INVESTIGATION INTO HEALTH DISPARITIES AMONG STATELESS CHILDREN IN TAK PROVINCE, THAILAND

PROLOY BARUA

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Doctor of Philosophy in (Health Systems Management (International Program)
- (Type 1.1))
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By PROLOY BARUA

has been approved by the Graduate School as partial fulfillment of the requirements for the Doctor of Philosophy in Health Systems Management (International Program) - (Type 1.1) of Naresuan University

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Title	INVESTIGATION INTO HEALTH DISPARITIES AMONG STATELESS CHILDREN IN TAK PROVINCE, THAILAND
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Academic Paper	Thesis Ph.D. in Health Systems Management (International Program) - (Type 1.1), Naresuan University, 2019
Keywords	Stateless children, Health insurance, Health service utilization, Health outcomes, Health inequalities

ABSTRACT

Statelessness is the worst possible form of violation of fundamental human rights which can lead to serious adverse health outcomes in children. Thailand is one of many countries where stateless people are concentrated. In Thailand, stateless people are defined as nationals without birth registration documents stating their Thai citizenship, even though they have been residing in the country for generations especially along the Thai-Myanmar border area including Tak Province. Previous research suggests that health service utilization is much lower in stateless people compared with their Thai counterparts due to the lack of formal access (accessibility) to government health facilities. Additionally, financial barriers (affordability) led to catastrophic health spending amongst the stateless. To address this issue, the Thai Cabinet introduced “Health Insurance for People with Citizenship Problem (HIPCP)” scheme in 2010 to increase health service utilization among the stateless population leading to improving health outcomes. However, despite the HIPCP policy in place since 2010, little is known about the policy on the magnitude of use of medical services amongst stateless children that may lead to better health outcomes.

The primary aim of this thesis is to investigate whether access to care improves the health outcomes of stateless children through adequate utilization of health services. Tak Province has been selected as the study site since it has the

largest proportion of stateless people compared to other provinces. The objectives of the study are threefold: (1) To summarize the policies for the provision of healthcare services for stateless populations in ASEAN countries; (2) To compare healthcare utilization of children by insurance status: UCS, HIPCP, and uninsured; (3) To compare the presence of cases with diseases, and death in children by insurance status: UCS, HIPCP, and uninsured.

Regarding methods of corresponding objectives, a scoping review was conducted for objective-1, while multivariate analysis was applied, using longitudinal health facilities-based data, for objective-2 and objective-3. Data were used from four selected border districts of Tak Province: Mae Ramat, Tha Song Yang, Phop Phra, and Umphang. The electronic medical records of children aged between 0-15 years were retrieved for those who visited health facilities between January 1, 2013 and December 31, 2017. Univariate and multivariate analysis were performed based on the types of outcome data.

The findings suggest that none of the ASEAN countries have explicit healthcare policies for stateless people except Thailand. The ratification of international human rights treaties relating to the right to health of people does not necessarily translate into the provision of healthcare policies for the stateless population.

Regarding service utilization, outpatient (OP) and inpatient (IP) use rates of the HIPCP were 25% lower (incidence rate ratio [IRR] = 0.75, 95% confidence interval [CI] = [0.68, 0.82], $p<0.001$) and 29% higher (IRR = 1.29, 95% CI = [1.23, 1.35], $p<0.001$), respectively as compared to the UCS. In addition, the HIPCP patients had 34% longer hospital lengths of stay (LOS) (IRR = 1.34, 95% CI = [1.27, 1.41], $p<0.001$) relative to the UCS patients. Regarding health outcomes, a multivariate analysis revealed that the HIPCP had 2.6 times greater odds of malaria (adjusted odds ratio [AOR] = 2.55, 95% CI = [1.60, 3.94], $p<0.001$), and 2.1 times greater odds of conjunctivitis (AOR = 2.11, 95% CI = [1.18, 4.18], $p = 0.016$) than the UCS. The study also suggested that the uninsured had 2.6 times greater odds of death (AOR = 2.60, 95% CI = [2.05, 3.25], $p<0.001$) than the UCS. On the other hand, the HIPCP was not associated with death (AOR = 0.63, 95% CI = [0.37, 1.00], $p = 0.070$) when

compared with the UCS.

In conclusion, the study demonstrates that the OP service utilization rate of stateless children insured with the HIPCP is significantly lower than their Thai counterparts with the UCS. Additionally, stateless children may be more likely to experience infectious diseases than Thai children. Besides, stateless children are more likely to use IP care and to stay longer at the hospital than their Thai counterparts. This worse off health of stateless children may draw immediate policy attention to overcome the inherent weakness of the HIPCP policy to be implemented. Additional research is needed to examine the causes and outcomes of these differences to shrink disparities in health outcomes.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my sincere gratitude to my advisor, Dr Kanida Narattharaksa, for the continuous support of my Ph.D. research. I would like to thank Professor Dr Nathorn Chaiyakunapruk for his continuous support, especially in developing this research proposal. His wonderful guidance groomed me for writing this thesis. I am ever indebted to him.

I would also like to thank Dr Rapeepong Suphanchaimat and Associate Professor Dr Mukdarut Bangpan for their insightful and invaluable comments and suggestions on my Ph.D. research study. My sincere thanks also go to Assistant Professor Dr Phudit Tejativaddhana for providing an opportunity to join the Ph.D. program in health systems management.

I am also thankful to Mr Sittipong Promham, Mr Suporn Kavinum, and Tak Provincial Public Health Office (PPHO) for their kind cooperation and help with data acquisition. My dissertation would not have been successfully completed without their timely contribution.

I also wish to thank Mr Supawat Yotnarin, and Mr Reggie Dalman Hinoguin for providing administrative and editorial support respectively. I am also grateful to Naresuan University and Naresuan University Graduate School for generous funding support for my Ph.D. research. I am also grateful to BRAC and BRAC International for giving me unique opportunity to realize my potential through pursuing a Ph.D.

Last but not the least, I would like to thank my family members: my mother, my sister, my brother in law, and particularly my wife (Ms. Gayatri Talukdar), who have stood by me all the time. This thesis would not have been possible without their encouragement and spiritual support that helped me to overcome difficult periods in my life abroad. Without them, I could not have traveled so far.

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CHAPTER I

INTRODUCTION

Statement of purpose

Statelessness is the worst possible form of violation of fundamental human rights which can lead to serious adverse health outcomes in children. Thailand is one of many countries where stateless people are concentrated. A stateless person is defined by Article 1 of the 1954 Convention relating to the Status of Stateless Persons as “a person is one who is not recognized as a national by any state under the operation of its law” [1, 2]. In Thailand, stateless people are defined as nationals without birth registration documents stating their Thai citizenship, even though they have been residing in the country for generations especially along the Thai-Myanmar border area.

Previous research suggests that health service utilization is much lower in stateless people compared with their Thai counterparts due to the lack of formal access (accessibility) to government health facilities. Additionally, financial barriers (affordability) led to catastrophic health spending amongst the stateless [3]. To address the Thai Cabinet introduced “Health Insurance for People with Citizenship Problem (HIPCP)” scheme in 2010 to increase health service utilization among the stateless population without catastrophic spending [4, 5].

While the expansion of public health insurance seeks to attain increasing access to healthcare services and improving health outcomes, the extent to which these desirable goals are met in a real-world policy context remains an empirical question of increasing research and policy interest in recent years [6, 7]. As such, the overarching aim of this thesis is to evaluate whether formal access to care improves the health outcomes in stateless children through adequate utilization of health services at public health facilities in Thailand. Tak Province has been selected as the study site since it has the largest proportion of stateless people compared to other provinces.

Research questions

The main research questions of this study are as follows:

1. What are the national health policies for stateless populations in ASEAN countries?
2. What is the impact of the stateless health insurance on healthcare service utilization among stateless children?
3. Do the health outcomes of children differ by health insurance status?

Research objectives

With the research questions above, the following are the corresponding objectives:

1. To summarize the health policies for the stateless populations in ASEAN countries
2. To compare healthcare service utilization of children by insurance status: UCS, HIPCP, and uninsured
3. To compare the presence of cases with diseases, and death in children by insurance status: UCS, HIPCP, and uninsured

Scope of the study

While statelessness is a cross-cutting and multi-sectoral issue, such as poverty, employment, trafficking in persons, education, ethnicity, culture etc., the study has focused on the healthcare issues of stateless children. Figure 1 depicts the links between the three objectives. The objective-1 (to summarize the policies for the provision of healthcare services for the stateless population in ASEAN countries) is broadly linked to the concept of accessibility under the umbrella of universal health coverage (UHC) [8]. The UHC is attained when all people including stateless people actually obtain the health services they need and benefit from financial risk protection. Access, on the other hand, is the opportunity or ability to do both of these things. Hence, the UHC is not possible without universal access, but the two are not the same. Access has three dimensions:

(i) Physical accessibility which refers to as the availability of good health services within reasonable reach of those who need them and of opening hours, appointment systems and other aspects of service organization and delivery that allow people to obtain the services when they need them

(ii) Financial affordability which refers to a measure of people's ability to pay for services without financial hardship. It takes into account not only the price of the health services but also indirect and opportunity costs (e.g. the costs of transportation to and from facilities and of taking time away from work). Affordability is influenced by the wider health financing system and by household income

(iii) Acceptability which captures people's willingness to seek services. Acceptability is low when patients perceive services to be ineffective or when social and cultural factors such as language or the age, sex, ethnicity or religion of the health provider discourage them from seeking services [9-12].

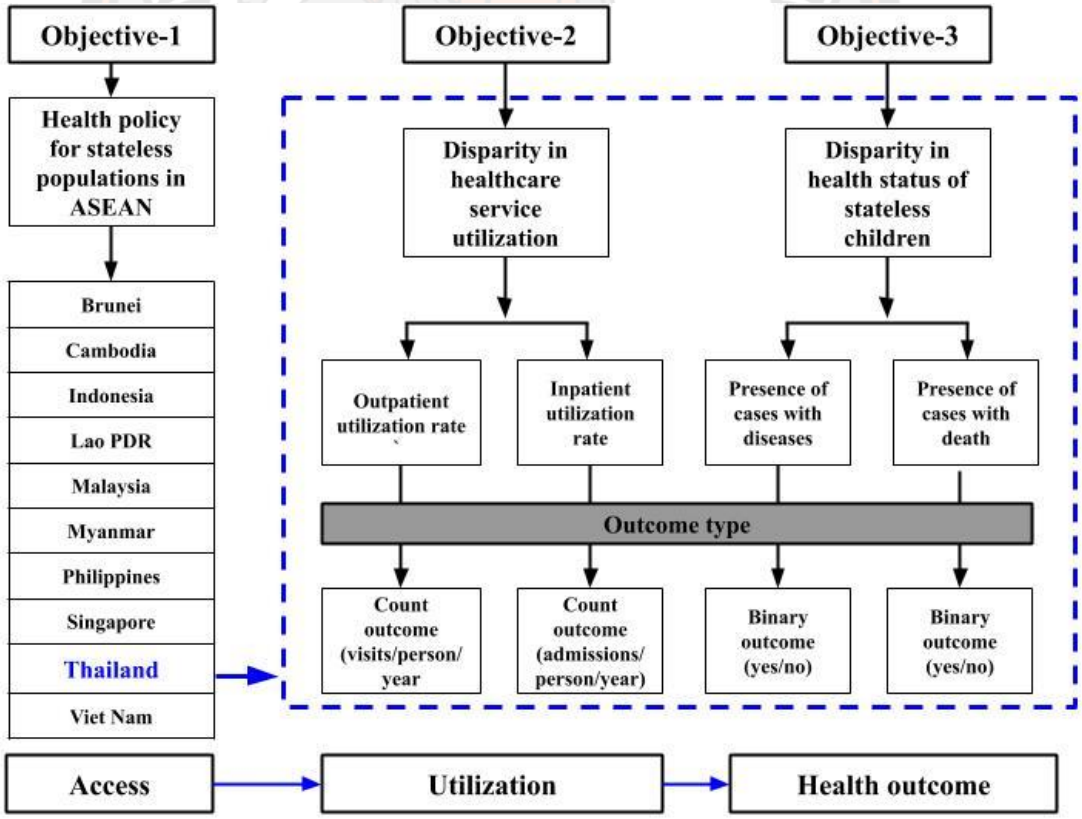


Figure 1 Links between study objectives

Note: Arrowed lines represent conceptual model leading to corresponding objectives of this thesis

To serve the purpose of the objective-1, a scoping review was conducted to explore health policies for stateless population in ASEAN countries focusing on health insurance coverage. Greater health insurance coverage helps its members gain entry into the healthcare system. In contrast, lack of adequate coverage makes it difficult for people to get the healthcare they need and, when they do get care, burdens them with large medical bills. As such, uninsured people are: less likely to receive medical care, more likely to be diagnosed later, more likely to have poor health outcomes, and more likely to die prematurely [13, 14].

Regarding the objective-2 (to compare healthcare service utilization of children by insurance status: UCS, HIPCP, and uninsured), previous research suggests that health insurance increases the healthcare service utilization among insured beneficiaries compared with uninsured in Thailand [5, 15]. However, this phenomenon was not examined for stateless children in the country. As such, this study has hypothesized that stateless insurance would increase healthcare utilization among stateless children compared with uninsured children.

Regarding the objective-3 (to compare the health outcomes of children by insurance status: UCS, HIPCP, and uninsured), the researcher hypothesized that increased healthcare service utilization would improve the health of stateless children in terms of lower odds of diseases and death compared with uninsured children in the country and vice-versa.

Definition of terms

Stateless persons: The Convention Relating to the Status of Stateless Persons (Stateless Convention) asserts that: “the term ‘stateless person’ means a person who is not considered as a national by any State under the operation of its law" [16]. A national is defined as someone who is a citizen or subject of a particular country. Some stateless persons are refugees, but not all refugees are stateless, and many stateless persons who are stateless have never crossed an international border [17]. It is estimated that there are more than 10 million stateless people worldwide and approximately a third of them are children [18].

Stateless people are persons who failed to register for a birth certificate in the country for distinct reasons such as geographical barriers, lack of information, and

ignorance of the civil registry system. Though most of the stateless are ethnic minorities (hill tribes), they also include children of both stateless and irregular migrant parents who did not join the civil registration in any country and children of undocumented migrant workers who cannot return to their country of origin or the country of origin refused to ratify their nationality [19]. For the purpose of this study, statelessness will apply to any individual residing in Thailand who is not recognised as a national of Thailand or any other country. This point is further elaborated in the literature review chapter (Chapter 2).

Aliens: By using nationality as a measure, populations in a country are categorised into two main groups: (i) persons with nationality of the nation-state (nationals), and (ii) persons without nationality of the nation-state or aliens. The 'aliens' could be broken down into two subgroups: (a) alien people residing in the present country since birth (called in-situ stateless), and (b) people migrating from another country. Concerning human mobility, in the receiving country, the nationals of another country are often treated as “foreigners”, while the “non-nationals” in the in-home country are often labelled “stateless migrants”. The focus of this study is in-situ stateless and stateless migrants in the country (Figure 2). This point is further elaborated in the literature review chapter (Chapter 2).

