charge per Visit)**

| No. | Health Problems/Conditions | ICD-10 | Average Charge (THB) |
|---|---|---|---|
| 1 | Abnormal findings on diagnostic imaging of lung | R91 | 9,353 |
| 2 | Cystic kidney disease | Q61 | 5,760 |
| 3 | Benign neoplasm of other and ill-defined parts of digestive system | D13 | 5,390 |
| 4 | Burn and corrosion of ankle and foot | T25 | 4,805 |
| 5 | Care involving dialysis | Z49 | 4,418 |
| 6 | Other abortion | O05 | 4,330 |
| 7 | Disorders of porphyrin and bilirubin metabolism | E80 | 4,310 |
| 8 | Decubitus ulcer | L89 | 4,263 |
| 9 | Labour and delivery complicated by fetal stress [distress] | O68 | 3,919 |
| 10 | Malignant neoplasm of pancreas | C25 | 3,875 |
| 11 | Delirium, not induced by alcohol and other psychoactive substances | F05 | 3,679 |
| 12 | Anuria and oliguria | R34 | 3,486 |
| 13 | Long labour | O63 | 3,454 |
| 14 | Other obstetric trauma | O71 | 3,349 |
| 15 | Abnormal finding in specimen from female genital organ | R87 | 3,174 |
| 16 | Spontaneous abortion | O03 | 2,668 |
| 17 | Complications following abortion and ectopic and molar pregnancy | O08 | 2,655 |
| 18 | Other disorders of amniotic fluid and membranes | O41 | 2,627 |
| 19 | Malignant neoplasm of uterus, part unspecified | C55 | 2,615 |
| 20 | Neoplasm of uncertain or unknown behaviour of oral cavity and digestive organs | D37 | 2,530 |

Remark: Data obtained from two hospital databases between 2012-2015

For inpatient care, the top five migrant health problems/conditions that were treated the most number of times – starting from the top and going down the list – consisted of single spontaneous delivery, diarrhea and gastroenteritis of resumed infectious origin, other complications of labor and delivery (not classified elsewhere), maternal care for known or suspected disproportion, and perineal laceration during delivery, respectively. Details for the entire list are shown in Table 11. In terms of average charge per visit, the top five problems/conditions, from highest average charge first, consisted of malignant neoplasm of the

breast, malignant neoplasm of the vulva, other liver diseases, decubitus ulcer, and HIV resulting in infectious and parasitic diseases, respectively.

**Table 11 Top 20 Migrant Health Problems/Conditions Treated in Inpatient Care (Number of Visits)**

| No. | Health Problems/Conditions | ICD-10 | Number of visits |
|---|---|---|---|
| 1 | Single spontaneous delivery | O80 | 3,755 |
| 2 | Diarrhoea and gastroenteritis of presumed infectious origin | A09 | 998 |
| 3 | Other complications of labour and delivery, not classified elsewhere | O75 | 958 |
| 4 | Maternal care for known or suspected disproportion | O33 | 720 |
| 5 | Perineal laceration during delivery | O70 | 583 |
| 6 | Maternal care for known or suspected abnormality of pelvic organs | O34 | 537 |
| 7 | Pneumonia, organism unspecified | J18 | 404 |
| 8 | Single delivery by caesarean section | O82 | 375 |
| 9 | Bacterial pneumonia, not elsewhere classified | J15 | 283 |
| 10 | Acute appendicitis | K35 | 279 |
| 11 | Dengue fever [classical dengue] | A90 | 277 |
| 12 | Unspecified abortion | O06 | 271 |
| 13 | Dengue haemorrhagic fever | A91 | 262 |
| 14 | Leptospirosis | A27 | 260 |
| 15 | Other abnormal products of conception | O02 | 258 |
| 16 | Intracranial injury | S06 | 257 |
| 17 | Open wound of head | S01 | 249 |
| 18 | Convulsions, not elsewhere classified | R56 | 240 |
| 19 | Other chronic obstructive pulmonary disease | J44 | 239 |
| 20 | Acute bronchitis | J20 | 231 |

Remark: Data obtained from two hospital databases between 2012-2015

**Table 12 Top 20 Migrant Health Problems/Conditions Treated in Inpatient Care (Average Charge per Visit)**

| No. | Health Problems/Conditions | ICD-10 | Average Charge (THB) |
|---|---|---|---|
| 1 | Malignant neoplasm of the breast | C50 | 15,468 |
| 2 | Malignant neoplasm of the vulva | C51 | 13,304 |
| 3 | Other liver diseases | K76 | 10,199 |
| 4 | Decubitus ulcer | L89 | 7,915 |

| No. | Health Problems/Conditions | ICD-10 | Average Charge (THB) |
|---|---|---|---|
| 5 | HIV resulting in infectious and parasitic diseases | B20 | 7,436 |
| 6 | Open wound of hip and thigh | S71 | 7,252 |
| 7 | Alcoholic liver disease | K70 | 7,034 |
| 8 | Paroxysmal tachycardia | I47 | 6,523 |
| 9 | Other abortion | O05 | 6,175 |
| 10 | Fracture of lumbar spine and pelvis | S32 | 6,084 |
| 11 | Burn and corrosion of ankle and foot | T25 | 6,030 |
| 12 | Other inflammatory liver diseases | K75 | 5,974 |
| 13 | Certain early complications of trauma, not elsewhere classified | T79 | 5,892 |
| 14 | Other diseases of biliary tract | K83 | 5,746 |
| 15 | Nephrotic syndrome | N04 | 5,600 |
| 16 | Complications of procedures, not elsewhere classified | T81 | 5,459 |
| 17 | Other obstetric trauma | O71 | 5,350 |
| 18 | Other disorders of fluid, electrolyte and acid-base balance | E87 | 5,328 |
| 19 | Myositis | M60 | 5,303 |
| 20 | Respiratory tuberculosis, not confirmed bacteriologically or histologically | A16 | 5,240 |

Remark: Data obtained from one hospital database between 2011-2015

3.1.2 Database analysis

An analysis of medical reimbursement from the Division of Health Economics and Health Security's database in 2016 showed that the highest reimbursements incurred in outpatient care for migrant health problems/conditions was HIV at approximately 13 million baht – with an average charge per visit of 887 baht and number of reimbursements at 15,242 times. Other problems/conditions which had the highest reimbursements comprised HIV resulting in infectious and other conditions and malignant neoplasms in various organs. Details for the top 20 outpatient problems/conditions which were reimbursed are shown in Table 13.

Inpatient care for migrant health problems/conditions which incurred the highest reimbursement was disorders related to short gestation and low birth weight at approximately 48 million baht. Problems/conditions with the highest reimbursements were injuries to various organs, and various diseases for newborns and infants. Details for the top 20 inpatient problems/conditions which were reimbursed are shown in Table 14.

In addition, analyzing health problems/conditions over the period of 2013-2015 showed that the top 20 problems/conditions were similar to the analysis of the dataset in 2016 (Annex 1).

**Table 13 Top 20 Migrant Health Problems/Conditions Treated in Outpatient Care and Reimbursed in 2016**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Unspecified human immunodeficiency virus (HIV) | B24 | 13,515,913 | 887 ± 1,870 | 15,242 |
| 2 | Malignant neoplasm of the breast | C50 | 1,867,286 | 2,541 ± 3,456 | 735 |
| 3 | HIV resulting in infectious and parasitic diseases | B20 | 1,307,196 | 725 ± 1,052 | 1,802 |
| 4 | Malignant neoplasm of cervix uteri | C53 | 1,097,150 | 2,482 ± 2,229 | 442 |
| 5 | Asymptomatic HIV infection status | Z21 | 837,747 | 1,070 ± 1,430 | 783 |
| 6 | HIV resulting in other conditions | B23 | 617,962 | 972 ± 1,432 | 636 |
| 7 | Need for immunization against combinations of infectious diseases | Z27 | 473,099 | 67 ± 46 | 7,026 |
| 8 | Special screening examination for infectious and parasitic diseases | Z11 | 389,317 | 75 ± 71 | 5,222 |
| 9 | Need for immunization against certain single viral diseases | Z24 | 282,855 | 65 ± 41 | 4,326 |
| 10 | Malignant neoplasm of the nasopharynx | C11 | 276,212 | 4,455 ± 6,900 | 62 |
| 11 | Malignant neoplasm of the corpus uteri | C54 | 272,629 | 3,207 ± 4,015 | 85 |
| 12 | Malignant neoplasm of the rectum | C20 | 242,475 | 1,684 ± 1,531 | 144 |
| 13 | Need for immunization against single bacterial diseases | Z23 | 204,854 | 59 ± 47 | 3,467 |
| 14 | Other medical care | Z51 | 156,352 | 3,191 ± 2,091 | 49 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 15 | Diffuse non-Hodgkin's lymphoma | C83 | 148,892 | 3,384 ± 894 | 44 |
| 16 | Malignant neoplasm of the stomach | C16 | 137,821 | 2,600 ± 1,415 | 53 |
| 17 | Malignant neoplasm of the brain | C71 | 128,464 | 4,144 ± 3,249 | 31 |
| 18 | Malignant neoplasm of other connective and soft tissue | C49 | 125,840 | 2,330 ± 1,585 | 54 |
| 19 | Malignant neoplasm of the anus and anal canal | C21 | 120,672 | 5,028 ± 13,886 | 24 |
| 20 | Malignant neoplasm of the palate | C05 | 100,800 | 4,032 ± 160 | 25 |

**Table 14 Top 20 Migrant Health Problems/Conditions Treated in Inpatient Care and Reimbursed in 2016**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Disorders related to short gestation and low birth weight, not elsewhere classified | P07 | 48,077,540 | 53,007 ± 66,650 | 907 |
| 2 | Intracranial injury | S06 | 11,454,129 | 58,439 ± 72,601 | 196 |
| 3 | Liveborn infants according to place of birth | Z38 | 10,773,916 | 2,673 ± 2,302 | 4,030 |
| 4 | Pneumonia, organism unspecified | J18 | 9,094,124 | 15,414 ± 24,337 | 590 |
| 5 | Bacterial sepsis of newborn | P36 | 6,426,400 | 13,333 ± 27,949 | 482 |
| 6 | Birth asphyxia | P21 | 5,517,976 | 42,122 ± 62,417 | 131 |
| 7 | Congenital malformations of cardiac septa | Q21 | 5,429,947 | 64,642 ± 57,878 | 84 |
| 8 | Neonatal aspiration syndromes | P24 | 5,164,092 | 36,625 ± 55,798 | 141 |
| 9 | Neonatal jaundice from other and unspecified causes | P59 | 4,765,590 | 3,363 ± 4,058 | 1,417 |
| 10 | Respiratory distress of newborn | P22 | 4,486,604 | 14,198 ± 26,827 | 316 |
| 11 | Congenital pneumonia | P23 | 4,398,464 | 29,129 ± 51,086 | 151 |
| 12 | Intracerebral haemorrhage | I61 | 4,321,920 | 93,955 ± 76,089 | 46 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 13 | Injury of intra-abdominal organs | S36 | 3,726,701 | 73,073 ± 44,620 | 51 |
| 14 | Lymphoid leukaemia | C91 | 3,310,603 | 44,738 ± 37,014 | 74 |
| 15 | Fracture of lower leg, including ankle | S82 | 3,205,714 | 12,823 ± 34,453 | 250 |
| 16 | Congenital malformations of great arteries | Q25 | 3,183,236 | 81,621 ± 69,505 | 39 |
| 17 | Acute myocardial infarction | I21 | 3,168,255 | 83,375 ± 35,721 | 38 |
| 18 | Fracture of lumbar spine and pelvis | S32 | 2,968,588 | 29,986 ± 41,668 | 99 |
| 19 | Bacterial pneumonia, not classified elsewhere | J15 | 2,657,510 | 23,518 ± 35,436 | 113 |
| 20 | Fracture of femur | S72 | 2,520,766 | 13,850 ± 26,222 | 182 |

### 3.2 Prioritization of migrant health problems

Based on the document reviews and data analysis conducted in 3.1, these migrant health problems/conditions were presented to stakeholders in the meeting for prioritizing migrant health problems. The 40 migrant health problems/conditions were chosen by the research team and were divided into 20 communicable diseases and 20 non-communicable diseases. Subsequently, each list would go through a prioritization process involving the stakeholders. The list for the 20 communicable diseases and 20 non-communicable diseases are shown in Table 15.

**Table 15 Migrant Health Problems/Conditions for Prioritization**

| Communicable Diseases | |
|---|---|
| 1. Tuberculosis | 11. Measles |
| 2. Leprosy | 12. Scrub Typhus |
| 3. Filariasis | 13. Gonorrhea |
| 4. Syphilis | 14. Hepatitis B |
| 5. AIDS | 15. Malaria |
| 6. Pneumonia | 16. Dysentery |

| | |
|---|---|
| 7. Vaccination for immunizations | 17. Leptospirosis |
| 8. influenza | 18. Mumps |
| 9. Dengue fever/dengue hemorrhagic fever (D.H.F) | 19. Genital Herpes Simplex |
| 10. Hand, Foot, and Mouth disease | 20. Meningitis |
| **Non-Communicable Diseases** | |
| 1. Drug addiction | 11. Malignant neoplasm of the brain |
| 2. Chronic alcoholism | 12. Malignant neoplasm of the anus and anal canal |
| 3. Psychosis | 13. Head injuries |
| 4. Pregnancy | 14. Gastroenteritis |
| 5. Newborn disorders | 15. Fracture of arm and leg |
| 6. Malignant neoplasm of the breast | 16. Organ injuries |
| 7. Cervical/uterine cancer | 17. Hypertension |
| 8. Malignant neoplasm of the rectum | 18. Care involving dialysis |
| 9. Malignant neoplasm of the nasopharynx | 19. Diabetes |
| 10. Malignant neoplasm of the stomach | 20. Liver disease |

In addition to the health problems list identified in Table 15, participants suggested to include diarrhea in the communicable diseases list and combine gonorrhea with syphilis in the same list. For non-communicable diseases, the participants recommended using the terms "mental disorders" instead of "psychosis", "work injuries" instead of "organs injuries", and combining drug addiction with chronic alcoholism. The results of the first round of prioritization is shown in Table 16.

**Table 16 Selection of Top 10 Migrant health problems/conditions classified into communicable and non-communicable diseases**

| Communicable diseases | Non-communicable diseases |
|---|---|
| Tuberculosis | Pregnancy |
| HIV/ AIDs | Diabetes |
| Syphilis/Gonorrhea | Newborn disorders |
| Diarrhea | Hypertension |
| Vaccination for immunizations | Drug addiction/Chronic alcoholism |
| Dengue fever (DF)/ dengue hemorrhagic fever (DHF)/ dengue shock syndrome (DS) | Work injuries |
| Leprosy | Head injury |
| Filariasis | Mental disorders |
| Hepatitis B | Breast cancer |
| Malaria | Cervical/Uterine cancer |

In the second round of prioritization (1st ranking), the top 10 health problems/conditions identified from the first round were ranked –with one being the most important health problem and ten being the least important health problem (Table 17). The results showed that participants agreed with tuberculosis being the most significant migrant health problem, followed by HIV/AIDS, and vaccination for immunizations. For non-communicable diseases, pregnancy, newborn disorders, and diabetes were the top three significant health problems/conditions.

**Table 17 The 1st ranking of the top 10 migrant health problems/conditions classified into communicable and non-communicable diseases**

| Number | Communicable diseases | Number | Non-communicable diseases |
|---|---|---|---|
| 1 | Tuberculosis | 1 | Pregnancy |
| 2 | HIV/ AIDS | 2 | Newborn disorders |
| 3 | Vaccination for immunizations | 3 | Diabetes |
| 4 | Syphilis/Gonorrhea | 4 | Hypertension |
| 5* | Diarrhea | 5 | Drug addiction/Chronic alcoholism |
| 5* | Filariasis | 6 | Work injuries |
| 6 | Hepatitis B | 7 | Head injury |

| Number | Communicable diseases | Number | Non-communicable diseases |
|---|---|---|---|
| 7 | Dengue fever (DF)/ dengue hemorrhagic fever (DHF)/ dengue shock syndrome (DS) | 8 | Mental disorders |
| 8 | Malaria | 9 | Breast cancer |
| 9 | Leprosy | 10 | Cervical/Uterine cancer |

* Diarrhea and filariasis had identical scores.

In the third round (2nd ranking), the top 10 health problems/conditions were ranked again to confirm the result (Table 18). The top three communicable diseases were still tuberculosis, HIV/ AIDS, and vaccination for immunizations, while pregnancy, diabetes, and newborn disorders were the top three non-communicable diseases.

**Table 18 The 2nd ranking of top 10 migrant health problems/conditions classified into communicable and non-communicable diseases**

| Number | Communicable diseases | Number | Non-communicable diseases |
|---|---|---|---|
| 1 | Tuberculosis | 1 | Pregnancy |
| 2 | HIV/ AIDS | 2 | Diabetes |
| 3 | Vaccination for immunizations | 3 | Newborn disorders |
| 4 | Syphilis/Gonorrhea | 4 | Hypertension |
| 5 | Diarrhea | 5 | Drug addiction/Chronic alcoholism |
| 6* | Dengue fever (DF)/ dengue hemorrhagic fever (DHF)/ dengue shock syndrome (DS) | 6 | Work injuries |
| 6* | Filariasis | 7 | Head injury |
| 7 | Leprosy | 8 | Mental disorders |
| 8 | Hepatitis B | 9 | Breast cancer |
| 9 | Malaria | 10 | Cervical/Uterine cancer |

* Dengue and filariasis had identical scores.

As the result of the meeting, the participants agreed with the 20 selected migrant health problems. However, regarding the limited information on the effectiveness of screening and treatment of each health problem, the severity of the problems, and their budget impact, the

participants suggested the research team conduct additional literature review on those issues and re-prioritize the selected health problems.

### 3.3 Developments and revising the health screening package of migrants

3.3.1 Reviews of health screening interventions

Effective and/or cost-effective screening interventions for various migrant health conditions/problems were identified by reviewing the Thai clinical practice guidelines and the cost-effectiveness studies of screening interventions for the prioritized health conditions/problems in 3.2. The list of screening interventions is shown in Table 19, and details about the review of the clinical practice guidelines and cost-effectiveness studies are shown in Annex 2 and 3.

**Table 19 Summary of reviewing on screening interventions of selected diseases/conditions**

| Diseases | Screening interventions | Target groups | Cost |
|---|---|---|---|
| Communicable diseases | | | |
| Tuberculosis | Chest x-ray and questionnaire. Sputum testing is performed if abnormal chest x-ray consistent with TB and/or TB symptoms are found. | Migrant workers | • Chest x-ray (Mass Chest) (50 THB)<br>• Chest x-ray (Film Chest) (170 THB) |
| HIV/AIDS | 1. HIV antibody tests such as enzyme-linked immunosorbent assay (ELISA), simple/rapid tests, and Western blot tests<br>2. Virological tests such as HIV antigen tests, polymerase chain reactions (PCRs), and virus culture | Population aged 15-65 years | • HIV-Ab (screening) – RAPID (250 THB)<br>• HIV-Ab (screening) – GPA, ELISA, MEIA, ECLIA (140 THB)<br>• HIV-Ag (160 THB) |
| Syphilis | VDRL, RPR, TPHA, TPPA, FTA-ABS | High-risk populations such as all pregnant women, people donating blood/blood products or solid | • VDRL, RPR (50 THB)<br>• TPHA (100 THB)<br>• FTA-ABS (200 THB) |

| Diseases | Screening interventions | Target groups | Cost |
|---|---|---|---|
| | | organs, people having a sex partner who has syphilis, etc. | |
| Gonorrhea | Gram stain and Culture (to confirm the presence of Neisseria gonorrhoeae) | N/A | • Gram stain (65 THB) |
| Dengue fever | Tourniquet test and complete blood count (CBC) | Patients who suspect they may have Dengue fever | • * Tourniquet test (50 THB)<br>• CBC (90 THB) |
| Filariasis | Blood smear | N/A | • Blood smear (50 THB) |
| Leprosy | Medical history/skin examinations | N/A | • *Medical history and skin examinations (50 THB) |
| Hepatitis B/C | Hepatitis B: Screening via HBsAg and Anti-HBs<br>Hepatitis C: Screening via anti-HCV | N/A | • HBsAg (80-3,000 THB)<br>• Anti-HBs (100-180 THB)<br>• anti-HCV (200-300 THB) |
| Malaria | Malaria microscopy via thick film and thin film | Population suspected of having malaria | • Malarial film (50 THB) |
| Non-communicable diseases | | | |

| Diseases | Screening interventions | Target groups | Cost |
|---|---|---|---|
| Diabetes | Choose one of the following methods;<br>1. Fasting plasma glucose (FPG)<br>2. Fasting capillary blood glucose (FCBG)<br>3. Oral Glucose Tolerance Test (OGTT) | Patients with risk factors, e.g. aged 35 years and over, first-degree relative with diabetes, hypertension, etc. | • Glucose test (40 THB)<br>• OGTT (170 THB) |
| Hypertension | No screening interventions are defined but should be diagnosed via blood pressure measurement | N/A | *50 THB |
| Drug addiction | Urine test | General population | • Amphetamine (urine) (300 THB) |
| Chronic alcoholism | Screening questionnaire: ASSIST (Only for alcohol questions) or AUDIT | N/A | *50 THB |
| Mental disorders | Screening questionnaire for psychosis, depression, and suicide | N/A | *50 THB |
| Breast cancer | Breast self-examination or clinical breast examination | Women aged 20 years and above | *50 THB |
| Cervical cancer | Pap smear or VIA | Women aged 30-60 years, examined every | • Pap smear (50-100 THB)<br>• VIA (no information) |

| Diseases | Screening interventions | Target groups | Cost |
|---|---|---|---|
| | | 3-5 years or once sexual intercourse has occurred (VIA can be tested until 45 years of age) | |

Remarks: 1) Vaccination for immunizations, diarrhea, newborn disorders, work injuries, and head injury are health problems/conditions that are unable to be screened. 2) No information was found for pregnancy screening intervention (urine test 70 THB) 3) * refers to cost of services for medical history and physical examinations, assumed from outpatient care rate of 50 THB per day.