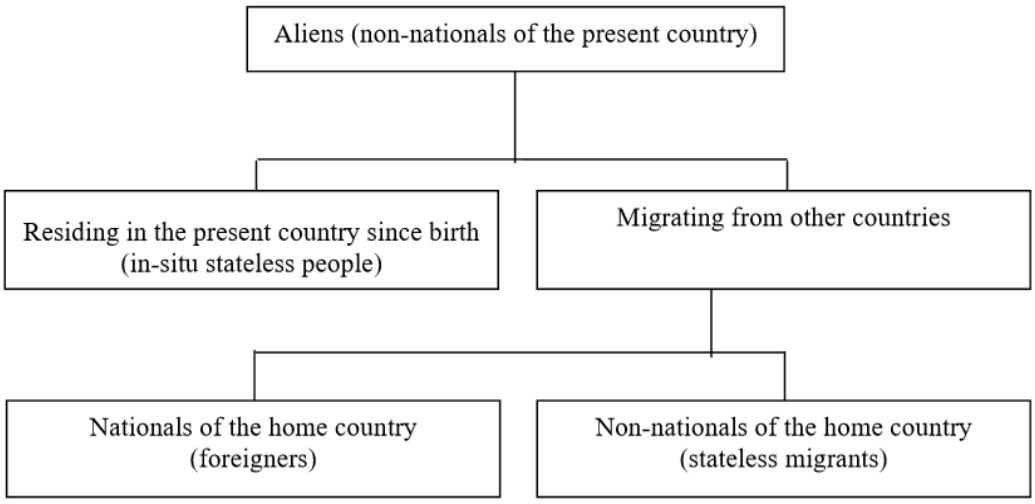


Figure 2 Simplified diagram of various subgroups of ‘aliens’

Source: Adapted from Suphanchaimat [15] and Napaumporn [20]

Child: According to the Thai Child Protection Act 2003 (Child Act) a child is any individual under the age of 18 [21]. However, for the purpose of this study, a child refers to an individual from zero to fifteen (0-15) years old which is also referred to as the child dependency age because a person can officially enter the labour market in Thailand at the age of 15 (Figure 3). Under Thai law it is illegal to employ anyone under the age of 15. Additionally, previous research on the health of migrant children in the country used age 0-14 to refer to a child [22]. To keep consistency with the existing literature, in this study, any person under 15 has been considered as a child.

Figure 3 Identifying the dependency age of a child

Health: A state of complete physical, emotional and social well-being and not merely the absence of disease or infirmity [23].

Health outcomes: An individual or population's overall level of health. In this thesis, the researcher measured the health outcomes of stateless children and native children in Thailand in terms of incidence of infectious diseases (e.g. pneumonia) and incidence of death.

Health disparities: Health disparities indicate the difference in the incidence, prevalence, mortality, and burden of diseases/illness/injuries, and other adverse health conditions that exist among specific population groups [24]. In this study, health disparities are compared between uninsured children, stateless children with stateless insurance and native Thai children with universal coverage scheme (UCS) in Thailand.

Odds ratio (OR): An odds ratio is the ratio of the frequency (or likelihood) of its occurrence to the frequency (or likelihood) of its non-occurrence. The OR is a comparison of the odds of an event after exposure to a risk factor with the odds of that event in a control or reference situation. The OR is measured as the odds of an event in the exposure group divided by the odds of that event in the control or reference group; the result is expressed as a ratio to denominator one [25].

Relative risk (RR): The relative risk of an event is the likelihood of its occurrence after exposure to a risk variable as compared with the likelihood of its occurrence in a control or reference group. Relative risk is an important and commonly used term. An RR of 1.00 means that the risk of the event is identical in the exposed and control group while RR less than 1.00 means that the risk is lower in the exposed group and RR greater than 1.00 means that the risk is increased in the exposed group [25].

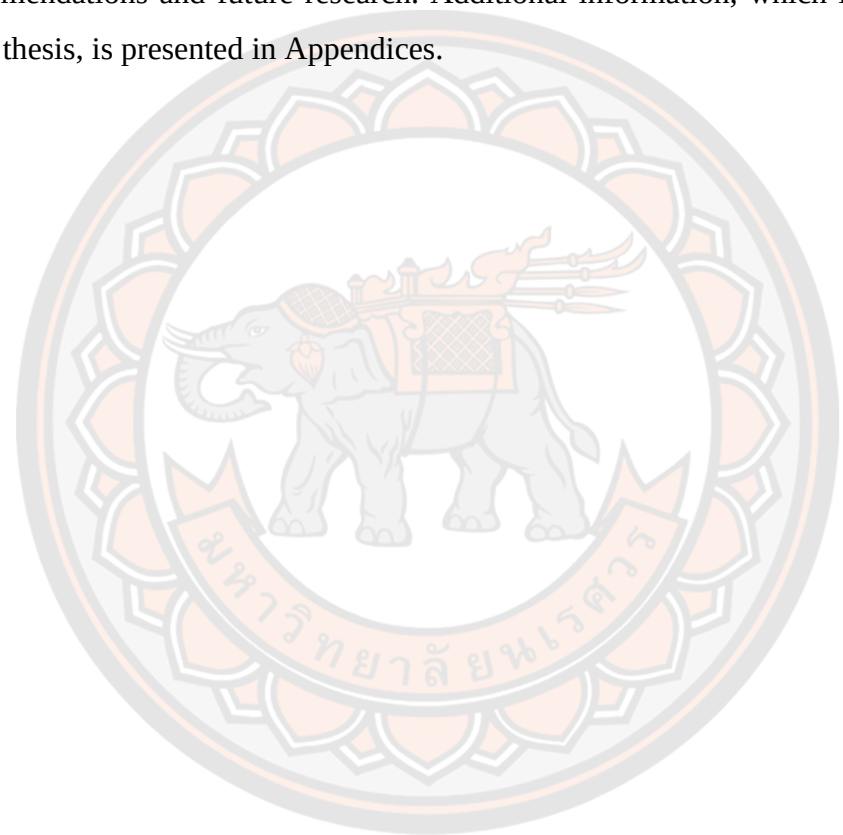
Expected outcomes

A few, possibly no prior studies exclusively focused on the healthcare utilization and health outcomes of stateless children compared to native children in Thailand. As such, there is a dearth of evidence on healthcare service utilization and health outcomes among stateless children in Thailand. This information on the magnitude and severity of health outcomes could be useful for policy decision-makers to make appropriate policy initiatives for reducing disparities in health outcomes among stateless children compared with native children if any. As such, this study is expected to provide important information about the health issues of stateless children through comparing health disparities among children based on their health insurance affiliations: uninsured, stateless, and the UCS.

Thesis outline

With this introduction chapter (Chapter 1) the next chapter (Chapter 2) shows results from the literature review from several angles, such as theoretical concepts concerning child health, determinants of health, stateless children in Thailand, and health insurance policies for stateless populations in the country. Chapter 2 also narrows the issues to the Thai context and presents gaps in knowledge. Following the

literature review, Chapter 3 briefly describes the relevant methodology in general while specific methods have also been blended into results sections of the following chapters (Chapter 4 and Chapter 5) in which Chapter 4 displays the key findings of objective-1 (scoping review), and Chapter 5 presents the findings of the quantitative analyses by study objectives-2 and objective-3. The key results from previous chapters (Chapter 4 and Chapter 5) are discussed in more detail in Chapter 6 which concludes the thesis by summarizing the findings of this study leading to policy recommendations and future research. Additional information, which is not the core of the thesis, is presented in Appendices.



CHAPTER II

LITERATURE REVIEW

Introduction

The review begins with giving an overview of the literature reviewed while following sub-sections are: (i) The theory and concepts of child health, (ii) Acculturation theory, (iii) Determinants of health, (iv) Statelessness as a social determinant of health, (v) Key international human rights treaties and Thailand, (vi) Types of alien or non-Thais in Thailand, (vii) Stateless persons in Thailand, (viii) source of stateless persons in Thailand, (ix) National policies for addressing stateless issues in Thailand, (x) Health insurance scheme for Thai citizens, (xi) Evolution of health insurance for stateless populations in Thailand, (xii) Empirical evidence on the impact of health insurance on utilization, (xiii) Empirical evidence on the impact of health status, (xiv) Most relevant studies in Thailand, and (xv) Knowledge gap or value addition of this study. Each section is discussed in several sub-sections.

Overview of review

Stateless person is defined as “a person who is not considered as a national by any State under the operation of its law” [1, 2]. Globally, over 10 million people are stateless [26]. A big portion of stateless persons is concentrated in Asia, especially in Nepal, Myanmar, and Thailand [27]. Statelessness is the worst possible form of violation of fundamental human rights [28]. Without any nationality, stateless persons may have difficulty in accessing a wide range of human rights including civil, cultural, economic, political, education, and healthcare [29]. According to the World Health Organization (WHO) the violations of human rights can lead to serious health outcomes as the health and human rights are inextricably intertwined [30-32]. It is because health and human rights are linked like Borromean rings in three aspects: (i) violations of human rights can lead to serious health outcomes; (ii) health policies and programmes can promote human rights in their design or implementation; and (iii) vulnerability to ill health can be addressed by taking steps to fulfil human rights (Figure 4).

According to the International Observatory on Statelessness, the exact number of stateless persons in Thailand is unknown, but likely to be 2.75 million [33]. According to the UNHCR, in 2018, 487,000 stateless persons in the country are registered with the Ministry of Interior (MOI) [33, 34]. However, there are over 2-3 million unregistered stateless persons who are at risk of statelessness in the country. It is because the stateless persons are denied the right to vote, travel, own property, work legally, and have access to education and healthcare [33, 35].

Consequently, the stateless children are unable to receive formal healthcare services unlike Thai children in the country. Lack of access to healthcare among children might deteriorate their health status that could eventually impede greater human development. Previous research suggests that the exposure to adverse social factors (e.g. inequities in health) in early childhood is independently associated with a range of adverse health and developmental outcomes of children throughout their remaining life course [36]. The vulnerable children are often at risk of malnutrition, delayed development, vaccine preventable infectious diseases, and a higher risk of mortality [37, 38]. While complete immunization could prevent children from severe illnesses, such as amputation of an arm or leg, paralysis of limbs, hearing loss, convulsions, brain damage, and death, the immunization rate among the migrant children along the Thai-Myanmar border are much lower (e.g. 54%) than native children (e.g. 95%) due to illegal and clandestine migrant status [39].

While the violations of human rights can lead to serious health outcomes, health policies and programmes can promote human rights and vulnerability to ill health among disadvantaged populations like the stateless in Thailand. As such, the Thai government has undertaken multiple policy measures to address health issues of non-Thais including stateless persons since the early 2000s, especially when they were excluded from universal coverage scheme (UCS) [4]. For instance, the Thai Cabinet instigated health insurance card scheme (HICS) for cross-border migrants in 2004, free education for non-Thai children in 2005, and health insurance for people with citizenship problems (HIPCP) in 2010. Despite these initiatives, the healthcare service utilization of the target populations was not increased as compared with the Thai citizens [4, 5].

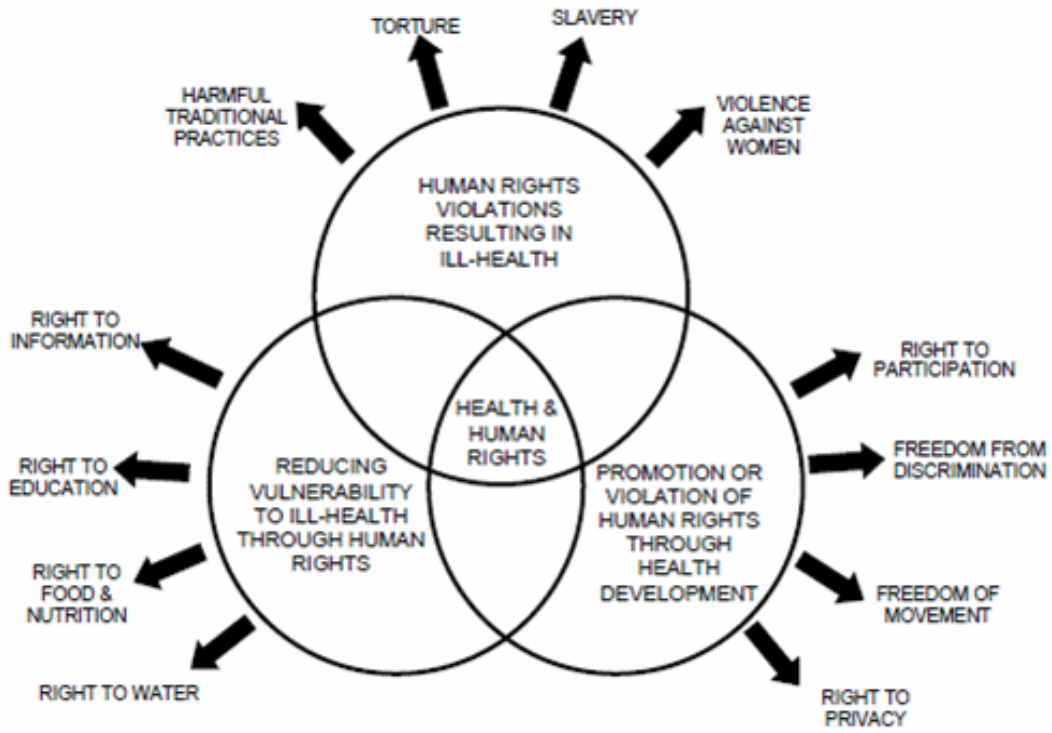


Figure 4 Links between health and human rights

Source: Adapted from the World Health Organization [32]

Theory and concepts of child health

Regarding the concept of *child* development, one of the questions that developmental scientists are curious about is how does development happen? Development is not a function of just nature and biology, or just nurture and the environment, but rather development is the interaction between neurological biological processes and the environment. The most powerful environmental influences in the prenatal stage through to the age of three are the relationships infants have with their parents, caregivers, and other adults in their environment. Also, the basic health supports and risks, such as nutrition, water, sanitation, and disease, are key influences on development. Similarly, the wider environment, such as culture and the local economy and infrastructure of the child's environment also influence child development.

The bioecological systems theory of human development

One of the most famous developmental scientists, who talked theoretically about development in environmental context, was Urie Bronfenbrenner. Urie proposed an ecological model of human development in 1979 which has situated the child at the centre, and then around that child where the many influences that have affected development [40]. These developments he referred to as the biosystem, the microsystem, the mesosystem and the macrosystem. This model may be comparable to Dahlgren and Whitehead's [41] social model of health as shown in Figure 5.

The microsystem: the microsystem of development refers to the immediate environment the baby grows up in. That includes the womb environment. As the baby is born, the everyday routines that the child has and regular interactions with other people are the influences that shape the developmental course of that child. So, the thousands upon thousands of interactions every day with a physical and social setting of a baby's life shape the course of development, and immediate sources of nutrition, feeding, social interaction, language inputs, those are all a part of the microsystem [42, 43].

The mesosystems: the mesosystem of development refers to the relations between different microsystems. For example, the relation between the caregiver at home and the caregiver at childcare. If the childcare provider expects the child to be very quiet and obedient, whereas the caregiver at home wants the child to explore and play and assert their own will, it would create a conflict of value systems that would, in turn, affect infant development.

The exosystem: the ecosystem refers to the links between a social setting in which the individual does not have an active role and the individual's immediate context. For example, a parent's or child's experience at home may be influenced by the other parent's experiences at work [42]. The parent might receive a promotion that requires more travel, which might increase conflict with the other parent and change patterns of interaction with the child.

The macrosystems: the macrosystems of development refers to the broader values and socialization goals of the larger context and larger societal patterns. It can refer to the values and norms and expectations of a cultural community. A child, his or her parents, his or her school, and his or her parent's workplace are all part of a

large cultural context. Members of a cultural group share a common identity, heritage, and values. The macrosystem evolves over time, because each successive generation may change the macrosystem, leading to their development in a unique macrosystem [44]. This also refers to the policies of the national government which can have a powerful influence on local society. For example, the introduction of a system of national health insurance can make it much easier for children to gain access to necessary medical treatment. It can also refer to large-scale social, economic changes in a community. The historical change can affect children such as forces of urbanization, industrialization, or historically being born at a time of war versus a time of peace can have an enormous influence on the microsystems of young children and their development.

Acculturation theory

Acculturation: Acculturation is defined as the cultural modification of an individual, group, or people by adapting to or borrowing traits from another culture. This can happen both at the group level and at the individual level. At the group level, the most common forms of acculturation are changes in food, clothing, language, customs, education, and healthcare while at the individual level, foreign-born individuals adopt the values, customs, norms, attitudes, and behaviours of the dominant host culture which are linked to physical and mental well-being. As migrants around the world are on the rise, many migrants adjust to the host society through acculturation. This acculturation has a positive effect on the health of migrants by altering levels of stress, access to health resources, and attitudes towards health [45-47].