3.3.2 In depth interviews

The list of health screening for migrants depends on the purpose of the screening. Having conducted interviews with high-level official at the Ministry of Public Health, it was found that health screening for migrants was performed solely for administrative purposes, specifically for employment. Increasing the tests will only serve to provide awareness to migrants and cannot be used to deny them employment. Moreover, these health screening should also not be used to determine whether migrants will be eligible for the HICS.

Informants who were interviewed were of the opinion that other than the safety, effectiveness, and cost-effectiveness of screening interventions, the addition or subtraction of interventions into the list of health screening interventions for migrants should consider other factors such as:

- Cost for screening – providing additional screening tests will have an impact on the price; if costs for health tests increase, employers may not want to pay for their employee's health tests, and hence serves as an obstacle in accessing health evaluations for migrants. Therefore, one policy maker said that health screening for migrants may be entirely unnecessary and that all migrants should be covered by the HICS to increase their access to examinations and treatment.
- Workload of health officers who are already beyond capacity due to the large number of service utilizers.
- Impacts from health examinations, e.g. HIV testing may create stigmatization and discrimination.
- Operational feasibility.
- Acute diseases are unable to be diagnosed if symptoms are not present on the day of examination or examinations for substance abuse may not be accurate if substance users halt their usage prior to the health examination.

Moreover, informants suggested that health screening for non-communicable diseases is not necessary except for those stated in law as they incur additional costs and time, and are complex in terms of evaluation. Once a health disease is found, it must be treated and therefore results in additional costs. It may also result in problems with health staff's attitude as they may not be willing to conduct examinations due to work burden and additional treatment costs. In

addition, migrants typically reside or work in Thailand on a temporary basis. As such, the context for investing in migrant health screening services differs from the Thai population as it may not be considered as long-term prevention. Some informants suggested that non-communicable diseases should be screened for using budget for health promotion and disease prevention after entering the HICS; alternatively, some were open to conducting health assessments for tests which do not result in addition costs, e.g. hypertension and measuring waistline and weight, in order to provide general screening for migrants but not for disqualifying them from entering the HICS.

Many informants provided additional information about problems which occur during health screening of migrants, particularly in conducting assessments in a different manner from those defined in guidelines or not have clear guidelines for health staff to follow – resulting in lower quality health services. In addition, limitations in terms of quality of equipment used in health tests also compounded the problems faced, e.g. testing for tuberculosis via chest x-ray but not following up with a sputum test to confirm results, not prescribing diethylcarbamazine (DEC) prior to testing for filariasis, conducting VDRL or TPHA differently among health facilities for screening syphilis, and undergoing a VDRL for patients who have been successfully treated for syphilis even though the results may be a false positive. Disbursing HICS cards in various hospitals was also an issue as there were no standards, resulting in incidents such as a migrant with active tuberculosis being issued an HICS card and allowed to work by a physician even though his/her condition was severe enough to send the migrant back to his/her country of origin. Another problem faced was the poor quality in aggregating and storing health screening data of migrants. Moreover, informants also mentioned a system for hospital referrals/transfers and monitoring for migrants so that they may receive treatment in follow-ups after the initial tests. It might be difficult to enforce additional screenings or treatments due to communication issues and the ability to take leave of absence, which may be detrimental to migrant workers and their employers.

Table 21 provides details about expert opinions about migrant health screening of diseases/health conditions obtained from the prioritization process.

**Table 21 Experts' opinions on a list of the reviewed migrant health screening tests**

| Diseases | Screen or not | Reasons |
|---|---|---|
| Tuberculosis | √ | Communicable and easily spread |
| | ± | Chest x-ray (without sputum testing) is not effective. Considering effectiveness, sputum testing is recommended as it has more sensitivity than a chest x-ray but is less practical. However, if the law enforces screening, it should be screened as a precondition for acquiring work permits only, not a precondition to be insured by the HICS; migrants should be insured regardless of the results. |
| HIV/AIDS | X | HIV/AIDS screening may lead to stigmatization and discrimination. HIV/AIDS is difficult to transmit as the infection depends on sexual behavior. Therefore, it should not be screened as a precondition for acquiring work permits or being insured by the HICS, except for the purpose of access to treatment. |
| Syphilis | √ | Practical for screening and treatment. However, the same screening intervention should be provided in all hospitals. Currently, some hospitals perform VDRL and some perform TPHA. |
| | X | Not highly contagious. Also, prevalence in migrants may not be different from Thais as the disease is subject to individual health risk. The test should be done in high-risk populations, not only in migrants, and this may be done through a campaign. If screened, it should only be for the purpose of access to treatment. |
| Gonorrhea | √ | Practical for screening (by physical examination) and treatment. |
| | X | Not highly contagious and causes more workload if screening by gram stain. If screened, it should only be for the purpose of access to treatment. |

| Diseases | Screen or not | Reasons |
|---|---|---|
| Dengue fever | X | Acute disease, and also found in Thais. It causes more workload and is not practical to screen as patients with symptoms normally come to the hospital's OPD. |
| Filariasis | √ | Myanmar is still a filariasis-endemic country. It should be tested for treatment and prevention. However, healthcare providers may face difficulties as filariasis are more likely to be detected at night-time by blood test. Diethylcarbamazine (DEC) can be used as it does not cause high budget impact. |
| Leprosy | √ | Practical and no additional cost if screened by a physical examination However, if slit-skin smear is done, there would be an additional cost. Therefore, the MoPH should provide more information for physicians on what tests should be done. Moreover, it is important as it is not found in Thailand and Myanmar is still an endemic country. |
| Hepatitis B/C | X | Additional cost and a high workload. Not easily contagious and not a major public health problem. It is also difficult to follow-up for treatment. If screened, it should only be for the purpose of access to treatment. |
| | ± | May have additional benefit. The severity of disease transmission and cost of the test should be taken into consideration as cost can be a barrier of access to services. Hepatitis B screening is cost-effective. |
| Malaria | √ | Screen in migrants with fever and then give treatment. However, migrants may not have symptoms when they are tested. |
| | X | Acute disease, and not practical to screen as patients with symptoms normally come to a hospital's OPD. It may be appropriate to screen in only malaria-endemic provinces. |

| Diseases | Screen or not | Reasons |
|---|---|---|
| Pregnancy | √ | Test to determine whether they should receive certain medication or services that are specific to pregnant women but not as a precondition for being insured by the HICS. However, there is no need to check all migrants by urine test –migrants should be screened via questioning first. |
| | X | Additional cost and a high workload. There should be clear objectives for pregnancy test, and intervention after knowing the result. |
| Diabetes | √ | Screen depending on risk factors in order to obtain early treatment. Dextrostix (DTX) may be used because fasting blood sugar (FBS) may not be practical. If DTX is high, FBS is then performed. |
| | X | Additional cost and workload. It should be tested and treated after being insured under the HICS. |
| Hypertension | √ | Normally included in physical examination, and for early treatment. |
| | X | Should be tested and treated after being insured under the HICS. Patients with hypertension are able to work, so it should not be tested as a precondition for acquiring a work permit. |
| Drug addiction | √ | Screening according to the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551)[3]. Drug addiction is also screened in Thais. |
| | ± | Incurs additional costs and cannot solve the fundamental problem. However, it may be difficult to amend the laws. |

[3] Ministerial Regulation No. 14 (B.E. 2535) issued under the Immigration Act B.E. 2522 and Ministerial Regulation (B.E.2552) issued under the Alien Work Act B.E.2551 mentions that aliens with the following diseases are prohibited from residing in the Kingdom of Thailand and granted work permits, respectively: leprosy, tuberculosis in the dangerous stage, filariasis, drug addiction, chronic alcoholism, syphilis, and psychosis.

| Diseases | Screen or not | Reasons |
|---|---|---|
| Chronic alcoholism | √ | Screening according to the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551) and then provide advice for quitting. |
| | ± | Not practical but difficult to amend the laws. Patients with chronic alcoholism should not be granted work permits but should be insured and treated under the HICS. However, alcoholism is not included in the benefit package. |
| Mental disorders | √ | Screening (psychosis) according to the laws (Immigration Act B.E. 2522 and Alien Work Act B.E.2551). |
| | X | Psychosis is not easily screened compared to major depression. Should not be tested as a precondition for acquiring work permits or being insured because some patients with mental disorders are able to work. Criteria should be clearly set. |
| Breast cancer | √ | Screen depending on risk factors. It is not practical but can be screened on a voluntary basis. |
| | X | Not practical but should be screened and treated after being insured under the HICS. |
| Cervical cancer | √ | Screen depending on risk factors. It is not practical but can be screened on a voluntary basis. |
| | X | Not practical but should be screened and treated after being insured under the HICS. |

√ Should be screened X Should not be screened ±May or may not be screened

According to the results of the reviews and interviews, migrant health screening procedures may be divided into three lists as follows:

- The list of health screening tests required by laws (the present screening list). This list consists of tuberculosis, syphilis, filariasis, leprosy, pregnancy test, drug addiction, chronic alcoholism, and psychosis. Most experts agreed with this list, with the condition that some screening protocols/interventions should be monitored or revised in detail; for instance,

the screening results of tuberculosis should not be used as a precondition prohibiting affected patients from the insurance and its screening intervention should be monitored because screening by only a chest x-ray without confirmation from a sputum test is not effective. Screening for these diseases costs around 500-840 baht per person.

- The cost of 500 baht includes 1) chest x-ray (mass chest) (50 THB); 2) VDRL or RPR (50 THB); 3) blood smear for Filariasis (50 THB); 4) cost of services for medical history/physical examinations for leprosy, chronic alcoholism, psychosis (50 THB); and 5) urine test for drug addiction (300 THB). This does not include a cost of pregnancy test in case of men.
- The cost of 840 baht includes 1) chest x-ray (film chest) (170 THB); 2) FTA-ABS (200 THB); 3) blood smear for Filariasis (50 THB); 4) cost of services for medical history/ physical examinations for leprosy, chronic alcoholism, psychosis (50 THB); 5) urine test for drug addiction (300 THB); and 6) urine test for pregnancy (70 THB).

- The list of health screening tests which may not be necessary and should be removed from the present screening list if possible because it was considered not effective or not practical. These diseases include syphilis, pregnancy test (no need to be done by using urine test in all migrants), drug addiction, chronic alcoholism, and psychosis.
- The list of health screening tests that may be added to the present screening list because its tests can be included in general physical examinations with little to no additional costs, i.e. gonorrhea, hypertension, and major depression. Hepatitis B, malaria, and diabetes can be added to the list but would incur additional costs so testing might depend on migrants' risk factors or symptoms.

## 4. Conclusion and Discussion

This study was conducted with the aim of reviewing and developing recommendations for revising the health screening list for migrants in Thailand. The current situation of health migrant problems in Thailand was reviewed in addition to seeking appropriate health screening measures consistent with the problems faced. As a result of reviewing the situation and prioritizing health migrant problems/conditions, it was found that the highest-ranking communicable diseases were tuberculosis, HIV/AIDS, immunizations (VPDs), syphilis/gonorrhea, diarrhea, dengue fever, filariasis, leprosy, hepatitis, and malaria; the highest-ranking non-communicable diseases comprised pregnancy, diabetes, newborn disorders, hypertension, drug addiction/chronic alcoholism, work injury, head injury, mental disorders, breast cancer, and cervical cancer. Considering in terms of appropriateness of screening those health conditions/problems, it can be divided into three categories:

- Health conditions or problems that are required to be tested according to laws (current list) – comprising tuberculosis, syphilis, filariasis, leprosy, pregnancy test, drug addiction, chronic alcoholism, and psychosis. The cost for screening is approximately 500-840 baht per person.
- Health conditions or problems that may be removed from the current migrant health screening list – comprising syphilis, pregnancy test, drug addiction, chronic alcoholism, and psychosis.
- Health conditions or problems that may be added into the migrant health screening list – comprising gonorrhea, hypertension, and major depression. Hepatitis B, malaria, and diabetes can also be included but will incur additional screening expenses and may result in migrants being unable to access health screening due to cost issues. Therefore, screening for hepatitis B, malaria, and diabetes may be conducted for those deemed at high-risk or show symptoms.

Even though most experts believed that the current health screening list for migrants is already appropriate, some health conditions or problems still lack clear and concise detection measures. Therefore, the Ministry of Public Health should provide information about measures for health screening based on individual diseases in the announcement to provide more clarity, e.g. measures obtained from the reviews of this study may be used for leprosy, chronic alcoholism, and psychosis. Moreover, agencies responsible for migrant health screening should have measures or guidelines for

monitoring hospitals individually to increase compliance with the set operational guidelines, e.g. there should be monitoring for conducting a sputum test after a chest x-ray result is positive.

One benefit of current operational practices based on the current migrant screening list is that each hospital is already familiar with conducting health screenings for each disease. On the other hand, some drawbacks are that certain health conditions/problems may not be necessary for screening, e.g. syphilis, screening for diseases that are not the root cause, e.g. substance abuse/drug addiction, or poor-quality health screening measures, e.g. undergoing a chest x-ray without a follow-up sputum examination to confirm the results. Subsequently, resources and time are wasted, and costs for the HICS are also increased. Even though removing some items from the migrant screening list may help reduce costs of screening and healthcare providers' workload, this possibility is quite low given that legal amendments must be made, or the public may be unaccepting of the reduction.

For Thais, according to the Office of the Civil Service Commission's Regulations on Diseases B.E. 2553 (2010) (29), those entering civil service must not have any of the prohibited characteristics: being incompetent, quasi-incompetent, psychosis, active tuberculosis, obvious filariasis, drug addiction, chronic alcoholism, and severe communicable diseases that may pose obstacles in working. The health conditions/problems in this list are similar to the migrant health screening list. The list is used only for administrative purposes. Therefore, migrant health screening should only be conducted for the purpose of entering the workforce, and should not be used to approve or reject them from being a part of the HICS as these migrants should have the right to purchase health insurance regardless of their health examination results.

For health screening costs, if the current migrant health screening list is used and the cost for services are calculated according to the Comptroller General's Department, the cost per service is approximately 500-840 baht. The lowest cost of 500 baht is for men as it does not include screening for pregnancy. Therefore, the cost for screening may increase depending on the additional tests that they undertake, e.g. the cost of pregnancy screening would be added for women, or those at high risk or symptoms should add the cost of additional screening.

In addition, a database should be developed to effectively aggregate and store all health examination results data of migrants. This knowledge of migrant health conditions/problems would be beneficial in revising the migrant health screening list in the future, e.g. migrant health conditions or

problems that have been decreasing may no longer need to be screened for. Moreover, although the MoPH announcement has already mentioned about a follow-up or referral for further treatment after migrants are screened and categorized into Group 2, there should be a more rigorous system to manage it as well as a communication in order to create understanding and awareness with migrants and their employers.

To explore the effectiveness and cost-effectiveness of screening interventions, only guideline and cost-effectiveness studies in Thailand were reviewed because international guideline and literature may not be suitable for adoption in the Thai context. In addition, health screening reviews were conducted base on the general population and not only for migrants. Thus, this study utilized inputs from the in-depth interviews conducted with experts in this field and incorporated it with the results of the literature review. Therefore, the results of this study may be more comprehensive in covering other issues aside from effectiveness and cost-effectiveness. However, due to time constraints, only certain informants were interviewed such as policy-makers and academics. Nonetheless, concrete plans have been devised to further interview health staff, as well as to organize another expert meeting to confirm this study's results.

This study explored only a part of migrant health insurance. It focused only on health issues and did not covering the perspectives from other relevant sectors such as political feasibility. Therefore, it should be aware when using the result of this study. Finally, this study only looked at migrant health screening in the first year and did not account for the screening in other years as the considerations for screening in those years were different i.e. some diseases may be considered not necessary to be screened again within one year.

**Policy recommendations**

1. Migrants' health screening designed for the purpose of employment should not be required as a precondition for them to be insured by the HICS.
2. The Ministry of Public Health may consider revising the items in the health screening list based on this study's results as follows:
    - Health screening may be done on diseases as required by the laws (the current list). This list consists of tuberculosis, syphilis, filariasis, leprosy, pregnancy test, drug addiction, chronic alcoholism, and psychosis. Screening for these diseases range between 500-840

baht per person, depending on tests received. Therefore, the adjustment of the charge may be needed to reflect tests that migrants undertake.

- Health screening tests that are not effective or not practical should be removed from the current list. These include tests for syphilis, pregnancy test, drug addiction, chronic alcoholism, and psychosis.
- Other screening tests may be added to the current list since they will have little to no additional cost, that is, gonorrhea, hypertension, and major depression, to the current list. Hepatitis B, malaria, and diabetes screening can be added to the list but would incur an additional cost, so testing might depend on migrants' risk factors or symptoms.

In addition, the Ministry of Public Health should revise its announcement by clearly defining screening measures for each health problems/conditions based on this study's reviews.

3. The Division of Health Economics and Health Security, Ministry of Public Health, should develop a database to aggregate health screening data of migrants so it can be used to support the development of the health screening list for migrants in the future.
4. The Division of Health Economics and Health Security, Ministry of Public Health, should have a monitoring system for health screening operations at hospitals to ensure the quality of services.
5. Hospitals should collaborate in conducting health screening according to the guidelines announced by the Ministry of Public Health and report the health results for migrants to the Division of Health Economics and Health Security, Ministry of Public Health. Simultaneously, an effective approach should be done to follow-up migrants for further treatment if needed, after initial screening.

**Annex 1 Database analysis of medical reimbursement from the Division of Health Economics and Health Security in 2013-2015**

**Top 20 Migrant Health Problems/Conditions Treated in Outpatient Care and Reimbursed in 2013**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Neoplasm of uncertain or unknown behaviour of brain and central nervous system | D43 | 949,850 | 94,985 | 10 |
| 2 | HIV disease resulting in infectious and parasitic diseases | B20 | 908,723 | 2,894 ± 518 | 314 |
| 3 | Malignant neoplasm of breast | C50 | 892,486 | 2,215 ±2,528 | 403 |
| 4 | Malignant neoplasm of cervix uteri | C53 | 505,120 | 1,701 ±1,338 | 297 |
| 5 | Unspecified human immunodeficie virus (HIV) disease | B24 | 156,074 | 1,858 ±1,637 | 84 |
| 6 | Malignant neoplasm of bronchus and lung | C34 | 154,503 | 15,450 ±26,900 | 10 |
| 7 | Malignant neoplasm of liver and intrahepatic bile ducts | C22 | 117,769 | 2,617 ±1,821 | 45 |
| 8 | Malignant neoplasm of nasopharynx | C11 | 110,486 | 3,157 ±761 | 35 |
| 9 | Malignant neoplasm of base of tongue | C01 | 108,476 | 2,583 ±1,081 | 42 |
| 10 | Benign neoplasm of meninges | D32 | 100,770 | 3,876 ±634 | 26 |
| 11 | Malignant neoplasm of rectum | C20 | 77,063 | 2,569 ±598 | 30 |
| 12 | Malignant neoplasm of brain | C71 | 69,403 | 3,305 ±586 | 21 |
| 13 | Malignant neoplasm of pyriform sinus | C12 | 67,180 | 2,488 ±1,329 | 27 |
| 14 | Acute renal failure | N17 | 63,000 | 2,172 ±384 | 29 |
| 15 | Malignant neoplasm of accessory sinuses | C31 | 58,000 | 2,900 ±1,242 | 20 |
| 16 | Malignant neoplasm of floor of mouth | C04 | 43,900 | 1,372 ±748 | 32 |
| 17 | Malignant neoplasm of stomach | C16 | 39,009 | 1,147 ±689 | 34 |
| 18 | Lymphoid leukaemia | C91 | 37,269 | 1,962 ±678 | 19 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 19 | Malignant neoplasm without specification of site | C80 | 32,355 | 1,348 ±428 | 24 |
| 20 | Malignant neoplasm of colon | C18 | 28,560 | 28,560 | 1 |

**Top 20 Migrant Health Problems/Conditions Treated in Inpatient Care and Reimbursed in 2013**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Disorders related to short gestation and low birth weight, not elsewhere classified | P07 | 18,258,166 | 48,559 ±67,987 | 376 |
| 2 | Intracranial injury | S06 | 4,133,969 | 61,701 ±67,705 | 67 |
| 3 | Neonatal aspiration syndromes | P24 | 3,016,445 | 38,183 ±62,802 | 79 |
| 4 | Lymphoid leukaemia | C91 | 2,942,634 | 42,647 ±36,416 | 69 |
| 5 | Liveborn infants according to place of birth | Z38 | 2,563,809 | 7,410 ±23,185 | 346 |
| 6 | Injury of intra-abdominal organs | S36 | 2,349,193 | 51,069 ±38,523 | 46 |
| 7 | Neonatal jaundice from other and unspecified causes | P59 | 2,200,742 | 4,091 ±9,331 | 538 |
| 8 | Birth asphyxia | P21 | 2,195,762 | 32,291 ±48,929 | 68 |
| 9 | Respiratory distress of newborn | P22 | 2,141,383 | 19,119 ±38,074 | 112 |
| 10 | Slow fetal growth and fetal malnutrition | P05 | 1,836,079 | 14,572 ±28,617 | 126 |
| 11 | Bacterial sepsis of newborn | P36 | 1,634,303 | 12,476 ±22,973 | 131 |
| 12 | Congenital malformations of cardiac septa | Q21 | 1,381,463 | 62,794 ±60,296 | 22 |
| 13 | Intracerebral haemorrhage | I61 | 1,362,487 | 113,541 ±75,703 | 12 |
| 14 | Malignant neoplasm of liver and intrahepatic bile ducts | C22 | 1,247,760 | 47,991 ±22,723 | 26 |
| 15 | Myeloid leukaemia | C92 | 1,211,159 | 67,287 ±30,662 | 18 |
| 16 | Fracture of skull and facial bones | S02 | 1,196,505 | 26,011 ±60,581 | 46 |
| 17 | Fracture of lower leg, including ankle | S82 | 1,195,102 | 7,564 ±18,873 | 158 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 18 | Fracture of lumbar spine and pelvis | S32 | 1,191,219 | 32,195 ±41,672 | 37 |
| 19 | Bacterial pneumonia, not elsewhere classified | J15 | 1,128,429 | 94,036 ±86,274 | 12 |
| 20 | Cholelithiasis | K80 | 1,071,444 | 71,430 ±24,614 | 15 |