Fourfold model: Most of the scholarly research and theory have primarily focused on the adjustments and adaptations of minorities such as immigrants, refugees, and indigenous peoples in the host societies through acculturation. The fourfold model explains this phenomenon which is a bilinear model that categorizes acculturation strategies along two dimensions. The first dimension concerns the retention or rejection of an individual's minority or native culture whereas the second dimension concerns the adoption or rejection of the dominant group or host culture [48]. The model has four approaches of acculturation based on the degree to which

migrants become submerged in a new cultural environment and how migrants maintain the original culture: (i) assimilation, occurs when individuals adopt the cultural norms of the host culture, over their original culture, (ii) separation occurs when individuals reject the host culture in favour of preserving their original culture, (iii) integration occurs when individuals can adopt the host culture while maintaining their original culture, and (iv) marginalisation occurs when individuals reject both their original culture and the host culture [49, 50]. Amongst the four strategies, marginalisation is the most harmful approach [51] while integration is the most preferable acculturation strategy [52, 53]. Previous studies found that, among the three nationalities, Laotian migrant workers were better socially integrated into Thai society than migrants from Myanmar [22].

Acculturative stress: The negative health behaviours and outcomes of migrants such as substance abuse, low birth weight associated with the acculturation process are attributable to acculturative stress theory [54]. Acculturative stress refers to the stress response of immigrants in response to their experiences of acculturation [46, 47, 50]. Acculturative stress can be manifest in many ways such as anxiety, depression, substance abuse, and other forms of mental and physical maladaptation of migrants [49, 55]. The migration status also increases the risk of acculturative stress as voluntary migrants experience roughly 50% less acculturative stress than refugees [48, 56, 57].

Immigrant paradox: The conventional view about the children of migrants asserts that they are more likely to perform poorly or fail in school and become delinquent, at risk of poor health outcomes due to their social, economic environment and lower levels of assimilation. Despite linguistic and cultural barriers that put them at an initial disadvantage, the children of immigrants (first generation) demonstrate better health, behaviour, and academic outcomes on average compared with grandchildren (second generation) and great grandchildren (third generation) immigrants [58]. This phenomenon is due to an erosion of protective cultural factors and an accumulative exposure to risky behaviours found in a host country, such as smoking and substance abuse [59]. Some studies have found that typically low levels of education among immigrant parents lead to relatively high levels of poverty, lower wages, and more part-time work. This situation may be true in specific circumstances.

Asian immigrants to North America, for example, generally have higher levels of education and place a high priority on education for their children. They also, on average, maintain a high standard of living. Despite drawing on significant family support, many immigrant families face constraints due to limited human capital and lack of acculturation in the US. Such disadvantages hint more at the presence of immigrant risk rather than advantage [51].

Determinants of health

Numerous factors combine in a complex web to influence the health of individuals and populations. These various factors that influence health are called determinants of health. The determinants of health affect both individual response (behaviour and biology) and the prevalence of illness and disease. Several conceptual models have been developed to illustrate health determinants. The Dahlgren and Whitehead [41] model shown here in Figure 5 depicts the relationship between individual factors, which are at the centre of the diagram and constitute factors, such as genetics and biological factors (age, sex). The next layer of influence on health is personal behaviours and lifestyle factors, which includes behaviours such as smoking, alcohol and drug use, and poor diet. The following layer is social and community influences, such as family, friends, and the community around the target population (in this case migrant children). The next layer comprises structural factors such as housing, working conditions, healthcare service, education, water and sanitation facilities, employment, and so on. The outer layer includes the general socioeconomic, cultural, and environmental conditions. This is also called “upstream” factors that affect the health status of populations and individuals like vulnerable migrant children.

According to the World Health Organization's 2002 World Health Report determinants of health are categorized as either proximal determinants or distal determinants [31]. The proximal determinants are viewed as having the most direct effect on health status. Examples include individual behaviours such as hand washing, alcohol, and cigarette use, beliefs, attitudes, genetics, and biology. On the other hand, the distal determinants have a more indirect effect on a person's health and tend to be background factors in the sociocultural and environmental context that can predispose

people to greater or lower health risks. Examples include cultural factors, education level, and the physical environment. The distal socioeconomic factors may affect levels of proximal factors. For example, low income may lead to poor nutrition and housing.

According to the National Scientific Council on the Developing Child [60], *"the future of any society depends on its ability to foster the health and well-being of the next generation. Stated simply, today's children will become tomorrow's citizens, workers, and parents. When we invest wisely in children and families, the next generation will pay that back through a lifetime of productivity and responsible citizenship. When we fail to provide children with what they need to build a strong foundation for healthy and productive lives, we put our future prosperity and security at risk.*" Thus, it is necessary to address significant inequalities in opportunity, beginning in the earliest years of life. This is both a fundamental and moral responsibility and a critical investment in our nation's social and economic future.

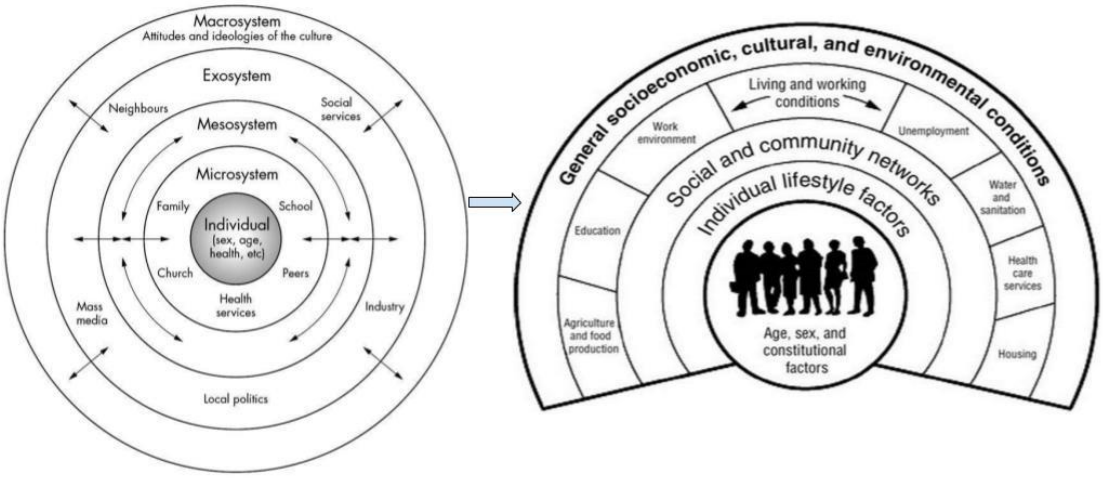


Figure 5 Urie's ecological model (left) and Dahlgren and Whitehead's model (right)

Source: Adapted from Bronfenbrenner [40] and Dahlgren and Whitehead [41]

Statelessness as a social determinant of health

The International Organization for Migration (IOM) recognizes migration as one of the social determinants of health of migrants and is committed to working with

governments and partners to reduce health inequities for migrants [61-63]. Similarly, statelessness could be seen as one of the social determinants of health, especially from humanitarian grounds. In 2014, the United Nations launched a global campaign, popularly known as "#IBELONG", to end statelessness by 2024 [64]. This section reviews contemporary issues on statelessness and its impact on the health of stateless people followed by ad hoc health interventions to address the health issues of stateless people beyond Thailand.

A number of studies have emerged since 2017 focusing on addressing health issues of Rohingya Muslims, who fled Myanmar due to armed conflicts in the Northern Rakhine State [65, 66], and took refuge in Bangladesh, Malaysia, and Thailand, while Cox's Bazar of Bangladesh was preferred destination for Rohingya stateless refugees due to the close proximity, matching language and religion [67, 68]. However, lack of legal and administrative framework (e.g. Bangladesh is neither a signatory of the 1951 Refugee Convention or the 1954 Convention relating to the status of Stateless Persons), issues related to protection and safety, and barriers of distribution of international aid have negatively affected the health of Rohingya stateless refugees in Bangladesh [69].

The statelessness of Rohingya people has a detrimental effect on their physical and mental health. The physical health outcomes include high prevalence acute malnutrition [70] and chronic malnutrition amongst Rohingya children [68, 70], high infant mortality rate [68], high maternal mortality [71], very low birthweight [72], respiratory tract infections, diarrhoea, skin diseases, measles and water-borne diseases, [68, 70, 73, 74]. On the other hand, mental health outcomes include chronic anxiety, grief, depression and post-traumatic disorders (PTSD) [75, 76], epilepsy, seizures and psychotic disorders [68, 73, 75].

Similarly to Rohingya stateless, the Roma consists of the largest ethnic minority in the European Region [77]. The Roma minorities became stateless in Serbia, Bosnia and Herzegovina, Slovenia and Montenegro due to state succession and war conflicts, who were formerly Yugoslav citizens back in the early 1990s [78]. They are a marginalized group with a low socioeconomic status in the European Region [79]. Previous research suggests that the health status, measured by communicable diseases, child health and reproductive health, of Roma people has been

disproportionately poorer than their counterparts in different European countries, especially in Spain, Slovakia, and Czech Republic [80].

Similarly, prevalence of non-communicable diseases (e.g. dyslipidaemia, obesity, tobacco consumption, hypertension, and diabetes mellitus) is higher among Roma minorities in Slovakia, Croatia, Czech Republic, Hungary, Romania, and Serbia compared with their counterparts [81, 82] Additionally, the Roma people have poorer access to health services and uptake of preventative care as well [80].

Evidence suggests greater prevalence of health risk factors among Roma children compared with non-Roma children, which contributes to increased risk of poor health outcomes among Roma children [83]. For instance, Roma children are of greater health risk of smoking [84-86], less physical activity [85, 87], poorer nutrition [88], low birth weight [89], and lower vaccination coverage [90, 91] compared with non-Roma children. There is a large difference in vaccination coverage between Roma and non-Roma children in Central and South-East Europe [91]. Research suggests that lower vaccination coverage contributes to the outbreak of measles among Roma and undocumented immigrants in Italy [92, 93]. Roma adolescents are also found to be poorer health, more accidents and injuries compared with non-Roma adolescents living in eastern Slovakia [94].

The displaced and/or undocumented people in some African countries, such as Kenya, Cote d'Ivoire, Zimbabwe, Democratic Republic of Congo (DRC), and Ethiopia, are reportedly at risk of statelessness [95]. Evidence shows that the refugee, migrant and displaced girls and young women are at risk of sexual and reproductive health (SRH) related diseases. Available evidence demonstrates that young women and girls are less likely to be aware about the SRH services such as contraceptive methods, sexually transmitted infections (STIs), and HIV/AIDS [96]. The access and availability of SRH services are often limited to young women and girls due to distances, costs and social stigma. Additionally, this vulnerable population group often experiences gender-based and sexual violence and abuse [96].

While the social exclusion leads to worsening health status of the Roma population [97], strong political commitment, inter-sectoral policy coordination, adequate budgeting, evidence-based inclusive policies for the Roma population are inevitable for improved health outcomes and well-being of those vulnerable people

[77]. Holistic health policies integrating other interrelated social determinants of health, including education, economic, labour market, housing, environmental and territorial development policies, are to reduce health inequalities for Roma people [77, 79]. In 2005, in Budapest, many international organisations joined with national governments in the region to launch the Decade of Roma Inclusion. It established a framework for action to improve the situation of the Roma in the region through prioritizing four sectors: education, employment, healthcare, and housing [77].

Similar to Roma minorities in European Region, the hill-tribes ethnic minorities are reportedly considered to be stateless in Northern Thailand (this point is discussed later in greater detail). Historical sources suggest that the hill-tribes populations immigrated to Thailand from neighbouring countries (e.g. Laos and Myanmar), and from more distant regions (e.g. Tibet or Southern China) [98-100]. Most of the stateless people live along the Thai-Myanmar border in Thailand. Vulnerable children including stateless and undocumented children face multiple barriers to access healthcare services in the border areas [35].

Canavati et al. studied barriers to child immunisation among migrants in Tak Province and concluded that though child immunisation was available to all patients, some irregular migrants seemed to benefit less from those services than Thai people [39]. The main causes of lower immunization were the illegal status of migrant parents, and ‘fear of arrest’ by the Thai government. Another study [101] found that, the vaccine-preventable infectious diseases, such as measles, mumps, tuberculosis and hepatitis, were found to be the commonly reported disease among the undocumented population in Tak Province.

Additionally, the Thai government maintains immunization records for all Thai children but not for migrant children living on the Thai-Myanmar border. The Thai district health authorities attributed this to difficulties in completing immunization courses due to the mobile nature of migrants. Consequently, only 53.7% of Burmese migrant children ages 1-2 years were fully immunized according to Thailand’s national immunization schedule (for children under 1 year) compared with 95.2% of the Thai Children in four border districts of Tak Province. Complete immunization could prevent children from severe illnesses which can cause amputation of an arm or leg, paralysis of limbs, hearing loss, convulsions, brain damage and death.

Chamchan, Apipornchaisakul and Thianlai [22] found that 76% of migrant children (0-14) did not have any health insurance which is the highest in Tak (96%) followed by Ranong (64%), and Chumphon Province (62%). Their survey also found that overall 22% of the babies born in those three provinces were non-Thais including stateless wherein this figure was the highest (around 35%) in Tak Province. Regarding healthcare utilization among pregnant women, institutional deliveries were found to the highest (94%) in Tak Province and majority of those deliveries took place in NGO health facilities (70%) followed by public hospitals (17%) and private hospitals (7%) respectively. Birth registration was also found to be the highest (81%) in Tak compared with Ranong Province (72%) and Chumphon Province (57%). However, the study did not exclusively focus on the health status of stateless children in Tak Province.

Anecdotal evidence [102] shows that immunization coverage among stateless children in Phop Phra and Umphang districts of Tak Province are much lower (45-50%) than the national level (99.9%). This is attributable to the mobile behaviour of stateless persons who move with their children and keep them away on immunization day or they do not bring their children to the hospital for routine immunization during the harvest season. This phenomenon of stateless persons increases the chances of their children to suffer from different vaccine preventable infectious diseases. However, such evidence should be verified with facility-based longitudinal health records of stateless children.

Empirical evidence shows a high incidence of pneumonia in young children in the Maela Refugee Camp along the Thailand-Myanmar border [103, 104]. Pratheepamornkull, Ratanakorn [105] explored the seasonality of pneumonia cases associated with environmental factors in Chiang Mai Province using time-series models that predicted the average monthly incidence of pneumonia was 1.17 times smaller than the real number of pneumonia cases. Pratheepamornkull et al. [105] suggest that young and preterm (premature) infants with community acquired pneumonia (CAP) are at high risk for developing serious complications by virus infections at Chonburi Hospital in eastern Thailand. Williamson et al. suggest that the risk of a vaccine-preventable diseases (VPDs) requiring hospitalization is strongly correlated with a lack of vaccination among ethnic minorities such as the Amish in

Pennsylvania State [106]. This phenomenon may be comparable with the stateless population in Thailand.

In Thailand, the expansion of the health infrastructure and developments of the targeted health insurance schemes reduced under-five mortality by ~86 % between 1970 and 2015 [107]. In 2017, infant, neonatal, and children aged 5-14 mortality rates were eight, five, and five per 1000 live-births respectively in the country [108, 109]. Thailand already met the sustainable development goal by reducing under-five mortality. However, the inequality in child mortality exists between various population groups including the stateless group in the country. A recent study showed that geographical disparity in mortality in children aged 0-14 years old has increased over 2001-2014 in the country while under-five mortality is high among ethnic minority groups, including stateless people along the Thai-Myanmar border [110].

Key international human rights treaties and Thailand

This section examines the relevant international treaties to which Thailand is a state party or signatory. The 1948 Universal Declaration of Human Rights (UDHR) has been considered the supreme maxim of the human rights issue [111]. The scope of human rights encompassed not only an individual's physical health, but also his/her quality of life and social determinants as reaffirmed by several international covenants and conventions on human rights [20]. For instance, Thailand acceded to the International Covenant on Civil and Political Rights (ICCPR) in 1996 and the International Covenant on Economic Social and Cultural Rights (ICESCR) in 1999. Thailand has not, however, signed the optional protocol to either the ICESCR or ICCPR which concerns communication procedures. Thailand acceded to the Convention on the Rights of the Child (CRC) in 1992 [112]. In 2006, Thailand acceded to the First and Second Optional Protocols concerning the involvement of children in armed conflict and the sale of children, child prostitution and child pornography respectively [113]. In 2012, Thailand ratified the Optional Protocol regarding communication procedure [114]. Table 1 gives more specific information on these treaties.

It is necessary to examine the relevant international treaties to which Thailand is not a party, meaning Thailand is not bound by these treaties. For example, Thailand

has not signed the Refugee Convention [114]. It means the UNHCR in Thailand has the role of providing international protection to asylum seekers and refugees. Thailand has also not signed the Convention Relating to the Status of Stateless Persons [115] or the Convention on the Reduction of Statelessness [116] meaning stateless persons may seek assistance from the UNHCR in Thailand. This situation may put stateless people at risk of protection of their basic human rights under human rights instruments or international law [117]. However, Thailand's military government, which took power in 2014, has pledged to "zero statelessness" by 2024 [118] echoing the UNHCR's initiative called "#IBelong Campaign to end Statelessness" in ten years from 2014 [18]. Additionally, initiatives by Her Royal Highness Princess Maha Chakri Sirindhorn has been helping to provide greater access to nationality for school-aged children and vulnerable people, including stateless persons in the country [119].

Types of aliens or non-Thais in Thailand

As of February 15, 2017, there were 2,586,089 registered non-Thais with 13-digits household registration ID with MOI [120]. Figure 6 demonstrates six groups of non-Thai populations living in Thailand: permanent foreigners (65,559), temporary foreigners (45,331), ethnic minorities (488,105), Cambodia, Lao PDR, and Myanmar or CLM migrants (1,588,914), refugee groups (101,713), and stateless people (316,748 excluding children of permanent foreign workers, children of CLM migrant workers, and children of refugees in the refugee camps). Of these six groups, some of the ethnic minorities and stateless people are the target population of this study.

The ethnic minority groups also include persons who migrated into Thailand and settled in the country for a few decades. The population of this subgroup is 400,731 including 290,269 children, 78,676 students, 8,670 rootless children.

Table 1 Ratification and accession of International Standards by Thailand

Title of the treaty	Action type	Date of UN conclusion	Deposit date
The International Covenant on Civil and Political Rights (ICCPR)	Accession	16 Dec 1966	29 Oct 1996
International Covenant on Economic, Social and Cultural Rights (ICESCR)	Accession	16 Dec 1966	5 Sep 1999

Title of the treaty	Action type	Date of UN conclusion	Deposit date
Convention on the Rights of the Child (CRC)	Ratification	20 Nov 1989	27 Mar 1992
Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict	Accession	25 May 2000	27 Feb 2006
Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography	Accession	25 May 2000	25 Jan 2006
Optional Protocol to the Convention on the Rights of the Child on a communications procedure	Ratification	19 Dec 2011	25 Sep 2012
Protocol to Prevent, Suppress and Punish Trafficking in Persons, Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime	Ratification	15 Nov 2000	17 Oct 2013
Worst Forms of Child Labour Convention (ILO C 182) (ILO Convention, 1999)	Ratification	1 Jun 1999	Feb 2001

Note: Ratification: Ratification defines the international act whereby a state indicates its consent to be bound to a treaty if the parties intended to show their consent by such an act. The institution of ratification grants states the necessary time-frame to seek the required approval for the treaty on the domestic level and to enact the necessary legislation to give domestic effect to that treaty.
Accession: Accession is the act whereby a state accepts the offer or the opportunity to become a party to a treaty already negotiated and signed by other states. It has the same legal effect as ratification. Accession usually occurs after the treaty has entered into force.

Source: Adapted from United Nations Treaty Collection [121]

The ethnic minority groups also include persons who migrated into Thailand and settled in the country for a few decades. The population of this subgroup is 400,731 including 290,269 children, 78,676 students, 8,670 rootless children.

Stateless persons in Thailand

Definition: The international legal definition of a stateless person is “a person who is not considered as a national by any State under the operation of its law” [16]. In simple terms, this means that a stateless person does not have the nationality of any country. Some people are born stateless (de facto), but others become stateless (de jure). Stateless persons especially children are indisputably among the most vulnerable and marginalized population in the world [122].

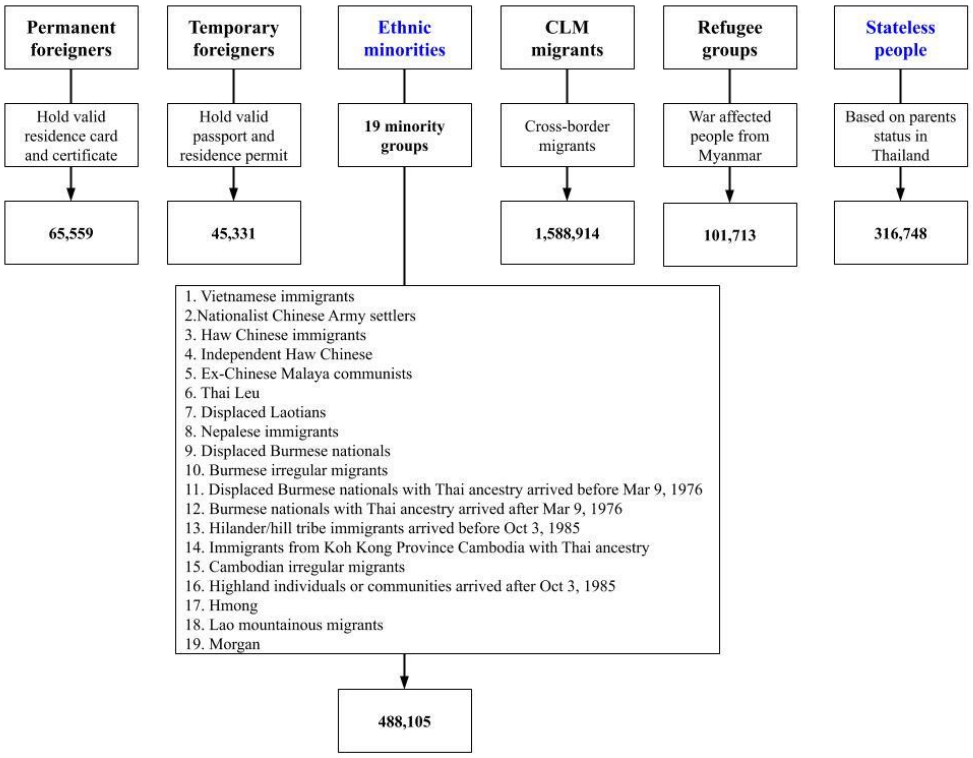


Figure 6 Types of non-Thais in Thailand

Note: CLM: Cambodia, Lao PDR, Myanmar. Of these six groups in the above figure, some of ethnic minorities and stateless people are the target population of this study.

Source: Author developed for this thesis, statistical figures as of 2017 [120].

Statelessness can occur for several reasons, including conflicts of nationality laws, discrimination against particular ethnic or religious groups, state succession, the legacy of colonization, arbitrary deprivation of nationality, administrative barriers and lack of documentation, and the inheritance of statelessness [28, 123]. In Thailand, stateless persons are those who are not considered citizens of any nation due to different circumstances. Thailand's stateless population includes Rohingya Muslims from Myanmar and members of the Karen, Mon, Hmong and other hill tribes including displaced Thais who have been living in the country for decades [124].

Archavanitkul [125] suggested that stateless persons in Thailand included four population subgroups: (i) ethnic minorities, (ii) undocumented people without a birth registration document despite being born within Thai territory, (iii) cross-border migrants from neighbouring countries and (iv) refugees from Myanmar. For the

purpose of this study, the first two groups are considered as stateless persons identified in health records (this point is discussed in a later section). It is estimated that around 443,862 people are stateless ethnic minorities who are reportedly called hill-tribes in Thailand [123, 126]. The largest hill-tribal group is Karen (~46%), followed by Hmong (~16%), and Lahu (~11%) [124]. In addition to intergenerational poverty, these hill-tribe people are culturally different (e.g. language, delay in seeking care, self-treatment) from other Thais that often puts them at morbidity risk [124, 127].

Source of stateless persons in Thailand

In the past, according to first Nationality Act 1913, 'Thai nationality' was based on a person's place of birth, regardless of his/her parents' nationality (jus soli enjoyment) meaning anyone born in Thai soil automatically gets Thai citizenship. However, in 1972, the Regulation of Revolution Party No.337 (Por Wor 337), revoked and refused to grant Thai Nationality of persons born of alien parents with non-permanent residence in Thailand [128] as cited in [15]. Por Wor 337 was introduced due to a fear of communism in Southeast Asia that had spill-over effects on people from non-communist countries like Myanmar [128]. In 1992, the Regulation was repealed by the 1992 Nationality Act (second revision), but the concept of jus soli restriction remains in force today as presented in the Section 7bis of the current 2008 Nationality Act (fourth revision) [15]. There are mainly two groups of stateless people in Thailand: (i) a group of people who migrated into Thailand without any legal documents and but cannot return to the country of origin, de jure stateless persons, and (ii) a group of people born stateless in Thailand due proper registration documentation, de facto stateless.

National strategies for addressing stateless issues in Thailand

Thai government has undertaken multiple strategies to address stateless issues in the country which may broadly be categorized into four groups, though they are not mutually exclusive: (i) Registration of stateless persons, (ii) Resolving legal rights of stateless persons, (iii) Resolving nationality for stateless persons, and (iv) Resolving human rights issues of stateless persons. Although there are various issues to be

solved for stateless persons, the focus of this study, however, is health insurance as a tool for improving the health of stateless children in the country as highlighted in Figure 7. National level strategies for addressing stateless issues are briefly described below.

Registration of stateless persons

Birth registration: In 2010, the Thai Government relaxed birth registration and nationality under the Convention on the Rights of the Child (CRC) to comply with the United Nations principle of universal birth registration. Thailand is now legally obliged to ensure birth registration for all children born in Thailand regardless of their nationality [129]. This opportunity allows undocumented alien parents to register their babies born in Thailand to be documented which is the first stepping stone for enjoying social services such as healthcare and education followed by the possibility of acquiring Thai Nationality in the future [129]. The Legal Clinics (LCs) also helps stateless people to acquire and/or recover Thai Nationality based on the amended Civil Registration Act of 2008 in Thailand [129, 130]. Legal Clinics (LCs) are an initiative of local providers, especially in the Thai-Myanmar border hospitals, rather than an initiative of the central government. Legal Clinics have been established in five district hospitals in Tak province to provide support to newborns, school going children, and adult migrants, and stateless people. It plays a critical role for stateless children to access health and education services through the issuing of important identification documents such as the 'delivery certificate'.

Civil registration of stateless persons: According to the Thai Civil Registration Act (No.2) B.E. 2551 (2008) *" (paragraph one) the district or local registrar shall issue a household registration for persons without Thai nationality having been permitted to stay temporarily and those having been given leniency for temporary residence in the Thai Kingdom as a special case in accordance with law on immigration and the declaration of the Cabinet and their children born within the Thai Kingdom. In a case of permission of temporary residence overdue, the registrar shall immediately dispose of such persons".*

Additionally, *"(paragraph two) the Director of Central Registration shall make profile registration for persons without Thai nationality besides those under paragraph one in accordance with the declaration of the Cabinet. Registration under*

paragraphs one and two shall lie in the manner prescribed in the regulations under the discretion of the Director of Central Registration." [131].

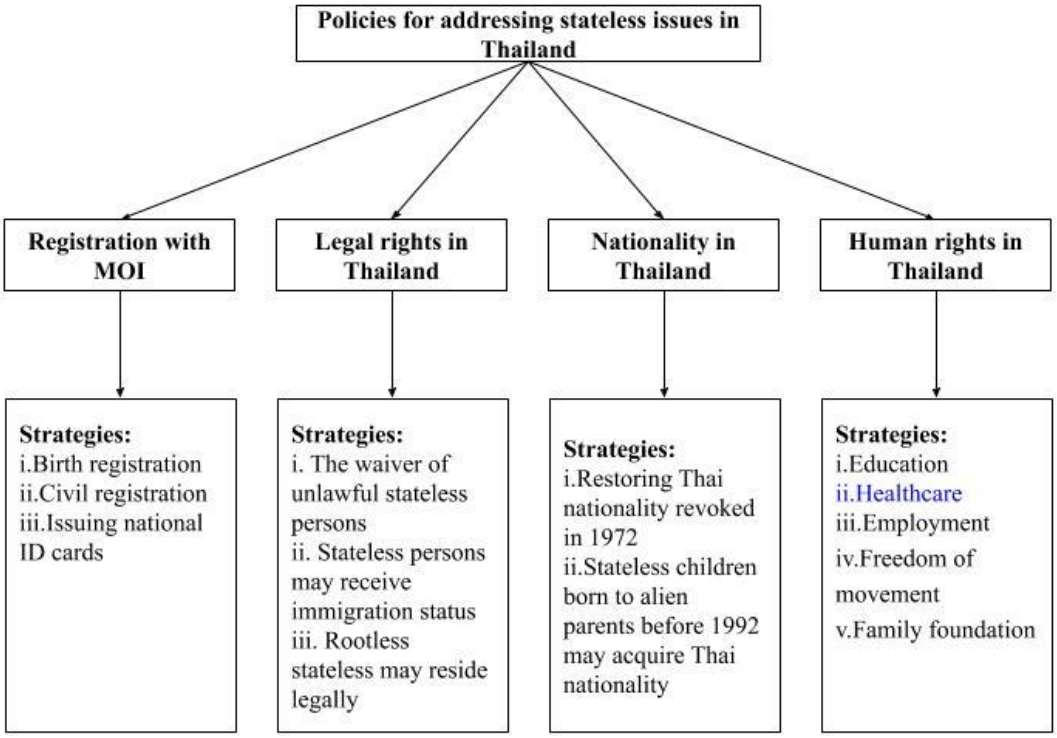


Figure 7 Policy measures for addressing statelessness in Thailand

Note: MOI: Ministry of Interior, Thailand

Issuing identification cards for stateless persons: In 2005, the National Security Council (NSC) endorsed the Stateless Strategy to affirmation of the basic human rights through a comprehensive registration process between 2007-2009 [132] as cited in [15]. A 13-digit national identification card was issued starting with '0' for a stateless person which is also called '0' Card. A '0' cardholder is eligible to apply for Thai nationality if the person does not have a nationality of another country and has been living in Thailand for at least five years [3, 133]. Figure 8 illustrates solving statelessness problem by issuing '0 card' through implementing the Stateless Strategy in Thailand.

Resolving legal rights of stateless persons

Waiver of statutory status: The waiver of unlawful stateless persons without statutory status is entitled to temporarily reside in Thailand while awaiting the execution of such matters as the execution of a person's legal status. The Minister of Interior has set up a residential control area using the province, where the alien has registered their profile. However, stateless people with limited documentation need prior authorization from the Provincial Governor for travel outside the province. Offenders are subject to severe punishments, fines, or a jail term of 45 to 60 days. Persons without an identity card may not travel at all.

Right to immigration: The stateless persons without statutory qualifications and conditions as defined by the Cabinet can obtain status as an alien by law. The Thai Cabinet passed a resolution on December 7, 2010, which allows certain stateless persons without immigrant status to be granted the right to immigration. For instance, permanent residence laws are applicable to ethnic groups who migrated to Thailand on January 18, 1995 must be received immigration status. Additionally, those who participated in the survey conducted in 1999 and have a name in the house registration would receive immigration status in the country. Besides, stateless students who were admitted to Thai education institution on January 18, 1995 and who took part in the 2005-2009 survey must be registered as a legal immigrant. The stateless students who graduated with a bachelor’s degree by January 18, 2005 could apply for Thai nationality [120].