**Top 20 Migrant Health Problems/Conditions Treated in Outpatient Care and Reimbursed in 2014**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Unspecified human immunodeficiency virus (HIV) disease | B24 | 2,364,255 | 841 ±1,344 | 2,811 |
| 2 | Malignant neoplasm of breast | C50 | 832,184 | 2,499 ±1,860 | 333 |
| 3 | HIV disease resulting in infectious and parasitic diseases | B20 | 814,695 | 2,007 ±1,289 | 406 |
| 4 | Malignant neoplasm of cervix uteri | C53 | 730,800 | 2,486 ±1,591 | 294 |
| 5 | Benign neoplasm of other and unspecified endocrine glands | D35 | 472,870 | 94,574 | 5 |
| 6 | Neoplasm of uncertain or unknown behaviour of brain and central nervous system | D43 | 283,722 | 94,574 | 3 |
| 7 | Malignant neoplasm of bronchus and lung | C34 | 272,118 | 3,239 ±1,918 | 84 |
| 8 | Asymptomatic human immunodeficiency virus [HIV] infection status | Z21 | 216,121 | 1,150 ±1,369 | 188 |
| 9 | HIV disease resulting in other conditions | B23 | 199,707 | 614 ±812 | 325 |
| 10 | Malignant neoplasm of nasopharynx | C11 | 148,051 | 3,084 ±1,070 | 48 |
| 11 | Malignant neoplasm of brain | C71 | 141,795 | 4,574 ±2,009 | 31 |
| 12 | Other specified types of T/NK-cell lymphoma | C86 | 85,140 | 3,870 ±435 | 22 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 13 | Need for immunization against combinations of infectious diseases | Z27 | 68,075 | 64 ±44 | 1,064 |
| 14 | Malignant neoplasm of oesophagus | C15 | 67,000 | 2,792 ±988 | 24 |
| 15 | Malignant neoplasm of other and unspecified parts of tongue | C02 | 59,672 | 1,865 ±1,383 | 32 |
| 16 | Lymphoid leukaemia | C91 | 55,605 | 2,528 ±554 | 22 |
| 17 | Malignant neoplasm of tonsil | C09 | 47,406 | 1,756 ±454 | 27 |
| 18 | Other special examinations and investigations of persons without complaint or report | Z01 | 46,650 | 707 ±1,746 | 66 |
| 19 | Persons encountering health services for other counselling and medical advice, not elsewhere classified | Z71 | 44,641 | 1,653 ±3,224 | 27 |
| 20 | Malignant neoplasm of corpus uteri | C54 | 41,300 | 1,796 ±1,632 | 23 |

**Top 20 Migrant Health Problems/Conditions Treated in Inpatient Care and Reimbursed in 2014**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Disorders related to short gestation and low birth weight, not elsewhere classified | P07 | 22,186,813 | 46,031 ±61,364 | 482 |
| 2 | Intracranial injury | S06 | 7,444,212 | 68,928 ±80,376 | 108 |
| 3 | Neonatal aspiration syndromes | P24 | 3,570,482 | 37,984 ±57,787 | 94 |
| 4 | Birth asphyxia | P21 | 2,614,668 | 36,826 ±58,752 | 71 |
| 5 | Liveborn infants according to place of birth | Z38 | 2,483,248 | 6,484 ±16,696 | 383 |
| 6 | Injury of intra-abdominal organs | S36 | 2,402,247 | 52,223 ±36,842 | 46 |
| 7 | Respiratory distress of newborn | P22 | 2,393,683 | 15,246 ±33,924 | 157 |
| 8 | Neonatal jaundice from other and unspecified causes | P59 | 2,330,938 | 3,274 ±2,630 | 712 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 9 | Congenital malformations of cardiac septa | Q21 | 2,300,453 | 76,682 ±79,207 | 30 |
| 10 | Intracerebral haemorrhage | I61 | 2,013,200 | 91,509 ±65,408 | 22 |
| 11 | Myeloid leukaemia | C92 | 1,967,284 | 78,691 ±38,620 | 25 |
| 12 | Bacterial sepsis of newborn | P36 | 1,947,442 | 12,096 ±24,504 | 161 |
| 13 | Cholelithiasis | K80 | 1,692,171 | 70,507 ±34,502 | 24 |
| 14 | Fracture of forearm | S52 | 1,602,490 | 12,422 ±57,740 | 129 |
| 15 | Lymphoid leukaemia | C91 | 1,523,065 | 30,461 ±28,930 | 50 |
| 16 | Congenital malformations of great arteries | Q25 | 1,473,259 | 92,079 ±56,617 | 16 |
| 17 | Congenital pneumonia | P23 | 1,357,905 | 22,632 ±43,702 | 60 |
| 18 | Slow fetal growth and fetal malnutrition | P05 | 1,348,250 | 10,873 ±25,688 | 124 |
| 19 | Fracture of lumbar spine and pelvis | S32 | 1,312,902 | 34,550 ±56,048 | 38 |
| 20 | Bacterial pneumonia, not elsewhere classified | J15 | 1,171,606 | 78,107 ±70,818 | 15 |

**Top 20 Migrant Health Problems/Conditions Treated in Outpatient Care and Reimbursed in 2015**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Unspecified human immunodeficiency virus (HIV) disease | B24 | 7,615,487 | 887 ±1,827 | 8,585 |
| 2 | Malignant neoplasm of breast | C50 | 995,104 | 2,944 ±4,148 | 338 |
| 3 | Malignant neoplasm of cervix uteri | C53 | 922,156 | 2,820 ±1,794 | 327 |
| 4 | HIV disease resulting in infectious and parasitic diseases | B20 | 613,117 | 912 ±1,452 | 672 |
| 5 | Malignant neoplasm of rectum | C20 | 571,097 | 5,145 ±30,023 | 111 |
| 6 | Malignant neoplasm of brain | C71 | 506,884 | 6,107 ±6,172 | 83 |
| 7 | HIV disease resulting in other conditions | B23 | 495,776 | 805 ±1,114 | 616 |
| 8 | Neoplasm of uncertain or unknown behaviour of brain and central nervous system | D43 | 378,296 | 94,574 | 4 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 9 | Asymptomatic human immunodeficiency virus [HIV] infection status | Z21 | 359,472 | 842 ±1,347 | 427 |
| 10 | Malignant neoplasm of colon | C18 | 358,510 | 21,089 ±76,466 | 17 |
| 11 | Persons encountering health services for other counselling and medical advice, not elsewhere classified | Z71 | 261,261 | 3,732 ±2,691 | 70 |
| 12 | Need for immunization against combinations of infectious diseases | Z27 | 249,424 | 68 ±64 | 3,660 |
| 13 | Malignant neoplasm of larynx | C32 | 243,040 | 9,722 ±7,576 | 25 |
| 14 | Need for immunization against certain single viral diseases | Z24 | 204,028 | 82 ±37 | 2,490 |
| 15 | Other special examinations and investigations of persons without complaint or report | Z01 | 200,110 | 463 ±850 | 432 |
| 16 | Other congenital malformations of circulatory system | Q28 | 192,000 | 64,000 ±55,426 | 3 |
| 17 | Malignant neoplasm of ovary | C56 | 129,914 | 7,642 ±2,876 | 17 |
| 18 | Malignant neoplasm of tonsil | C09 | 124,000 | 4,000 | 31 |
| 19 | Benign neoplasm of other and unspecified endocrine glands | D35 | 112,000 | 4,000 | 28 |
| 20 | Other malignant neoplasms of skin | C44 | 94,248 | 4,960 ±2,641 | 19 |

**Top 20 Migrant Health Problems/Conditions Treated in Inpatient Care and Reimbursed in 2015**

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 1 | Disorders related to short gestation and low birth weight, not elsewhere classified | P07 | 32,711,405 | 50,248 ±64,965 | 651 |
| 2 | Intracranial injury | S06 | 8,996,830 | 63,807 ±71,492 | 141 |
| 3 | Liveborn infants according to place of birth | Z38 | 6,209,941 | 3,260 ±5,407 | 1,905 |
| 4 | Birth asphyxia | P21 | 4,796,350 | 53,293 ±69,128 | 90 |

| No. | Health Problems/Conditions | ICD-10 | Total (THB) | Mean ± SD (THB) | No. of reimbursement |
|---|---|---|---|---|---|
| 5 | Fracture of lumbar spine and pelvis | S32 | 4,152,216 | 53,925 ±131,593 | 77 |
| 6 | Congenital malformations of cardiac septa | Q21 | 3,889,299 | 79,373 ±67,225 | 49 |
| 7 | Bacterial sepsis of newborn | P36 | 3,833,825 | 15,335 ±30,464 | 250 |
| 8 | Pneumonia, organism unspecified | J18 | 3,520,147 | 19,236 ±35,658 | 183 |
| 9 | Neonatal jaundice from other and unspecified causes | P59 | 3,455,641 | 3,566 ±8,927 | 969 |
| 10 | Bacterial pneumonia, not elsewhere classified | J15 | 3,416,784 | 42,710 ±72,996 | 80 |
| 11 | Neonatal aspiration syndromes | P24 | 3,351,688 | 30,749 ±52,473 | 109 |
| 12 | Fracture of femur | S72 | 3,159,162 | 15,411 ±32,465 | 205 |
| 13 | Congenital pneumonia | P23 | 2,970,883 | 33,010 ±55,541 | 90 |
| 14 | Intracerebral haemorrhage | I61 | 2,775,154 | 95,695 ±80,023 | 29 |
| 15 | Injury of intra-abdominal organs | S36 | 2,700,460 | 61,374 ±35,021 | 44 |
| 16 | Myeloid leukaemia | C92 | 2,455,546 | 70,158 ±40,164 | 35 |
| 17 | Fracture of skull and facial bones | S02 | 2,427,826 | 17,721 ±30,347 | 137 |
| 18 | Respiratory distress of newborn | P22 | 2,379,639 | 13,998 ±27,780 | 170 |
| 19 | Congenital malformations of great arteries | Q25 | 2,360,656 | 124,245 ±128,617 | 19 |
| 20 | Fracture of lower leg, including ankle | S82 | 2,079,956 | 9,454 ±21,831 | 220 |