Resolving nationality issues for stateless persons

Amendment of nationality law: Thailand passed an amendment of nationality law to restore the nationality of those who lost their nationality as a result of its controversial 1972 Declaration. The applicants are required to present their birth documentation to acquire nationality. For instance, according to Citizenship Act BE 2508 (1965) amended (No. 4) BE 2551 (2008) and (No. 5) 2012, children of parents whose nationality was revoked by the Revolutionary Party No. 337 and who were born before 27 February 2008 could apply for Thai citizenship. Additionally, since 26 February 1992, a stateless person born to the alien parents with illegal immigration status in Thailand could obtain Thai citizenship with approval from the Minister of

Interior. Besides, children of minorities or ethnic groups who have been residing in Thailand for more than 15 years to date (September 30, 1999) could apply for Thai citizenship.

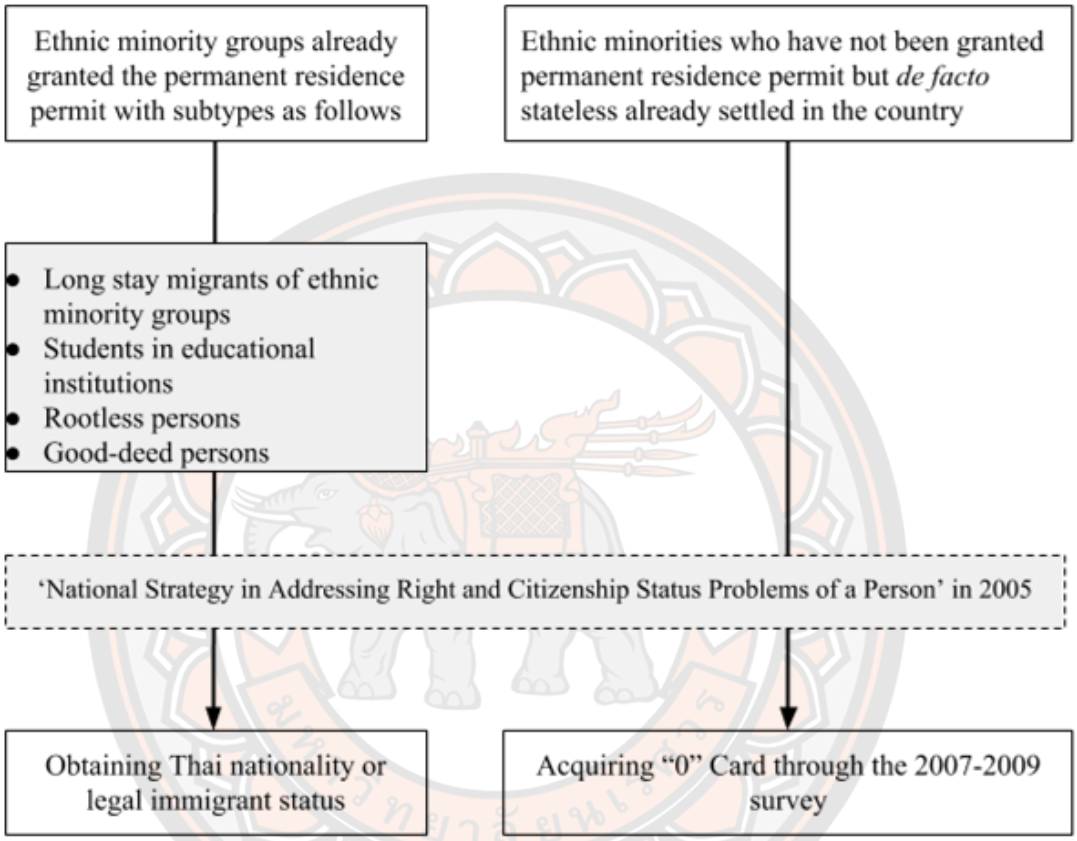


Figure 8 National security policies in dealing statelessness in Thailand

Source: Adapted from Suphanchaimat [15]

Also, a person born to alien patients (other than minorities or ethnic groups) and received the educational qualification (not less than a bachelor's degree from an educational institution in Thailand) could apply for Thai citizenship. Finally, orphaned or abandoned/rootless students who were born and have been living in Thailand for not less than 10 years could apply for Thai citizenship with approval from the Thai Ministry of Social Development and Human Security.

Resolving human rights issues of stateless persons

As mentioned earlier statelessness is the worst possible form of violation of human rights as stateless persons do not have formal access to any government services. To address this, the Thai government has taken so far different policy measures including education, health, employment, freedom of movement, and family foundation [120], which are briefly discussed as follows.

Right to education: On 5 July 2005, the Thai Cabinet approved the draft regulation of the Ministry of Education on education policy for the people without national registration and Thai nationality in the country. Since then basic education (grade 1-9) has been free for all children regardless of their nationality in the country. The Ministry of Education (MOE) also issues 13-digit ID 'G-series' cards for undocumented non-Thai children to enjoy free essential education in the country and to be included into capitation budget accordingly [15]. However, for pursuing secondary education, a non-Thai child needs Thai citizenship. As such, the stateless children must acquire Thai nationality for continuing secondary education in the country.

Right to healthcare: The Thai Cabinet Resolution on March 23, 2010 approved the Ministry of Public Health to take responsibility of stateless people and approved per capita budget from 2010 onwards. Thus, Thai government recognized the right to health of stateless persons in the country. The formal name of stateless insurance is 'Health Insurance for People with Citizenship Problem or HIPCP' which is the main focus of this study (this point is discussed in a later section).

Right to employment: Thai Cabinet Resolutions of 18 October 2016 approved the Proposal of the Review Committee that the stateless people are eligible to do all 27 types of work that were prohibited in the past, including wood carving, handmade textile, woven mat, handmade paper, make a lacquer, Thai musical instrument, making nielloware, making gold ornaments, making Thai Dolls, making monk's alms bowls, handmade silk products, making a Buddha image, making paper umbrellas, making Thai lettering by hand, draw or twist silk with hand, driving a motorized vehicle, sales clerk, auction, cutting or polishing of diamonds or gems, barber or beauty salon, broker or agent, handmade cigarettes, tourist guide, hawking, clerical

staff/secretary, and legal services except for the job duties as the Minister of Labour enforced on 21 June 2018 [134].

Right to freedom of movement: In accordance with the notification of the Ministry of Interior (MOI) on June 15, 2016, stateless persons can move outside the province, where they are registered, with the permission of MOI.

Right to family foundation: Provincial Registrar can register marriage to stateless persons and allow them to register adopted children for Thai nationality. According to Nationality Act 2008, a Thai national who has adopted a child may apply for Thai naturalization for his/her adopted minor child if the Thai national has registered the adoption for a period of not less than five years and bears evidence that the adopted child was born in Thailand. In this connection, such adopted children shall be exempt from the requirements under [135].

Health insurance schemes for Thai citizens

Thailand has become internationally known for its success with universal health coverage (UHC) policy and health sector development. Regarding health development, the country focused on investment in the health delivery infrastructure at the district level and below and on training the health workforce through its five year National Economic and Social Development Plan (NESDP) since the late 1970s. As such, full coverage of district hospitals was achieved by 1990 and was followed by a decade of health-centre development in 1992–2001. By the 2000s, all sub districts had a health centre [107].

The district health system, consisting of health centres and a district hospital, is the backbone of health development. A health centre serves 3,000-5,000 people, whereas a district hospital typically serves 30,000–50,000 people and has 30-150 beds, depending on the local population size. A health centre is staffed by a team of three to five nurses and paramedics, whereas a 30-bed district hospital is staffed by three to four general practitioners, 30 nurses, two to three pharmacists, one to two dentists, and more than 20 paramedics and other administrative staff [107]. With this development of district health system, today, Thai UHC collectively comprises of the three health insurance schemes: Civil Service Medical Benefit Scheme (CSMBS),

Social Security Scheme (SSS) and Universal Coverage Scheme (UCS) [136]. Table 2 shows the key characteristics of these three different schemes.

The CSMBS: The non-contributory CSMBS for government employees was introduced in 1980 by promulgation of a Royal Decree. It also covers the health expenses of dependents of a government employee including parents, spouses, and children younger than 18 years old. A fee-for-service reimbursement model was applied for health care from the start. Services are funded by taxation to compensate for the low salaries of government officials, and the package includes pension, housing benefits, and child allowance. CSMBS is available to government employees and their dependents, formal private sector employees, and also for non-formal, self-employed and low-income people.

The SSS: The Social Security Act was passed in 1990 to cover private employees in the formal sector. The SSS is a tripartite contributory scheme, in which employers, employees, and the government, all pay equal contributions to the Social Security Fund. The contribution is 5% of an employee's monthly salary. The SSS beneficiaries are covered for both health and non-health benefits, such as sickness, death, child assistance, pension, disability compensation, and funeral grants, and unemployment benefits. The Social Security Office (SSO) is in charge of purchasing health services from public and private providers by using a capitation contracting model. This marked the first application of capitation payment in Thailand.

The UCS: There were several schemes intended to help low-income people before launching UCS in 2002. For instance, the Low-Income Card Scheme (LICS) was launched in 1975 to provide free medical care to very poor people in the country. The targeted households, using the MOPH poverty benchmark, were given a card entitling them to access free medical care at MOPH facilities with no co-payment [107].

Table 2 Key characteristics of health insurance schemes under UHC in Thailand

Attributes	CSMBS	SSS	UCS
Legislation	Royal Decree 1980	Social Security Act 1990	National Health Security Act 2002
Eligible group	Public employees and their dependents	Private employees in formal sector	Employees in informal sectors and rest of Thais
Coverage (2016)	~7% of Thais	~15% of Thais	~78% of Thais

Attributes	CSMBS	SSS	UCS
Source of funds	General tax, non-contributory	Tripartite contribution: employee, employer, government	General tax, non-contributory
Budgeting	Open-ended budget	Closed-ended budget	Closed-ended budget
Payment mechanism	Outpatient: fee for service; Inpatient: diagnostic related groups (DRGs) with multiple cost bands	Outpatient: capitation Inpatient: diagnostic-related groups (DRGs) within global budget	Outpatient: capitation; Inpatient: DRGs with global budget; fee schedule for specific high-cost procedures
Purchaser of services	Comptroller General's Department, Ministry of Finance	Social Security Office (SSO), Ministry of Labour	National Health Security Office (NHSO)-a statutory agency in the country
Co-payment	No co-payment is generally required, but only for some inpatient care and for private hospitals	No co-payment is generally, only for services beyond budget schedule	No co-payment is generally, only for private services not related to illness

Note: UHC: Universal Health Coverage, CSMBS: Civil Servant Medical Benefit Scheme, SSS: Social Security Scheme, UCS: Universal Coverage Scheme

Source: Adapted from Suphanchaimat [15], Tangcharoensathien et al. [107], and Permpoonwiwat [137].

The LICS was later extended to elderly people, disabled people, and children younger than 12 years old. It should be noted that migrants or foreign populations, who were identified as 'being poor', were still eligible to buy the card [15].

In 1983, the MOPH initiated the Health Card Project (500 Baht Card), a voluntary community-based health insurance, for a household of up to five members. The benefit package was comparable to that of the LICS. In 1994, to increase enrolment, the Health Card Project became a publicly subsidised voluntary insurance scheme, and the MOPH subsidised 500 Baht per card to include healthy members who would not otherwise buy health insurance [107].

The UCS was established to cover members of the LICS beneficiaries, the Health Card Project beneficiaries who were under voluntary health insurance for the informal sector, and the 30% uninsured population. It is managed by the National Health Security Office (NHSO), a statutory agency established by the 2002 National Health Security Act [107].

Evolution of health insurance for stateless populations in Thailand

Thailand achieved universal health coverage (UHC) in 2002 through launching UCS for Thai citizens who were not covered by CSMBS and SSS. However, undocumented people including stateless persons excluded from the UCS, which is only for Thai citizens [4, 125]. The MOPH therefore shouldered the responsibility for protecting the health of the non-Thais.

Currently, the MOPH runs two public insurance schemes for non-Thai populations: 'Health Insurance Card Scheme' (HICS) for cross-border migrants, 'Health Insurance for People with Citizenship Problems' (HIPCP) for stateless people. The MOPH introduced the HICS in 2004 which was endorsed by the Thai Cabinet Resolution [15]. The Health Insurance Group (HIG) is the main governing body of the HICS. It is under the Office of the Permanent Secretary (OPS) of the MOPH [138]. The HIPCP is the prime focus of this thesis. The MOPH introduced the HIPCP in 2010 to overcome the financial barriers and to ensure the right to health of stateless persons in the country [3, 4].

The HIPCP was intended to cover about 500,000 stateless persons. The HIG is the governing body of the HIPCP policy. The features of the HIPCP is quite similar to the UCS in terms of benefit package, including outpatient and inpatient services, health promotion and disease prevention, high-cost care, and no co-payment at point of care. The purchasing mechanisms of the HICPC are copied from the UCS. Providers are paid on a capitation basis depending on the local number of registered stateless people with the MOI. The characteristics of the UCS and the HIPCP are presented in Table 3.

Table 3 Characteristics of the UCS and HIPCP in Thailand

Characteristics	UCS	HIPCP
Population coverage	~47 million	~450,000
Financing source	General tax	General tax
Governing body	The National Health Security Office (NHSO), the autonomous agency regulated by the MOPH	Health Insurance Group (HIG) of MOPH
Contracting mechanism	Capitation for outpatients and global budget plus DRGs for inpatients; additional fees for specific high priority services; no co-payment by	Capitation for outpatients and global budget plus DRGs for inpatients; additional fees for specific high priority services; no

Characteristics	UCS	HIPCP
	beneficiaries	co-payment by beneficiaries
Benefit package	Comprehensive: outpatient inpatient, accident, and emergency, high cost care (including chemotherapy, anti-retroviral drugs for HIV/AIDS, renal replacement therapy, organ transplants etc.), and health promotion and disease prevention	Comprehensive: outpatient inpatient, accident, and emergency, high cost care (including chemotherapy, anti-retroviral drugs for HIV/AIDS, renal replacement therapy, organ transplants etc.), and health promotion and disease prevention
Contracted health facilities	All public health facilities under the MOPH, majority of non-MOPH public facilities and some private hospitals and community clinics voluntarily contracting with the NHSO	Almost all public health facilities under the MOPH
Capitation budget	~2800 Baht	~1000-2000 Baht (varying by year)

Note: UCS: Universal Coverage Scheme, HIPCP: Health Insurance for People with Citizenship Problem, MOPH: Ministry of Public Health, NHSO: National Health Security Office, DRGs: Diagnosis related groups

Source: Adapted from Suphanchaimat et al. [5]

Empirical evidence on the impact of health insurance on utilization

Previous studies suggest that impacts of insurance on health service utilization are mixed across the countries (Table 4 and 5). Several studies have found a heterogeneous or null effect of insurance on health service utilization or access to care. For instance, regardless of types of insurance, and methodology used, empirical evidence shows that insurance has no effect on utilization in Burkina Faso [139], China [140], Georgia [141, 142], India [143, 144], Mexico [145], and Thailand [5]. On the other hand, irrespective of types of insurance, and methodology used, empirical evidence suggests that insurance significantly increases health service utilization in Cambodia [146], Indonesia [147], Lao PDR [148], Thailand [15, 149-152], USA [153], and Vietnam [154-156]. Evidence also suggests that insurance generally improves the utilisation of curative care (e.g. inpatient utilization) as those studies found a statistically significant positive effect [15, 148, 149, 151-154, 156-161]. In contrast, evidence on preventive care (i.e. outpatient utilization) is less clear as some studies found a significant positive effect [15, 147, 150, 155] while others found non-significant effect [139, 142, 143, 145].

The possible explanations of non-significant effects of health insurance are mainly twofold as previous studies reported: (i) uncovered essential items by the insurance benefit package, and (ii) inpatient policy focus. For instance, Sood et al. found a non-significant effect of community-based health insurance (CBHI) on outpatient utilisation in India. The authors argued that this dilution could be due to the inability of policy to specify the medical conditions covered by the insurance. In other countries, such as, transportation costs in Vietnam [162], and treatments that were not covered by the insurance in Indonesia and Lao PDR [147, 148] might explain the absence of a reduction in out-of-pocket health expenditures leading null effect of the policy. Another study by Yu et al. [163] showed that outpatient utilisation did not increase among the New Cooperative Medical Scheme (NCMS) beneficiaries, regardless of their demographic and geographic characteristics. The authors speculated that the NCMS policy might focus on inpatient services rather than outpatients to achieve its principal goal of preventing catastrophic health expenditure.

Empirical evidence on the impact of health insurance on health status

Previous research suggests that the impact of insurance on health status, measured by different health outcomes, has positive, and null effects across the countries (Table 6 and 7). Evidence, in general, suggests that the health insurance improves neonatal health outcomes, and provides health benefits to the target population.

Table 4 Summary of selected studies reporting impact of insurance on utilisation of inpatient and outpatient services (part-1)

Study	Year	Country	Name of insurance	Chosen outcome
Robyn et al. [139]	2012	Burkina Faso, Nouna District	CBHI	Seeking treatment in general and facility-based professional care (%)
Levine, Polimeni, and Ramage [146]	2016	Cambodia	CBHI	Facility visit (health centers, public hospitals) for first treatment (%)
Babiarz et al. [140]	2010	China	NCMS (Voluntary)	Overall use of medical care (%)
Chen et al. [157]	2014	China	URBMI (Voluntary)	Inpatient and outpatient health services utilization (%)
Cheng et al. [158]	2015	China	NCMS (Voluntary)	Getting adequate medical services when needed (%)

Study	Year	Country	Name of insurance	Chosen outcome
Ramirez et al. [161]	2013	Colombia	Subsidized scheme	Inpatient (hospitalization) and outpatient services (doctor visit for preventive healthcare) (%)
Zoidze et al. [141]	2013	Georgia	MIP (Subsidised scheme)	No. of contact with any type of health provider (contacts/person/year)
Gotsadze et al. [142]	2015	Georgia	MIP (Subsidised scheme)	Inpatient and outpatient utilization (%, count)
Fenny et al. [159]	2015	Ghana	NHIS (Voluntary scheme)	Seeking formal and informal care if got sick (%) during the last four weeks prior to the survey
Sood et al. [144]	2014	India, Karnataka	Subsidised scheme	Inpatient utilization (Rates of admissions in tertiary care facilities)
Raza et al. [143]	2016	India, Uttar Pradesh	CBHI	Outpatient care in the 30 days preceding the survey, and Inpatient care in the 12 months preceding the survey
Prinja et al. [164]	2019	India, Gujarat, Haryana and Uttar Pradesh	RSBY (National Health Insurance)	Inpatient utilization (hospitalization rate in last 365 days)
Sparrow et al. [147]	2013	Indonesia	JKN (Voluntary and subsidised)	Outpatient utilization (visits/person/month)
Alkenbrack and Lindelow [148]	2015	Lao PDR	CBHI	Inpatient and outpatient care in last 12 months (No. of visits, %)
Rivera-Hernandez et al. [145]	2016	Mexico	Seguro Popular (Voluntary scheme)	Diabetes and hypertension treatment and care process indicators (Binary)
Hu [152]	2010	Kanchanaburi Province, Thailand	UCS, Migrant Insurance	Health service utilization when needed (%)
Panpiemras et al. [151]	2011	Thailand	UCS (Subsidized scheme)	Number of inpatient visits, Number of outpatient visits
Ghislandi, Manachotphong, and Perego [149]	2015	Thailand	UHC (Subsidized scheme)	Inpatient admissions, outpatient visits (%)
Limwattananon et al. [150]	2015	Thailand	UCS (Subsidized scheme)	Outpatient utilization
Suphanchaimat et al. [5]	2016	Thailand, Kraburi Province	HIPCP	Inpatient utilization rate
Suphanchaimat [15]	2017	Thailand, Ranong Province	HICS	Outpatient utilization and Inpatient utilization rates
Eguia et al. [153]	2019	USA	Medicaid (Affordable care Act)	Inpatient utilization rate
Nguyen and Wang [154]	2013	Vietnam	Subsidised scheme for children	Number of inpatient admissions per year, number of outpatient contacts per year secondary level public hospital

Study	Year	Country	Name of insurance	Chosen outcome
Palmer et al. [156]	2015	Vietnam	Subsidised scheme for children	Number of inpatient admissions, number of outpatient visits
Nguyen [155]	2016	Vietnam	Voluntary and subsidised scheme (children)	Number of healthcare visits

Note: CBHI: Community-based Health Insurance, NHIS: National Health Insurance Scheme, NCMS: New Cooperative Medical Schemes, URBMI: Urban and Rural Basic Medical Insurance, UCS: Universal Coverage Scheme, UHC: Universal Health Coverage, JKN: Jaminan Kesehatan Nasional (National Health Insurance Scheme), HIPCP: Health Insurance for People with Citizenship Problem, HICS: Health Insurance Card Scheme, MIP: Medical Insurance for the Poor, RSBY: Rashtriya Swasthiya Bima Yojna (National Health Insurance Scheme).

Table 5 Summary of selected studies reporting impact of insurance on utilisation of inpatient and outpatient services (part-2)

Study	Methods/study design	Effect
Robyn et al. [139]	Fixed effect. Data: Household survey. N=2,820	Null
Levine, Polimeni, and Ramage [146]	Instrumental Variable (IV). Data: Randomized study. N=5,000	Positive
Babiarz et al. [140]	Difference in difference (DID). Data: Household Survey. N=6,201	Null
Chen et al. [157]	Bivariate probit. Data: Household survey. N=43,381	Positive
Cheng et al. [158]	Propensity score matching (PSM) and Difference in difference (DID). Data: Household survey. N=6,598	Positive
Ramirez et al. [161]	Poisson and probit with two-stage nonlinear method of moments. Data: Household survey. N=12,975	Positive
Zoidze et al. [141]	Difference in difference (DID). Data: National household database. N=0.22-1.4 million individuals	Null
Gotsadze et al. [142]	Difference in difference (DID). Data: Household survey. N=11,663	Null
Fenny et al. [159]	Multinomial Logit. Data: household survey. N=1,013 patients	Positive
Sood et al. [144]	Regression Discontinuity (RD) and Difference in difference (DID). Data: Household survey. N=986 - 22,796	Null
Raza et al. [143]	Instrumental Variable (IV). Data: Randomized study. N=21,372	Null
Prinja et al. [164]	Cross-sectional study. Data: Household survey. N=62,335 individuals, 12134 households	Null
Sparrow et al. [147]	Difference-in-difference (DID) and Propensity scope matching (PSM). Data: Household survey. N=34,525	Positive
Alkenbrack and Lindelow [148]	Propensity scope matching (PSM). Data: Household survey. N=3,000	Positive
Rivera-Hernandez et al.	Fixed Effects Instrumental Variable (FE-IV)	Null

Study	Methods/study design	Effect
[145]	repeated cross-sectional. Data: Household survey. N=53,07	
Hu [152]	Pre-post comparison. Data: Demographic Surveillance data. N=744-1,713	Positive
Panpiemras et al. [151]	Fixed effects. Data: Household survey. N=63,360	Positive
Ghislandi, Manachotphong, and Perego [149]	Triple Difference-in-difference (DDD) with Propensity Score (PS); Double Robust. Data: Thai Health and Welfare Survey (Household). N=15,022	Positive
Limwattananon et al. [150]	Difference-in-difference (DID) and Generalized Linear Model (GLM); censored quintile regression. Data: Household survey. N=26,557	Positive (elderly) Null (children)
Suphanchaimat et al. [5]	Difference-in-difference (DID). Data: Administrative data. N=7,153 records	Null
Suphanchaimat [15]	Poisson and Two-part model. Data: Administrative data. N=74,722 records (inpatients), N= 1,251,797 records (outpatients)	Positive
Eguia et al. [153]	Pre-post comparison, Data: Administrative database. N=117,241	Positive
Nguyen and Wang [154]	Difference-in-difference (DID). Data: Household Survey. N = 628 – 1,209	Positive
Palmer et al. [156]	Fuzzy Regression Discontinuity (FRD). Data: Household survey. N=18,517	Positive
Nguyen [155]	Fixed Effects (FE). Data: Household survey. N=5,013	Positive

Note: CBHI: Community-based Health Insurance, NHIS: National Health Insurance Scheme, NCMS: New Cooperative Medical Schemes, URBMI: Urban and Rural Basic Medical Insurance, UCS: Universal Coverage Scheme, UHC: Universal Health Coverage, JKN: Jaminan Kesehatan Nasional (National Health Insurance Scheme), HIPCP: Health Insurance for People with Citizenship Problem, HICS: Health Insurance Card Scheme, MIP: Medical Insurance for the Poor, RSBY: Rashtriya Swasthiya Bima Yojna (National Health Insurance Scheme).

For instance, social health insurance improves the health index of its beneficiaries in Cambodia [146], reduces malnutrition among its beneficiaries in China [165], reduces the incidence of low birth weight in Colombia [166], reduces adult mortality in India [144], reduces child mortality [167] and neonatal mortality [168] in Mexico.

Researchers also found positive effect of insurance in Nigeria measured by blood pressure [169], in the Philippines measured by C-reactive Protein (CRP)-positive level and wasting [170], in Thailand measured by infant mortality [109], and in the USA measured by proportions of intermittent and persistent asthma diagnosed [171]. Quimbo et al. found larger health effects of PhilHealth insurance in the Philippines that became manifest in the post discharge period rather than on

discharge. The authors argued that these lagged effects could be due to households' budgetary allocations on food consumption by avoiding health expenditures [170].

However, in some countries, social health insurance schemes demonstrate non-significant effects on health status. For instance, health insurance is not associated in reducing child mortality in Burkina Faso [172], and child mortality [173] and maternal mortality [158] in China, and improving the oral health of children in the USA [174]. Evaluations of insurance (e.g. user fee reduction schemes) in Burkina Faso and Ghana found reductions in catastrophic health expenditures without improvements in health outcomes [139, 175]. Similarly, a study of the expansion of national health insurance in Costa Rica found little impact on long term trends in child mortality [176].

Regarding methods used for measuring the impact of insurance on outcomes, the most commonly applied method is difference-in-differences (DID) followed by an instrumental variable (IV), regression discontinuity (RD), propensity score matching (PSM), and randomized control trial (RCT). Household surveys were major sources of data followed by administrative, and surveillance data (Table 6 and 7).

Table 6 Summary of selected studies reporting impact of insurance on health status (part-1)

Study	Year	Country	Name of insurance	Chosen outcome
Fink et al. [172]	2013	Burkina Faso, Nouna District	CBHI	Child and adult mortality
Levine, Polimeni, and Ramage [146]	2016	Cambodia	CBHI	Health index
Chen and Jin [173]	2012	China	NCMS (Voluntary)	Child and maternal mortality
Cheng et al. [158]	2015	China	NCMS (Voluntary)	Adult mortality
Peng and Conley [165]	2015	China	NCMS (Voluntary)	Malnutrition and food consumption
Camacho and Conover [166]	2013	Colombia	Subsidised scheme	Incidence of low birth weight and new-born health status
Sood et al. [144]	2014	India, Karnataka	Subsidised scheme	Adult mortality
Pfutze [167]	2014	Mexico	Seguro Popular (Voluntary scheme)	Child mortality
Celhay et al. [168]	2019	Mexico	Seguro Popular for under-5	Neonatal and infant mortality, self-reported

Study	Year	Country	Name of insurance	Chosen outcome
			(SMSXXI)	morbidity, and child's height
Hendriks et al. [169]	2014	Nigeria	CBHI	Blood pressure
Quimbo et al. [170]	2011	Philippines	PhilHealth (Voluntary scheme)	CRP-positive level and wasting
Gruber et al. [109]	2012	Thailand	30-Baht scheme	Infant mortality (%)
Coker, Caplan, and Chung [171]	2012	USA	Public insurance (Medicaid and CHIP)	Prevalence of intermittent and persistent asthma diagnosed (%)
Duffy et al. [174]	2018	USA	Medicaid and CHIP	Incidence of having dental caries or untreated caries (%)

Note: CBHI: Community-based Health Insurance, NCMS: New Cooperative Medical Schemes, HIPCP: Health Insurance for People with Citizenship Problem, HICS: Health Insurance Card Scheme, CHIP: Children's Health Insurance Program, CRP: C-reactive Protein, SMSXXI: Seguro Médico Siglo-21st Century Medical Insurance.

Table 7 Summary of selected studies reporting impact of insurance on health status (part-2)

Study	Methods/study design	Effect
Fink et al. [172]	Instrumental Variable (IV). Data: Randomized study. N=12,118	Null
Levine, Polimeni, and Ramage [146]	Instrumental Variable (IV). Data: Randomized study. N=5,000	Positive
Chen and Jin [173]	Difference-indifferences (DID)-Propensity Score Matching (PSM). Data: Census. N=3,977 – 950,681	Null
Cheng et al. [158]	Propensity score matching (PSM) and Difference in difference (DID). Data: Household survey. N=6,598	Null
Peng and Conley [165]	Instrumental Variable (IV) and Difference-in Differences (DID). Data: Household survey. N=8,309	Positive
Camacho and Conover [166]	Regression Discontinuity (RD). Data: Household survey. N=40,931	Positive
Sood et al. [144]	Regression Discontinuity (RD) and Difference in difference (DID). Data: Household survey. N=986 - 22,796	Positive
Pfutze [167]	Weighted Exogenous Sampling Maximum Likelihood. Data: Household survey. N=836,809	Positive
Celhay et al. [168]	Difference-in-difference (DID) and Triple Difference-in-difference (DDD). Data: Nationally representative survey and administrative data. N=11.38million	Positive
Hendriks et al. [169]	Difference-in-differences (DID). Data: Household survey. N=413	Positive
Quimbo et al. [170]	Difference-in-differences (DID). Data:	Positive

Study	Methods/study design	Effect
	Randomized study. N=1,100	
Gruber et al. [109]	Difference-in-differences (DID). Data: National survey. N= 182,543-200,926	Positive
Coker, Caplan, and Chung [171]	Multivariate logit model. Data: Population-based survey. N=11,719	Positive
Duffy et al. [174]	Multivariate logit model. Data: Nationally representative survey. N=6,057	Null

Note: CBHI: Community-based Health Insurance, NCMS: New Cooperative Medical Schemes, HIPCP: Health Insurance for People with Citizenship Problem, HICS: Health Insurance Card Scheme, CHIP: Children's Health Insurance Program, CRP: C-reactive Protein, SMSXXI: Seguro Médico Siglo-21st Century Medical Insurance.

Most relevant studies in Thailand

Paisanpanichkul [177] and Suphanchaimat [178] investigated financial barriers in accessing health services among stateless persons and concluded that the financial barrier led to low healthcare utilization and catastrophic spending among those stateless persons especially those who are living along the Thai-Myanmar border. Additionally, delayed registration process to obtain the 13-digit national ID, which is a precondition for enjoying the HIPCP benefits, put the stateless persons in facing difficulties in obtaining public services including healthcare, education, and employment [3, 4, 117].

Suphanchaimat et al. conducted a process evaluation after two years of the HIPCP's inception and found out multiple challenges of policy implementation in practice [4]. This point is discussed in detail in a later section. Another domestic study by Srithamrongsawat et al. demonstrated that HICS beneficiaries were less likely to use healthcare services (crude utilization rate) as compared to the UCS and the SSS beneficiaries at provincial hospitals in the country [179]. Another domestic study by Hu also reported much lower utilization of health services among ethnic minority migrants compared with Thai counterparts in Kanchanaburi Province [152].

Another study by Suphanchaimat et al. investigated the impact of HIPCP on access to inpatient care for stateless patients [5]. The study found that the HIPCP policy failed to bring about significant changes in the inpatient utilisation of stateless patients. Another recent study by Suphanchaimat showed that the outpatient and inpatient visits increased among HICS beneficiaries compared with the uninsured migrants but the effect was smaller than the UCS beneficiaries [15]. The study also

indicated that the proportion of inpatient (IP) and outpatient (OP) visits were found to be much higher among younger children compared with their older children regardless of insurance status (Table 8).