**Annex 2 Results of Reviewing Clinical Practice Guidelines on Health Screening**

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| **Communicable diseases** | | | |
| **Tuberculosis** | | | |
| Bureau of Tuberculosis, Department of Disease Control | 2017 | Chest x-ray and screening by questionnaire in all migrant workers who want work permit. AFB smear is performed if abnormal chest x-ray consistent with TB and/or TB symptoms are found. | (30) |
| **HIV/AIDS** | | | |
| 1. Asia Regional Office of the U.S. Agency for International Development (USAID)<br>2. Unicef<br>3. WHO | 2009 | 1. **HIV antibody tests** (e.g. Enzyme-linked Immunosorbent Assay (ELISA), simple/rapid test using saliva or urine, and an analysis of protein bands known as Western blot technique): Screen for HIV with informed consent. If the blood test shows positive, regardless of types of the initial test, other test should be performed to confirm the result. It should be aware that HIV antibody cannot be detected during acute HIV infection period.<br>2. **Virological tests** (e.g. HIV antigen test, Polymerase chain reaction (PCR) and viral culture) | (31) |
| 1. Department of Disease Control<br>2. Thai AIDS Society<br>3. Thai Network of People Living with HIV/AIDS | 2017 | 1. **HIV viral testing** is a test for viruses or parts of the viruses, e.g. p24 antigen test and NAT technique (nucleic acid amplification testing). These tests are useful when antibody cannot be founded, e.g. children aged less than 24 months who receive transmission of antibodies from mothers, or individuals who have a sexually transmitted infection from persons with positive HIV within a month. However, HIV antibody test should be proceeded whether the result is positive or negative.<br>2. **HIV antibody testing** (e.g. Enzyme-linked immunosorbent assay (ELISA), agglutination assay, immunochromatography, and dot immunoassay) | (32) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| **Syphilis** | | | |
| Department of Disease Control, Ministry of Public Health | 2015 | Syphilis serologic screening tests include:<br>1. Nontreponemal test or non-specific treponemal test are designed to detect reagin antibody that is non-specific for syphilis. These cover<br>• VDRL (Venereal Diseases Research Laboratory)<br>• RPR (Rapid Plasma Reagins)<br>2. Treponemal test or specific treponemal test are tools to specifically detect antibody to syphilis, which are<br>• TPHA (Treponema Pallidum hemagglutination assay)<br>• TPPA (Treponema Pallidum particle agglutination test)<br>• FTA-ABS (Fluorescent Treponemal Antibody Absorption Test) | (33) |
| **Gonorrhea** | | | |
| Department of Disease Control, Ministry of Public Health | 2015 | No screening interventions for Gonorrhea, only examinations to confirm infections.<br>Examinations consist of 2 types:<br>1. Laboratory diagnosis using a Gram stain to determine whether it is gram-negative intracellular diplococci<br>2. An examination using culture to confirm the presence of Neisseria gonorrhoeae | (33) |
| **Dengue fever** | | | |
| Queen Sirikit National Institute of Child Health | 2013 | Perform tourniquet test to diagnose the early stage of dengue. This test should conduct in all patients who suspect they may have dengue fever. A complete blood count (CBC) can be done along with tourniquet test.<br>The tests for confirming dengue infection include viral isolation, NS1 Antigen, Neutralization test, etc. | (34) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| Bureau of Vector Borne Diseases, Department of Disease Control, Ministry of Public Health | 2015 | Diagnosis of probable DF case can be done by tourniquet test, blood smear, and finding evidence of plasma leakage.<br>Laboratory diagnosis for confirmed DF case can be done by:<br>1. Direct diagnostic method; viral isolation, genome detection, and antigen detection<br>2. Indirect diagnostic method is serology detection. These include Hemagglutination inhibition assay, Enzyme immunosorbant assay (EIA, ELISA), and rapid test | (35) |
| **Filariasis** | | | |
| Lymphatic Filariasis Research Unit, Department of Parasitology, Faculty of Medicine, Chulalongkorn University | 2005 | Testing for microfilaria by blood smear. However, for asymptomatic amicrofilaremics patients, ultrasonography or antigen test are used to examine abnormalities. | (36) |
| **Leprosy** | | | |
| Rajprachasamai Institute | 2013 | Medical history/skin examinations via these 3 questions:<br>1. Do you have lesions or numbness?<br>2. Do you have chronic rashes or bumps?<br>3. Have you been diagnosed with a skin disease and have taken medication for over 3 months with no improvement?<br>If yes to any question, conduct a medical history and physical examination for leprosy. | (37) |
| **Hepatitis B** | | | |
| Thai Association for the Study of the Liver | 2015 | Assessment of patients whose HBsAg serum test's result is positive: | (38) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| | | 1. Blood tests to determine the stage of the disease, which covers HBeAg, HBeAb and HBV DNA<br>2. Measure the level of alanine aminotransferase (ALT) at least every 3-6 months to monitor liver's functioning<br>3. Assess the stage of hepatitis B, using diagnostic radiology and/or other techniques such as ultrasound or transient elastography in order to measure liver stiffness | |
| The Royal College of Physicians of Thailand (RCPT) | 2009 | Assessment of patients whose HBsAg result is positive:<br>1. Perform blood test to assess status of HBeAg and HBeAb<br>2. Perform ALT serum test – if the result is normal, healthcare providers should continue monitoring the level of serum ALT every 3-6 months.<br>3. If HBeAg is negative – but the patient's serum ALT level is abnormal or population who are at-risk of liver disease (e.g. men aged more than 40 years with a family history of cirrhosis and liver cancer, have chronic liver stigmata, those whose ALT level is more than half of the normal range, and persons whose ultrasound reveals abnormalities in the liver) – the serum HBV DNA is required to examination. | (39) |
| **Hepatitis C** | | | |
| Thai Association for the Study of the Liver | 2015 | In patients whose anti-HCV result is positive, HCV RNA in the blood should be measured to confirm hepatitis C virus infection. | (38) |
| The Royal College of Physicians of Thailand (RCPT) | 2009 | Patients suspected to have acute or chronic HCV infection should be tested anti-HCV and HCV-RNA viral load. HCV RNA should be performed when 1) anti-HCV result is positive; 2) patients are tended to be treated; or 3) it cannot be explained the reason of hepatitis and the result of anti-HCV is negative (especially in patients with chronic renal failure, HIV, or received immunosuppressive drugs). | (39) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| **Malaria** | | | |
| Department of Disease Control, Ministry of Public Health | 2015 | Diagnose all suspected individuals, using the following methods:<br>1. Microscopic examination of blood film (Thick and thin film) is the standard procedure for diagnosing malaria.<br>2. Rapid Diagnostic Test is recommended for malaria posts, border malaria posts, and sub-district hospitals, where microscopic examination is not available.<br>3. Molecular biological tests such as PCR, to diagnose and confirm types of malaria. This test should only be conducted if the facility is well-equipped. | (40) |
| **Non-communicable Diseases** | | | |
| **Diabetes** | | | |
| 1. Diabetes Association of Thailand under The Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn<br>2. The endocrine society of Thailand<br>3. Department of Medical Services<br>4. National Health Security Office | 2017 | Screening diabetes in adults is recommended for only those with high risk, e.g. aged 35 years old and over, first-degree relative with diabetes, hypertension, etc. Diabetes risk assessment test recommended by WHO can also be used and only persons whose score is 6 and over are required diabetes screening.<br>Choose one of the following methods for diabetes screening;<br>1. Fasting plasma glucose (FPG)<br>2. Fasting capillary blood glucose (FCBG)<br>3. Oral Glucose Tolerance Test (OGTT)<br>A1C measurement is not recommended for screening diabetes in Thai people because of the high cost. Additionally, there are few laboratories that meet the standard. | (41) |
| **Hypertension** | | | |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| Thai Hypertension Society | 2015 | No screening interventions are defined but should be diagnosed by using mercury sphygmomanometer and automatic blood pressure measurement device.<br>Hypertension –the systolic blood pressure (SBP) is higher or equal to 140 mm. Hg, and/or the diastolic blood pressure (DBP) is higher or equal to 90 mm. Hg. | (42) |
| **Drug addiction** | | | |
| Health Administration Division | 2017 | Urine test for drug addiction under the Narcotics Addict Rehabilitation Act, B.E 2545 (2002):<br>1. 1st urine test: kit test by police officers.<br>2. 2nd urine test: tested by laboratory staff/delegates in government hospitals; this can be used as evidence to prove that a person is considered a drug user/drug addict under the Narcotics Addict Rehabilitation Act, B.E 2545 (2002).<br>3. 3th urine test: confirming test via thin layer chromatography (TLC) by laboratory staff in government agencies. It is performed in some cases. | (43) |
| **Chronic alcoholism** | | | |
| Princess Mother National Institute on Drug Abuse Treatment (PMNIDAT) | 2015 | Using a screening questionnaire; Alcohol Use Disorder Identification Test (AUDIT) or CAGE. | (44) |
| **Mental disorders** | | | |
| Department of Mental Health | 2002 | Psychotic screening test containing 2 parts:<br>**Part 1 Data obtained by interviewing relatives or closed connections of the patient**<br>1. Speaking muddle<br>2. Dressing inappropriately<br>3. Aggressive behavior as well as harming others | (45) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| | | 4. Social isolation<br>5. Distrusting irrationally<br>6. Belief of having special talent compared to normal people<br>7. Hallucinations and delusions<br>8. Unusual and uncharacteristic behavior<br>**Part 2 Data acquired by interviewing the patient**<br>1. Distrusting irrationally<br>2. Belief of having special talent compared to normal people<br>3. Hallucinations and delusions<br>If the total scores show that the individual has more than one symptom, please refer the nearest hospital for diagnostic a mental disorder at the early stage. | |
| Department of Mental Health | 2014 | Using a depression and a suicide risk assessment questionnaire (2Q 9Q 8Q) | (46) |
| **Breast Cancer** | | | |
| National Cancer Institute | 2012 | There are 3 suggestions for screening breast cancer including self-examination, clinical examination, and mammography.<br>1. Mass screening<br>• Women aged 20 years and above should begin self-examining their breasts once a month. They should be informed about the benefits and limitations for breast self-exam, in addition to be taught how to accurately perform the examination. If there is a suspicious sign, they should again visit a doctor, or a trained medical staff examination.<br>• Women aged 40-69 years without symptom or suspicious sign of routine self-examination breast cancer, should undergo a clinical examination every year. | (47) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| | | • Women aged 70 years and above. The health professional should be aware of the advantage and risk of using mammography screening in these women.<br>2. Voluntary screening<br>• Women aged 20 years and above should start self-examining their breasts once a month. Moreover, they should take clinical examination at least every 3 years.<br>• Women aged 40-69 years should conduct regular self-exam as well as have clinical examination every year. Furthermore, they should take mammography every 1-2 years.<br>*Note: Breast self-examination is appropriate practice in Thai context.* | |
| Royal College of Surgeons of Thailand | 2008 | Mammography is recommended for women aged 40 years and above every two years. However, mammography can be done in women aged 35 years and above in case that they are found breast mass.<br>There is no expense for breast self-examination, so it is recommended for all women aged 30 years and above to check their breasts regularly; even though this intervention has low sensitivity. | (48) |
| **Cervical Cancer** | | | |
| National Cancer Institute | 2013 | 1. Cytological techniques; Papanicolaou (Pap) smear, and liquid-based cytology. These methods are standard tests for screening cervical cancer.<br>2. There are 2 types of HPV DNA test;<br>• HPV DNA testing is a screening for cervical cancer. It should be performed along with cytological screening test for women aged 30 years and above.<br>• HPV DNA genotyping is an additional examination, following the HPV DNA testing and cytological techniques for women aged 30 years and above. HPV | (49) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| | | DNA genotyping is conducted if the cytological test is normal, but the HPV test is positive.<br>3. Visual inspection with acetic acid (VIA) and cryotherapy | |
| Bureau of Medical Technical and Academic Affairs, Department of Medical Services, Ministry of Public Health | 2004 | Based on the study conducted by WHO in 1992, they found that using pap smear is a useful practice for screening cervical cancer in female population aged between 35-60 years old by undergoing pap smear test every 5 years (with the coverage 50 percent). It can reduce the incidence of the cervical cancer approximately 44 percent. Therefore, pap smear has been confirmed that it can decrease the incidence and mortality rate of cervical cancer, widely used, and is a low-cost method. | (50) |
| The Royal Thai College of Obstetricians and Gynaecologists | 2012 | 1. Cytological techniques (i.e. pap smear or liquid-based cytology) should be performed every 2 years in women 25 years of age who have had sexual intercourse before, and women 30 years of age who have never had sexual experience. For those who 65 years and above, if the results are normal for three consecutive times, they are no longer required screening.<br>2. For women aged 30 years and up, they should start taking HPV DNA test coupled with cytological examination every 3 years. They can stop taking this examination when they are older than 65 years old and their test results are normal for three consecutive times.<br>3. VIA and cryotherapy are used for women between 30-45 years old. These methods should be taken every 5 years. VIA is appropriate in the case when screening by ways of cytology does not offer effective treatment and/or the coverage is lower than target. If they are older than 45 years, doctors must screen patients using cytological techniques. | (51) |