A study by Hasuwannakit reported that, at the beginning of the policy, the outpatient use rate of the HIPCP patients was 11 times lower (e.g. 0.34 visits/person/year) than the UCS patients (e.g. 3.7 visits/person/year) at a public hospital in northern Thailand. The study also reported that the OP use rate of the HIPCP beneficiaries rose by 38% between 2010-2011. The author recommended that the HIPCP policy should allow its enrolees to change their registration to their actual domicile or working place for facilitating real access to care [3].

Table 8 Comparing utilization among children by age and insurance status

Age group	Uninsured (%)	HICS (%)	UCS (%)	Total
IP Visits				
0-7	2,327 (80)	841 (89)	8,302 (71)	11,470
8-15	578 (20)	109 (11)	3,464 (29)	4,151
Total	2,905	950	11,766	15,621
OP Visits				
0-7	17,560 (78)	8,640 (74)	99,480 (61)	125,680
8-15	4,867 (22)	2,967 (26)	62,978 (39)	70,812
Total	22,427	11,607	162,458 (83)	196,492

Source: Adapted from Suphanchaimat [15]

In sum, the utilization of health services is the most frequently studied topic with the health issues of the stateless population. Regarding impact evaluation, more frequently used comparison groups were the Thai UCS beneficiaries and uninsured migrant population. Regarding accessibility of health insurance, previous studies suggest low coverage with the HIPCP compared to the UCS for Thais regardless of age groups [152, 179]. While health service utilization was found to be higher among insurees compared to uninsured, healthcare service utilization rates of stateless persons were consistently lower as compared with Thai population with UCS.

Knowledge gaps

Several knowledge gaps, on health issues among stateless children, have been emerged from the literature review which needs to be filled by new research as presented below:

(i) While evidence-based information on best practices is useful for policy makers and practitioners to make informed decisions on developmental programmes for vulnerable children like the stateless children, there has been academic knowledge gap on systematic documentation of healthcare policies for stateless population living in Southeast Asian countries, particularly in the Association of Southeast Asian Nations (ASEAN) countries where statelessness is a common problem to some extent.

Chen and colleagues suggest that insufficient structural factors, such as political and economic, social, access to healthcare services, collectively contribute to poor health outcomes of stateless people [180]. A country's obligations to human rights as well as its health policies and programmes potentially address the vulnerability to ill health among stateless population [181].

The ASEAN is a regional grouping that promotes economic, political, and social security cooperation among its ten members: Brunei, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam [182]. Over 40% of the world’s stateless persons currently reside in ASEAN Member States [126]. While having legal nationality is not itself sufficient to guarantee the right to healthcare, not having legal nationality is almost certainly an obstacle for these stateless and undocumented people to some extent [183]. Empirical evidence suggests that stateless and undocumented people without health insurance are less likely to utilize healthcare services compared with their native counterparts resulting in catastrophic health expenditure to those uninsured vulnerable people [5, 15]. At the same time, extending healthcare access for undocumented individuals may help reduce emergency care and overall healthcare costs [184].

A number of existing studies have examined the broader health issues across ASEAN countries: the diversity and transitions of health and healthcare systems [185], the shortages and male distributions of health workforce [186], the emergence and challenges of infectious diseases [187], the rise of non-communicable diseases

[188], the maternal and child health [189], and the health financing reforms to overcome challenges in achieving universal coverage [190]. The commonality of these review papers [185-190], is the comparison of the health service-related issues and challenges across the 10 ASEAN member states. Van Minh et al. have evaluated the progress towards universal health coverage regarding population coverage, service coverage and the level of financial protection across ASEAN countries [191] while Guinto et al. have examined the inclusion of the low skilled migrant workers in government-run health insurance across ASEAN countries [192]. McMichael and Healy have examined health needs, access barriers, and policy responses to cross-border migrants in five ASEAN countries [193].

However, none of these reviews focused on healthcare policies for stateless and undocumented people living in ASEAN countries. Additionally, the ASEAN Human Rights Declaration (AHRD) promotes “health for all” that mirrors the tenet of universal health coverage (UHC) [8, 194]. The information on healthcare policies for stateless people across ASEAN countries is largely unknown in the literature.

(ii) There have been a few studies, possibly none, conducted on the health issues of stateless children in Thailand focusing on health service utilization and health outcomes by health insurance affiliations of children. The previous studies focused on the process evaluation of the HIPCP policy, and the impact of the HIPCP on inpatient utilization [4, 5]. However, none of the prior studies explicitly emphasized on both healthcare utilization and health outcomes of stateless children insured with the HIPCP, which could be useful information for policy decision-makers to adopt appropriate health policy for stateless children in the country.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

This section presents the research methods by the objectives of this research. For instance, a scoping review was conducted for objective-1 while quantitative analyses (e.g. univariate analysis, multivariate analysis) were employed for objective-2 and objective-3. This section begins with summarizing the study methods by objectives followed by explaining detailed methods in subsequent sub-sections under each objective.

Summary of study methods

Table 9 summarizes the methods of study by study objectives and expected outcomes of each objective.

Table 9 Summary of methods of the study by the objectives of the study

Objective	Methods	Expected outcome
To summarize the health policies for stateless populations in ASEAN countries	Tools: Scoping review Data source: Published and unpublished articles on review topic on electronic databases Participants: Stateless persons in ASEAN countries	Clearly identify important health services for stateless population in ASEAN countries
To compare healthcare service utilization of children by insurance status: UCS, HIPCP, and uninsured	Data: Five full years (2013-2017) health facility-based data from "43-files database" from Tak PPHO. Participants: Children aged 0-15 years old with the stateless insurance, the UCS children, and the uninsured Outcomes: Service utilization rates (visits/person/year, admissions/person/year). Univariate analysis: Mean, median, SD, IQR. Significance tests: ANOVA, Kruskal-Wallis, and Chi-square test Multivariate analysis: Poisson and Negative binomial regression for count outcome variables.	Quantifying the magnitude of health service utilization rate among insured stateless children compared with uninsured

Objective	Methods	Expected outcome
To compare the presence of cases with diseases, and death in children by insurance status: UCS, HIPCP, and uninsured	Data, participants, statistical tests are same as mentioned above Outcomes: Presence of cases with 40 diseases (yes/no), incidence of death (yes/no). Multivariate analysis: Multiple logistic regression for binary outcome variables	Quantifying the magnitude and severity of risk of most frequently found childhood diseases and incidence of death among insured stateless children compared with the UCS and uninsured children

Methods for objective-1: Scoping review

According to the Oxford English Dictionary, 'review' means 'to view, inspect, or examine a second time or again'. There are 14 common types of reviews and scoping review is one of them [195]. This type of review provides a preliminary assessment of the potential size and scope of the available research literature to identify the nature and extent of research evidence. This type of review is likely to inform policymakers as to whether a full systematic review is warranted. However, scoping reviews cannot usually be regarded as a final output in their own right due to its inherent limitations such as they typically do not include a process of quality assessment [195]. The researcher conducted a scoping review following six steps as recommended by Arksey and O'Malley [196] for serving the purpose of objective-1: to summarize the health policies for the stateless populations in ASEAN countries. The six-stage scoping review protocol were as follows: (i) specifying the research question, (ii) identifying relevant studies, (iii) study selection/inclusion criteria, (iv) charting the data, (v) collating and summarizing the findings, and (vi) stakeholder consultation. The details methods are discussed in the results section (Chapter 4).

Methods for objective-2 and 3: Quantitative analyses

The researcher employed quantitative analyses using administrative data to serve the purpose of objectives two and three of the study. As such this section subsequently discusses study settings (Tak Province), data sources, study participants, study variables, data cleaning/management, statistical methods used, ethical considerations, and statistical package used for data analyses as follows. While this

chapter presents a detailed description of the methods used for quantitative analyses, methods of each objective are briefly explained in the results section (Chapter 5).

Tak Province

Geography: Tak Province has the context of the area as the mountainous landscape and the plains; therefore, the health management is divided into two groups: In the west along the border of the Thai-Myanmar and 4 districts in the east. With the difference in geography, socioeconomic, lifestyle and beliefs have a profound effect on healthcare management. Tak Province has been selected as the study site for data collection. The province is located in the north of Thailand. It has a long boundary (560 km) with the Kayin State of Myanmar.

Tak Province is composed of nine districts (*amphoe*): (i) Muang Tak, (ii) Ban Tak, (iii) Sam Ngao, (iv) Mae Ramat, (v) Tha Song Yang, (vi) Mae Sot, (vii) Phop Phra, (viii) Umphang and (ix) Wang Chao. Of the nine administrative districts, the four border districts with the highest number of stateless populations are Tha Song Yang, Mae Ramat, Phop Phra and Umphang. These four districts are predominantly rural agriculture-based districts. This may imply that the major occupation of stateless populations is predominantly agriculture. The Asian Highway (AH1) and the Thai-Myanmar Friendship Bridge have linked Mae Sot and Myawaddy Town in Myanmar, which has made the Tak Province a thriving hub of border trade and industry in the lower north of Thailand [197].

Moreover, the population pattern is very dynamic and unstable because of a large migration across the Thai-Myanmar border districts such as Tha Song Yang and Mae Sot [198]. One of the 18 migration checkpoints on the Thai-Myanmar border is located in Tha Song Yang District. In 2013, 2264 migrants from Myanmar were recorded at this checkpoint [199].

Umphang District is located in the southernmost district of Tak Province which is located 247 km from Tak and 700 km from Bangkok. It is one of the least accessible districts in Thailand and there are 1,219 bends in the road. It can be reached only by a four-wheel-drive car [200]. Most of Umphang is mountainous, geographically separated from the east part of Tak Province by the Thanon Thongchai Range. A large number of the 28,000 population are hill tribes with Karen people

making up the largest proportion [201]. The Karen was the original settlers here before Thais began to migrate into the area, and the names of many places are in Karen language. The western edge of the district has a long boundary with Myanmar.

Ethnicity: The total population of Tak Province is about 540,000 [202]. It hosts 235,820 cross-border migrants from Myanmar which is the highest among the three Thai-Myanmar inland border provinces such as Ranong (116,883) and Chiang Rai (153,494) [203]. Tak Province has 157,980 ethnic populations [204, 205]. The Karen (69%) makes up the largest group, followed by Mon (19%) and highland Thai (7.7%), respectively. Lahu, Lisu, Mien and Akha comprise less than 5% of the ethnic population of Tak Province [197]. Most of these ethnic populations are stateless persons and the proportion of stateless to native Thai is the second highest in Tak Province after Ranong Province [15].

The Karen ethnic communities reside in the hard-to-reach areas where they lack access to health promotion services. Karen people use their native language and most of the senior adult population in the community cannot read Thai script. This forms a barrier to health education provided by the national health programme [206]. The Lisu ethnic groups mainly reside in Umphang District. The Lisu are part of the larger Sino-Tibetan ethnic family and are thought to have originated in north-western Yunnan and the Tibetan Plateau, and in Shan State of Burma [99].

Refugee camps: Tak Province also has temporary shelters (also known as “camps”). The shelters host over half of the displaced persons (also known as “refugees”) seeking refuge in Thailand as a result of the internal conflict in Myanmar. The three refugee camps in Tak Province are Mae La Camp in Tha Song Yang District, Umpiem Mai Camp in Phop Phra District and Nupo Camp in Umphang District [197].

Occupation: Rapid economic growth of both agricultural and non-agricultural sectors has led to a labour force shortage in Tak Province. Agriculture is a major part of the Tak economy which produces rice, corn, vegetables, fruits, beef, tilapia, and other foods. Non-agricultural sectors (industries) in Tak include mining, granite, and jewellery. The majority of registered stateless persons are employed in garment and textile factories followed by the agriculture sector, general daily-labour, and domestic

work. The proportion of the female stateless population, registered with MOI, in Tak Province has always outnumbered the male stateless population [197].

For the sake of this study only four districts: Tha Song Yang, Mae Ramat, Phop Phra and Umphang, of Tak Province have been purposely selected considering geographical context (northern Thailand), concentration of stateless children, and given time and resources available for study (less than a year after approval of the thesis proposal). The selected districts are shown in Figure 9 where Mae Ramat, Tha Song Yang, Phop Phra, and Umphang are coded as four (4), five (5), seven (7) and eight (8) in Tak Province.

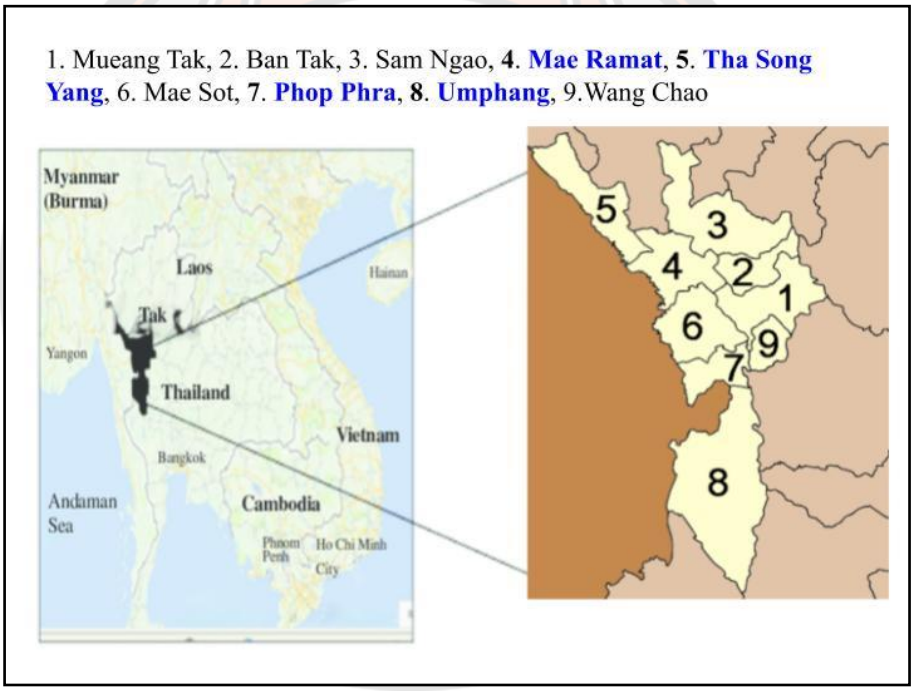


Figure 9 Sources of secondary database as shown on the map

Note: Mae Ramat, Tha Song Yang, Phop Phra, and Umphang are the selected districts for the study which are coded as four (4), five (5), seven (7) and eight (8) in Tak Province map

Source: Adapted from Sonkong et al. [207]

Data sources

Quantitative data: Routinely collected national level health database, popularly known as the "43-files database" with the Health Data Center (HDC), were

used in the study. The data is hosted by the Bureau of Planning and Strategy (BPS) under the Thai Ministry of Public Health (MOPH). BPS has been collecting these administrative data for the purpose of reimbursement and health service since 2007 when it was called the "12-files database" [208]. The data included the health records of children from Tak Provincial Public Health Office (PPHO) from January 1st, 2013 to December 31st, 2017. The electronic database included demographic data (e.g. date of birth, sex), insurance affiliations of patients, inpatient admission, outpatient visits of children, date of visit, outpatient and inpatient diagnostic codes (ICD-10 Thai Modification), and death records of children.

Regarding the relevance of quantitative data, unlike the data stored at the National Health Security Office (NHSO), data stored at the Provincial Public Health Offices (PPHO) captures stateless patient records, which is the main focus of the study, along with UCS and uninsured patient data for administrative purposes [15].

Qualitative data: At the inception phase of this study, the researcher collected qualitative data on health issues of non-Thai people living along the Thai-Myanmar border districts, namely Mae Sot, Phop Phra, and Umphang in Tak Province from 13-16 March 2018. The researcher visited two public district hospitals (e.g. Phop Phra and Umphang), one private clinic (e.g. Mae Tao Clinic), and one Children's Development Center (CDC). The researcher had an informal group discussion with the management team, comprised of director and administrative staff, from each of the two district hospitals and the clinic. As the research was a foreigner and had limited real time communication skills in Thai, a bilingual expert in this field facilitated the whole informal discussion as well as multimedia presentations. There were five informal discussions including one with the director of a vocational school called Umphang Wittayakom School (UWS) in Umphang district. The directors and managers, with decade-long field experience, shared their lived experiences about the health issues of non-Thais including migrants and stateless people residing along the border area. From these multiple discussions, the researcher gained valuable insights about the context of stateless problems in the country. As such, in this thesis, the researcher has used his lessons learned from the informal discussions to interpret and/or supplement the findings of the quantitative data analyses. In this thesis, this

qualitative information is referred to as “Informal discussion” especially in the discussion section (Chapter 6).