| Organizations | Year | Guidelines for health screening | Reference |
|---|---|---|---|
| Department of Health, Ministry of Public Health | 2015 | Every woman should undergo a screening test for cervical cancer at least once. This test is the most advantageous for women aged between 30-60 years old. However, females younger than 30 can benefit from it as well if there is evidence that they are at high risk of cervical intraepithelial neoplasia (CIN2+).<br>Methods of screening cervical cancer are as following:<br>1. Cytological techniques can be used with every female within the target population for the purpose of screening.<br>2. HPV testing is appropriate for women who are more than 30 years old.<br>3. VIA is appropriate for the patients are under 45 years old.<br>If the result of VIA or cytological test is negative, patients should repeat screening test again for 3-5 years. If HPV result is negative, patients should receive screening test again for the next 5 years at least. | (52) |

**Note: Unable to find clinical practice guideline on pregnancy screening.**

**Annex 3 Results of Literature Review on Cost-effectiveness of Health Screening**

| Title | Study design | Participants | Interventions | Comparator | Conclusion | Reference |
|---|---|---|---|---|---|---|
| **Communicable diseases** | | | | | | |
| **HIV/AIDS** | | | | | | |
| Identifying information regarding effectiveness and cost-effectiveness of policy and strategies reorientation to mitigate the impact of HIV/AIDS in Thailand | Literature review | Adults aged 15-65 years | Routine (provider initiated) Voluntary HIV Screening at Healthcare settings | No screening | Routine provider offering of HIV screening significantly increased the acceptance rate of HIV testing and the number of HIV infection detected compared to the standard practice of patient-initiated HIV testing (5.59% VS 0.32%) and (23 vs 10 HIV detection within 2 months in 8/8 case and control community hospitals), respectively. | (53) |
| **Hepatitis B** | | | | | | |
| Cost-utility Analysis of Screening for Hepatitis B viral infection in Thailand | Cost-utility analysis | Adults aged 21 years and above | 1. HBsAg<br>2. HBsAg and Anti-HBs and vaccination | No screening | Screening via HBsAg and Anti-HBs coupling with vaccination, and screening via HBsAg only, are cost-effective compared to no screening test in all age groups. | (54) |
| **Malaria** | | | | | | |
| A comparison of cost-effectiveness between dipstick and thick blood | NA | 9,114 | Dipstick and thick blood film | NA | Malarial active surveillance by using thick blood film is effective and has lower cost-effective – ACER equals to | (55) |

| Title | Study design | Participants | Interventions | Comparator | Conclusion | Reference |
|---|---|---|---|---|---|---|
| film for malarial active surveillance | | | | | 816.89 THB. Meanwhile, dipstick has ACER 1,475.92 THB. | |
| **Non-communicable diseases** | | | | | | |
| **Diabetes** | | | | | | |
| Cost and Effectiveness of Screening Methods for Abnormal Fasting Plasma Glucose among Thai Adults Participating in the Annual Health Check-Up at King Chulalongkorn Memorial Hospital | Cost-effectiveness analysis | Individuals between 35 and 60 years of age with no known diabetes or pre-diabetes | Four screening questionnaires | Fasting plasma glucose (FPG) | The total costs of screening per one newly detected case were 59.12 to 69.62 US dollars (2,022 to 2,381 THB). Compared to the universal FPG test, all screening methods using questionnaires were relatively more cost-effective. Their relative cost-effectiveness was, however, not obviously different. | (56) |
| **Chronic alcoholism** | | | | | | |
| Evaluation of cost-effectiveness of AUDIT-or ASSIST-linked brief intervention in Thailand | Cost-effectiveness analysis | Thai populations aged 15-59 years old | 1. Screening by AUDIT<br>2. Screening by ASSIST | No screening | Alcohol screening, followed by a brief intervention, was cost-saving as the screenings have lower cost and more effective than no screening. In addition, screening in younger population conduced to the greater cost-effective than screening in an older population. | (57) |
| **Breast Cancer** | | | | | | |

| Title | Study design | Participants | Interventions | Comparator | Conclusion | Reference |
|---|---|---|---|---|---|---|
| Cost-utility of Once-in-a-lifetime Breast Cancer Screening with Mammography in Thai women | Cost-utility analysis | Thai women aged between 40-49 and 50-59 years old | Breast cancer screening using a mammogram for once-in-a-lifetime | Opportunistic screening at the rate of 5% | Mammography is not cost-effective in Thai context. | (58) |
| **Cervical Cancer** | | | | | | |
| Economic Evaluation of Policy Options for Prevention and Control of Cervical Cancer in Thailand | Cost-utility analysis | Started age of 30–40 years and repeated at 5- and 10-year intervals. HPV vaccines were introduced at age 15–60 years. | 1. Pap smears<br>2. VIA<br>3. HPV-16, -18 vaccinations | No intervention, treatment only | Pap smears, VIA and the combination of VIA plus sequential Pap smears are cost-saving. The most cost-effective strategy was the combination of VIA and sequential Pap smear (i.e. VIA every 5 years for women aged 30–45 years, followed by Pap smear every 5 years for women aged 50–60 years) compared with doing nothing.<br>HPV vaccine is not cost-effective compared with Pap-smear. | (59) |
| Cervical Cancer Screening in Thailand: A Model-Based Economic Evaluation | Cost-utility analysis | Women under 30 years of age and adjust screening interval from every 5 years | Screening practice starting with younger women between 15-20 years old and/or testing | current 5-yearly screening practice for all women aged 30-60 years | The current practice is cost-effective. A 3-yearly screening for women aged 30-60 years has ICER -73,300 baht per QALY gained, but more cytologists and pathologists are needed. Therefore, strengthening the current program by increasing the number of women to reach | (60) |

| Title | Study design | Participants | Interventions | Comparator | Conclusion | Reference |
|---|---|---|---|---|---|---|
| | | to 3 years and 1 year | every 1 year and 3 years. | | the targeted coverage is the most cost-effective and pragmatic option. | |
| Economic evaluation of the Screening of Cervical Cancer through HPV DNA in Thailand | Cost-utility analysis | Women 11 years of age and over without sexual experience | 1. Liquid cytology (LC)<br>2. Co-testing of HPV DNA and LC<br>3. Begin with HPV DNA test–If the result is negative, proceed with co-testing.<br>4. Begin with Conventional Cytology–If the result is negative, continue with HPV DNA | Conventional cytology for women between 30-60 years old, which is carried out every 5 years at the screening rate of 80% | Co-testing of HPV DNA and LC every 3 years on women (30-60 years old) is cost-effective. It further decreases the incidence of cervical cancer. The cost of testing should be negotiated to 150 baht/test, so the budget burden will be equal to the current amount. | (61) |

**Note**: Based on our literature review, the researchers were unable to find cost-effectiveness study regarding tuberculosis, syphilis, gonorrhea, dengue fever, filariasis, leprosy, hepatitis C, pregnancy, hypertension, drug addiction, and mental disorders.

## Reference


1. Foreign Workers Administration Office, Department of Employment, Ministry of Labour. The situation of migrant workers in December 2014. [cited 2017 September 3]. Available from: https://www.doe.go.th/prd/assets/upload/files/alien_th/2a1c819568ce5898f0ab81919c8e088d.pdf. (in Thai)

2. Srithamrongsawat S, Wisessang R, Ratjaroenkhajorn S. Financing healthcare for migrants: a case study from Thailand. Bangkok: International Organization for Migration; 2009.

3. Buadang K. Health of migrant workers and access to public health services. Journal of Social Sciences. 2008;20(1):146-72.

4. Tangcharoensathien V, Thwin AA, Patcharanarumol W. Implementing health insurance for migrants, Thailand. Bulletin of the World Health Organization. 2017;95:146-51.

5. Suphanchaimat R, Putthasri W, Prakongsai P, Tangcharoensathien V. Evolution and complexity of government policies to protect the health of undocumented/illegal migrants in Thailand – the unsolved challenges. Risk Management and Healthcare Policy. 2017;10:49-62.

6. Ministry of Public Health. Notification of Ministry of Public Health on Guidelines for conducting health check-up and health insurance for migrants, 2015. 31 March 2015. (in Thai)

7. Khotmanee S. Health insurance for migrant workers 2016. [cited 2017 August 25]. Available from: https://www.hfocus.org/content/2016/09/9879. (in Thai)

8. Ministry of Public Health. Measurement and Guidelines for conducting health check-up and health insurance for migrants. 2005 [cited 2017 July 26]. Available from: http://drug.pharmacy.psu.ac.th/wbfile/77254812094.htm. (in Thai)

9. Foreign Workers Administration Office, Department of Employment, Ministry of Labour. Royal enactment of manegment for work of migrants worker 2017. [cited 2017 January 15]. Available from:https://www.doe.go.th/prd/assets/upload/files/alien_th/051aa1e74663946c6ab17c6c391805df.pdf . (in Thai)

10. Ministry of Social Development and Human Security. The situation of migrants working in Thailand. [cited 2017 January 6]. Available from: https://www.m-society.go.th/article_attach/9878/14286.pdf. (in Thai)

11. Foreign Workers Administration Office, Department of Employment, Ministry of Labour. The situation of migrant workers in December 2015. [cited 2017 September 3]. Available from: https://www.doe.go.th/prd/assets/upload/files/alien_th/d77d8cf38f414d07f5ef9b9c8bac764d.pdf. (in Thai)

12. Foreign Workers Administration Office, Department of Employment, Ministry of Labour. The situation of migrant workers in December 2016. [cited 2017 September 3]. Available from: https://www.doe.go.th/prd/assets/upload/files/alien_th/7ea8ffbc45d5a8371ed412b3d55df658.pdf. (in Thai)

13. Foreign Workers Administration Office, Department of Employment, Ministry of Labour. The situation of migrant workers in August 2017. [cited 2017 September 3]. Available from: https://www.doe.go.th/prd/assets/upload/files/alien_th/9fb995b9ab99398d9d110e76e2aa4fe1.pdf. (in Thai)

14. Comptroller General's Department, Ministry of Finance. Health Benefit Guideline for the civil servant. 2012 [cited 2017 October 3]. Available from: https://home.kku.ac.th/praudit/law/07_medical_fee/22_Medical_guide_government%20officer_CGD_2553.pdf. (in Thai)

15. Social Security office. Rules and Benefits. 2015 [cited 2017 September 4]. Available from: http://www.sso.go.th/wpr/content.jsp?lang=th&cat=868&id=3628. (in Thai)

16. National Health Security Office. National Health Security Act 2002. [cited 2017 September 4]. Available from: https://www.nhso.go.th/FrontEnd/index.aspx. (in Thai)

17. Suphanchaimat R. "Health Insurance Card Scheme" for cross-border migrants in Thailand: Responses in policy implementation & outcome evaluation: University of London; 2016.

18. Ministry of Public Health. Notification of Ministry of Public Health on Guidelines for conducting health check-up and health insurance for migrants 14 March 2016. (in Thai)

19. Department of Home Affairs, Australian Government. Health examinations. [cited 2018 February 16]. Available from: https://www.homeaffairs.gov.au/Trav/Visa/Heal/meeting-the-health-requirement/health-examinations#.

20. Centers for Disease Control and Prevention. Medical Examination of Immigrants and Refugees 2017. [cited 2018 February 16]. Available from: https://www.cdc.gov/immigrantrefugeehealth/exams/medical-examination-faqs.html.

21. Centers for Disease Control and Prevention. Final Rule Removing HIV Infection from U.S. Immigration Screening 2010. [cited 2018 February 16]. Available from: https://www.cdc.gov/immigrantrefugeehealth/laws-regs/hiv-ban-removal/final-rule-technical-qa.html.

22. Ministry of manpower. Full Medical Examination Form For Foreign Workers 2015. Available from: http://www.mom.gov.sg/~/media/mom/documents/services-forms/passes/medical_form.pdf?la=en.

23. World Health Organization Regional Office for Europe. Migration and health: key issues. [cited 2018 February 15]. Available from: http://www.euro.who.int/en/health-topics/health-determinants/migration-and-health/migrant-health-in-the-european-region/migration-and-health-key-issues#292934.

24. Pottie K, Greenaway C, Feightner J, Welch V, Swinkels H, Rashid M, et al. Evidence-based clinical guidelines for immigrants and refugees. CMBJ. 2011;183(12):E824-E925.

25. Australasian Society for Infectious Diseases and Refugee Health Network of Australia. Recommendations for comprehensive post-arrival health assessment for people from refugee-like backgrounds. 2nd ed. New South Wales: Australasian Society for Infectious Diseases; 2016.

26. World Health Organization Regional Office for Europe. Global Health Estimates 2015: DALYs by Cause, Age, Sex, by Country and by Region, 2000-2015. Geneva. 2016.

27. Health Insurance Group, Ministry of Public Health. Provincial Report as of 1 April 2016 - 2 August 2016. [cited 2018 February 19]. Available from: http://fwf.cfo.in.th/report2. (in Thai)

28. Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health. National Disease Surveillance (Report 506). [cited 2017 November 6]. Available from: http://www.boe.moph.go.th/boedb/surdata/index.php. (in Thai)

29. Office of the Civil Service Commission. The Civil Service Commission's Regulations on Diseases 2010. [cited 2017 September 9]. Available from: http://www.ocsc.go.th/%E0%B8%81%E0%B8%8E%E0%B8%AB%E0%B8%A1%E0%B8%B2%E0%B8%A2/%E0% B8% 81% E0% B8% 8E- % E0% B8% 81% E0% B8% 9E-%E0%B8%A7%E0%B9%88%E0%B8%B2%E0%B8%94%E0%B9%89%E0%B8%A7%E0%B8%A2%E0%B9%82%E0%B8%A3%E0%B8%84-%E0%B8%9E%E0%B8%A8-2553. (in Thai)

30. Bureau of tuberculosis, Department of Disease Control, Ministry of public health. Systematic screening for active TB and drug-resistant TB. 2017. (in Thai)

31. Asia Regional Office of the U.S. Agency for International Development. HIV Counselling Handbook: A Comprehensive Guide to Voluntary Counselling and Testing, Provider-Initiated Testing and Counselling, and Care Counselling. Bangkok: The United States Agency for International Development Asia Regional; 2009. (in Thai)

32. Bureau of AIDS, TB, and STIs, Department of Disease Control, Ministry of Public Health. Thailand National Guidelines on HIV/AIDS Treatment and Prevention 2017 Bangkok: The Agricultural Co-operative Federation of Thailand publisher; 2017. (in Thai)

33. Bureau of AIDS, TB, and STIs, Department of Disease Control, Ministry of Public Health. The guidelines on sexual transmitted infections treatment 2015. Bangkok: The Graphic's letters and Design publisher. Co.Ltd; 2015. (in Thai)

34. Queen Sirikit National Institute of Child Health. The diagnosis and treatment guidelines on dengue special issue to honor the queen Sirikit 80 years of age. Bangkok: Department of Medical Services; 2016. (in Thai)

35. Bureau of Vector Borne Diseases, Department of Disease Control, Ministry of Public Health. The public health guidelines on dengue virus infection and dengue fever: The Graphic's letters and Design publisher. Co., Ltd; 2015. (in Thai)

36. Jaijakul S, Nuchprayoon S. Treatment of Lymphatic filariasis: An update. Chula Med J. 2005;49(7):401. (in Thai)

37. The Rajprachasamasai Institute, Department of Disease Control, Ministry of Public Health. The screening guidelines on leprosy. 2013. (in Thai)

38. Thai Association for the Study of the Liver. The national guideline for chronic Hepatitis B and Hepatitis C treatment. 2015. (in Thai)

39. The Royal College of Physicians of Thailand. The national guideline for chronic hepatitis C treatment. As. 2009. (in Thai)

40. Department of Disease Control, Ministry of Public Health. Guideline for the Treatment of Malaria in Thailand 2015. Nonthaburi. 2015. (in Thai)

41. Diabetes Association of Thailand under The Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn, Thai endocrine society of Thailand, Department of medical services, Ministry of Public Health, National Health Security Office. Clinical practice guideline for diabetes 2017. Pathum Thani: Romyen Media Company Limited; 2017. (in Thai)

42. Thai Hypertension Society. Thai Guidelines on The Treatment od Hypertension. 2015. [cited 2017 November 27]. Available from: http://www.thaihypertension.org/files/GL%20HT%202015.pdf. (in Thai)

43. Health administration division, Ministry of Public Health. Order of Operation for Rehabilitation and Narcotic Drugs. 2017. [cited 2018 January 5]. Available from: http://ncmc.moph.go.th/force_down.php?f_id=362. (in Thai)

44. Patarakorn A, tippayawong T, Renuwattananon A, Rattanasang P, Lakkanapichanachat W. Clinical practice guideline of alcohol withdrawal patient for multidisciplinary team. 2015. (in Thai)

45. Department of Mental Health, Ministry of Public Health. Psychotic screening test 2002. [cited 2017 September 4]. Available from: https://www.dmh.go.th/download/ebooks/psychotictest.pdf. (in Thai)

46. Department of Mental Health, Ministry of Public Health. Guidebook of Depressive Disorders Surveillance and Care : Provincial Level (Revised Edition III ; 2014). 2014. [cited 2017 December 20]. Available from: http://www.thaidepression.com/www/58/guidebookdepress.pdf. (in Thai)

47. National Cancer Institute, Department of Medical services, Ministry of Public Health. Guidelines for Screening, Diagnosis and Treatment of Breast Cancer for Thailand 2012. [cited 2017 November 5]. Available from: http://www.nci.go.th/th/cpg/download/12.pdf. (in Thai)

48. Royal College of Sugeons of Thailand. Breast Mass. 2008. [cited 2017 November 23]. Available from: http://www.rcst.or.th/view.php?group=8&id=206. (in Thai)

49. National Cancer Institute, Department of Medical services, Ministry of Public Health. Guideline for screening and treatment of cervical cancer. Bangkok. 2013. (in Thai)

50. Bureau of Academic Medicine, Department of Medical services, Ministry of Public Health. Clinical practice guideline of cervical cancer screening and treatment of women with cervical cytological abnormalities. Bangkok. 2004. (in Thai)

51. The Royal Thai College of Obstetricians and Gynaecologists. Practices guideline by The Royal Thai College of Obstetricians and Gynaecologists: cervical cancer screening. Bangkok. 2012. (in Thai)

52. Bureau of Reproductive Health, Department of Health, Mistry of Public Health. Comprehensive Cervical Cancer Control: A guide to essential practice. Nonthaburi. 2015. (in Thai)

53. Pattanaphesaj J, Teerawattananon Y, Leartpitakpong C, Sirisamutr T. Identifying information regarding effectiveness and cost-effectiveness of policy and strategies reorientation to mitigate the impact of HIV/AIDS in Thailand. Nonthaburi. 2008. (in Thai)

54. Tantai N, Werayingyong P, Leelahavarong P, Teerawattananon Y. Cost-utility analysis of screening for hepatitis B viral infection in Thailand. Health Systems Research Institute Journal. 2013;7(4):440-51. (in Thai)

55. Vimolket T, Dhanamun B, Muernrat Y. A compare of cost - effectiveness between dipstick and thick blood film for malarial active surveillance. Chula Med J. 2006;50(9):641-9. (in Thai)

56. Srichang N, Jiamjarasrangsi W, Aekplakorn W, Supakankunti S. Cost and effectiveness of Screening methods for Abnormal Fasting Plasma Glucose among Thai Adults Partcipating in the Annual Health Check-Up at Chulalongkorn Memorial Hospital. J Med Assoc Thai. 2011;94(7):833-41.

57. Chantarastapornchit V, Leelahavarong P, Teerawattananon Y. Evaluation of cost-effectiveness of AUDIT- or ASSIST- linked brief intervention in Thailand. Journal of health systems research. 2012;7:468-84. (in Thai)

58. Anothaisintawee T. Cost-utility of once-in-a-lifetime breast cancer screening with mammography in Thai women. Health Systems Research Institute Journal. 2013;7(3). (in Thai)

59. Praditsitthikorn N, Teerawattananon Y, Tantivess S, Limwattananon S, Riewpaiboon A, Chichareon S, et al. Economic evaluation of policy options for prevention and control of cervical cancer in Thailand. Pharmacoeconomics. 2011;29(9):781-806.

60. Praditsitthikorn N. Cervical Cancer Screening In Thailand: A Model-Based Economic Evaluation. Health Systems Research Institute Journal. 2013;7(3):389-99. (in Thai)

61. Yamabhai I, Praditsitthikorn N, Anothaisintawee T, Teerawattananon Y. Economic evaluation of the Screening of Cervical Cancer through HPV DNA in Thailand. Nonthaburi: Health Intervention and Technology Assessment Program; 2015. (in Thai)