Study participants

The researcher included children aged 0-15 years who visited health facilities in selected districts: Mae Ramat, Phop Phra, Tha Song Yang, and Umphang, between January 1, 2013 and December 31, 2017.

Categorization of participants: Three types of children were included in this study based on their insurance affiliation: uninsured, stateless, and UCS. In the “43-files database”, 4-digit codes are used to differentiate beneficiaries by their insurance affiliations (e.g. variable called ‘Insurance Type’). In this case, ‘8300’, ‘8301’, ‘8302’, and ‘8308’ codes were used for stateless insurees, ‘0100’ code was used for UCS insurees, and ‘8200’, ‘8400’, ‘8401’, 8405’, ‘8406’, and ‘9100’ codes were used for uninsured children to be categorized (see Appendix B for more details). The uninsured are those who are the children of undocumented or irregular migrant workers in the country, mainly from neighbouring countries, such as Cambodia, Myanmar, Lao PDR, and Vietnam, without health insurance. They are supposed to pay out-of-pocket (OOP) and/or enjoy fee waiver from humanitarian grounds, if they cannot afford their medical bills, at the government health facilities [5, 15]. It should be noted here that UCS children were included in the study as they are the most relevant comparable group used in the previous studies [5, 15].

Study variables

Three sets of variables were used in the analysis: outcome variable, exposure variable, and covariates/confounders. The outcome variable was outpatient utilization rate (visits/person/year). The exposure variable was the three levels of insurance status (uninsured, stateless, UCS). Aside from the exposure, the analysis also took into account the effect of the key confounders, namely age (years), sex (male/female), domicile (districts), facility level (health center/district hospital), and year of utilization (2013-2017). Table 10 gives a detailed description of outcome, exposure, and confounders used in quantitative analysis.

Table 10 Description of variables used in the quantitative analysis

Variable	Type	Unit	Description of variable management
Outcomes:			
Outpatient (OP) utilization rate	Continuous	Visits/ person/ year	OP utilization rate is defined as the maximum number of outpatient department visits by an individual to health facilities within one year for care. The minimum OP rate should be one visit/person/year as data was retrieved only for those who visited the facility at least one time between 2013 and 2017.
Inpatient (IP) utilization rate	Continuous	Admissions/ person/ year	IP utilization rate is defined as the maximum number of admissions by an individual to a District Hospital within one year for inpatient care. The minimum IP utilization rate should be one admission/person/year as data was retrieved only for those who were admitted to hospital at least once between January 1, 2013 and December 31, 2017.
Lengths of stay (LOS)	Continuous	days/person/ year	LOS was calculated by subtracting the admission date from discharge date. To correspond with the IP use rate, LOS also calculate on a yearly basis.
Presence of diseases (40 diseases)	Binary	Proportion	Presence of diseases among those who were hospitalized between January 1, 2013 and December 31, 2017 was identified using the International Classification of Diseases, Tenth Revision Thailand Modification (ICD10-TM) codes. The outcome was coded 1 for diagnosed with all-cause pneumonia, 0 for otherwise. A comprehensive list of 40 types of disease and/or disease categories is presented in Appendix H.
Catastrophic illness/admission	Binary	Proportion	Catastrophic illness/admission was defined as having a fifth digit of diagnostic-related groups (DRGs) of 2 or above (e.g. an admission with DRGs of XXXX2, XXXX3, or XXXX4 was coded 1, coded 0 otherwise). Note that DRG is composed of five digits. The last digit, ranging from 0 to 4, reflects the degree of severity for that admission (1 = mild, 2 = moderate, 3 = severe, 4 = catastrophic).
Death/non-death	Binary	Proportion	All-cause death among those children who registered with the selected health facilities between January 1, 2013 and December 31, 2017. The outcome was coded 1 for death, 0 for otherwise.
Exposure:			
Insurance	Categorical	Proportion	The exposure variable was the insurance type of

Variable	Type	Unit	Description of variable management
affiliation			children, coded 0 for the uninsured, 1 for the stateless, and 2 for the UCS children.
Covariates:			
Age group	Categorical	Proportion	Five age groups were created: 0-1, 2-3, 4-5, 6-10, and 11-15 years. The age groups were used as confounding factors in the multivariate model. Note that the date of birth was used to calculate age on visit date or admission date.
Sex	Binary	Proportion	Male was coded as 0, female as 1. Sex was used as a confounding factor in the multivariate model
Facility level	Binary	Proportion	There were mainly two levels of facility in a district: district hospital at district level and health centers at sub-district level which is the lowest unit of care without inpatient facility. Health center is also called *Tambon* (sub-district) Health Promotion Hospital. The facility level was coded as 0 for district hospital and 1 for health center.
Domicile	Categorical	Proportion	District was used as a proxy for permanent residences (domiciles) of children. The district variable was coded as 0 for Mae Ramat, 1 for Phop Phra, 2 Tha Song Yang, 3 for Umphang, and was included as a confounder in the multivariate analysis. Note that Mae Ramat is the oldest district in Tak Province, which was established in 1951, and the youngest district is Phop Phra (established in 1987).
Year of utilization	Categorical	Proportion	The year variable was converted to factor variable and coded 0 for 2013, 1 for 2014, 2 for 2015, 3 for 2016, and 4 for 2017. Year was included in the model to capture time dimension of outcome and to see change over time if any

Data cleaning

As secondary data have been collected for different purposes, they needed to be cleaned before the statistical analyses. The PPHO retrieved data from the "43-files database" only for those children who were born between January 1, 1999 and December 31, 2014 and who ever registered with health facilities for health services between January 1, 2013 and December 31, 2017. Therefore, data was primarily filtered and cleaned at the source. The PPHO also provided corresponding facility codes (Appendix A) and insurance types codes (Appendix B) that linked to the raw

data for analysis. As such, the researcher matched corresponding values to create levels of facility levels, and district/domicile variables and exposure variables, respectively. Regarding outcome, to ensure an accurate count of utilization, outpatient visits were limited to a maximum of one visit per person per day regardless of multiple principal diagnosis codes appearing in the dataset for individual patients. The common identifiers for linking between data files were 100% complete. Linked variables, namely facility code (HOSPCODE), personal identification number (PID) were used to merge relevant files.

Insurance status (exposure variable) was cross-validated by checking the first digit of redacted first three digits national identification number in the "43-files database" that should have corresponded to the respective insurance affiliations. For instance, insurance status code "83XX" should correspond to national ID "0XX" to be stateless insurance as explained in the code list (Appendix C). After cross-checking, the researcher found that the insurance status codes perfectly corresponded to the respective first digits of the national identification numbers. Thus, the author validated the reliability of the classification of the insurance status of children which is the key categorical variable for data analysis.

Duplicated observations and other insurance beneficiaries, namely civil servant medical benefit scheme (CSMBS), social security scheme (SSS), and Traffic insurance were dropped from the data analysis. A flow chart has shown this point in the later sections. The hospital codes (HOSPCODE) and personal identification number (PID) within the facility were used as unique identifiers for data analyses and/or linking between data files as recommended by the PPHO. Finally, some critical mistakes, such as if anyone changed insurance status (e.g. switching UCS to uninsured and vice-versa) were dropped from the analysis to avoid misclassification of exposure variable.

Statistical methods

Univariate analysis: Univariate analysis summarizes individual variables in a given data set. Univariate analysis is the simplest form of statistical analysis. The basic data analyses include normality tests using both graphical and statistical

methods. Graphical methods included box-plot, histogram, density plot while the statistical method included mean, median, standard deviation (SD), and interquartile range (IQR).

Following the distribution of observational data, parametric and/or nonparametric tests were performed. For instance, one-way ANOVA (analysis of variance) was done for normally distributed continuous variables for comparing three groups followed by independent t-tests for comparing two groups if ANOVA finds significant difference. Similarly, the Kruskal-Wallis test was performed for non-normally distributed continuous variables for comparing three groups followed by Mann-Whitney U test for comparing two groups if Kruskal-Wallis test/rank sum test finds significant difference. Additionally, Chi-square test was performed for comparing categorical variables by two or more groups.

Multivariate analysis: Univariate analysis can yield misleading results while multivariate analysis is more appropriate. Multivariate regression analysis is a family of methods to associate predictor(s) to an outcome variable. Primarily, there are various types of variables such as binary, categorical, and continuous variables [209, 210]. For example, annual income outcome is a numerical measure and can be classified as a continuous variable. This outcome should be analysed using linear regression model (also called Gaussian regression). Similarly, a binary outcome variable, such as death or alive as an example, should be analysed as logistic regression model, while ordinal variable should be analysed using an extent of logistic regression (such as ordinal or polytomous logistic regression model). Another potential outcome is time-to-event variable, such as time to disease progression, time to death. These outcome variables are also continuous, but it would only be known to the end of a follow-up period. This type of outcome can be analysed using survival analysis (such as Cox proportional hazard model).

Count data (for example, the number of visits per person per year, number of admissions per person per year) is a type of outcome which is often used in medical research. In this case, Poisson regression model could be used to analyse count data. An empirical guidance for basic family of regression analysis is shown in Table 11.

Table 11 An empirical guidance to regression analysis

Regression model	Classification of variables	
	Dependent	**Independent**
Linear regression model	Continuous	Various types
Logistic regression model	Binary	Various types
Ordinal or polytomous regression model	Ordinal	Various types
Cox-proportional hazard model	Time-to-event	Various types
Poisson regression model	Count data	Various types

Source: Adapted from Kleinbaum et al. [211]

Regression model for count data analysis: Count data are often analysed incorrectly with ordinary least squares (OLS) regression while the Poisson regression under Generalised linear models (GLMs) is preferred. GLMs provide a powerful tool for analysing count data. However, researchers generally need to follow some steps for appropriate model selection. The starting point for count data is a GLM with Poisson-distributed errors, but not all count data meet the assumptions of the Poisson distribution (i.e. mean equal variance). Thus, the research needed to test if the variance is greater than the mean. The basic steps to determine which GLM were used to analyse count data are briefly described as follows.

Count models were estimated using the maximum likelihood (ML) estimator. The researcher started with Poisson regression model for count data analysis assuming the mean equals variance. Then the researcher tested for the goodness-of-fit of the model with a chi-square test based on the residual deviance and degrees of freedom. Then the research checked observed value and the result was significant ($p<0.05$) the model was not good and vice-versa. The researcher applied Negative Binomial Regression Model if overdispersion was found in outcome data where variance is larger than the mean. The Poisson regression, and the Negative binomial regression were performed for count outcome variables to estimate the effect of exposure by controlling for potential confounders [15].

Logistic regression for binary outcome data: Multiple logistic regression was performed for binary outcome variables to estimate associations between outcome and exposure and other predictors. The reasons for using the logit model are discussed as follows.

Most of the stateless children (patients) and uninsured children had very few study visits (i.e. 1-2 visits per the life course) and the researcher had very few data with a reasonable time span. Given this situation a binary logistic regression model was considered to measure the odds ratio (OR) of the insured stateless children and UCS children compared with uninsured children. Additionally, for the comparison of risks between groups, the odds ratio (OR) is a commonly used statistical method in the medical literature [212]. It served the purpose of the study objective-2 because an odds ratio is a relative measure of effect or association, which allows the comparison of the intervention group of a study relative to the comparison group. Odds are the ratio of the probability of an event occurring in a group (i.e. death, disease) divided by the probability of that event not occurring (i.e. survive, absence of disease).

Goodness of fit test: The Goodness of fit test was performed to choose a final model. For this, the likelihood ratio test (LRT) was applied to test the global null hypothesis (all regression coefficients are equal to zero). Pearson's chi-square test was performed to assess fit or lack of fit of the regression model. The tests produce a p-value. A null hypothesis was rejected if the p-value was low ($p<0.05$) and vice-versa [213]. The Akaike information criterion (AIC), an estimator of the relative quality of statistical models for a given set of data, the value was compared for selecting the final model in which a lower AIC value indicated better fit the data [214].

Ethical considerations

Ethical approval: This research was undertaken as part of the author's doctoral degree at Naresuan University in Thailand. The study was reviewed and approved by the Naresuan University Institutional Review Board (NUIRB). The Institutional Review (IRB) reference number is IRB No. 035/61 and the Certificate of Authentication number is COA No. 039/2019 (dated 23 January 2019). An official letter from the Naresuan University Graduate School was issued requesting the Provincial Public Health Office (PPHO) in Tak Province to provide required health facility-based data from the four districts: Mae Ramat, Tha Song Yang, Phop Phra, and Umphang.

Confidentiality and anonymity of participants: The important aspect that should be considered while using administrative and/or claimed databases is the need

to balance data access with need to protect patient confidentiality [215]. As such to adequately protect identifiers and prevent disclosure of confidential information, identifying information was destroyed at the earliest opportunity as recommended elsewhere [208]. This study was based on secondary data where voluntary participation and informed consent of human subjects were irrelevant. For instance, the researcher retrieved secondary health records of children from the PPHO. For the confidentiality and anonymity of the subjects, the author requested for de-identified data of the subjects after meeting the inclusion criteria.

Statistical software

All data analysis was done using an open source statistical software R (version 3.5.3). The major advantage of using R was the availability of R-scripts/codes for regression modelling along with a video tutorial [216]. As such, all R-reproducible codes for data analysis were available on websites which were easy to follow. The grammar of graphics (ggplot2 function) [217] for visualisation of data was another unique feature of R which was applied to present statistical results.

CHAPTER IV

RESULTS: SCOPING REVIEW

Introduction

While having legal nationality is not itself sufficient to guarantee the right to healthcare, not having legal nationality is almost certainly an obstacle for these stateless and undocumented people to some extent [183]. Empirical evidence suggests that stateless and undocumented people without health insurance are less likely to utilize healthcare services compared with their native counterparts resulting in catastrophic health expenditure to those uninsured vulnerable people [5, 15]. At the same time, extending healthcare access for undocumented individuals may help reduce emergency care and overall healthcare costs [184].

A number of existing studies have examined the broader health issues across ASEAN countries: the diversity and transitions of health and healthcare systems [185], the shortages and male distributions of health workforce [186], the emergence and challenges of infectious diseases [187], the rise of non-communicable diseases [188], the maternal and child health [189], and the health financing reforms to overcome challenges in achieving universal coverage [190]. The commonality of these review papers [185-190], is the comparison of the health service-related issues and challenges across the 10 ASEAN member states. Van Minh et al. have evaluated the progress towards universal health coverage regarding population coverage, service coverage and the level of financial protection across ASEAN countries [191] while Guinto et al. have examined the inclusion of the low skilled migrant workers in government-run health insurance across ASEAN countries [192]. McMichael and Healy have examined health needs, access barriers, and policy responses to cross-border migrants in five ASEAN countries [193]. However, the information on healthcare policies for stateless people across ASEAN countries is largely unknown in the literature. To fill this knowledge gap, a scoping review recommended by Arksey and O'Malley [196] was conducted to identify and summarise the existence and scope of government health insurance policies for stateless and undocumented people across the 10 ASEAN countries.

Methods

The researcher adopted the guidance for scoping reviews developed by Arksey and O'Malley [196] and modified by Anderson, Allen [218], Levac, Colquhoun [219], and Daudt, van Mossel [220], further refined by Peters, Godfrey [221]. The study was based on the six-stage scoping review protocol as follows: (i) specifying the research question, (ii) identifying relevant studies, (iii) study selection/inclusion criteria, (iv) charting the data, (v) collating and summarizing the findings, and (vi) stakeholder consultation. These steps are discussed below.

The research questions: The review focused on answering the following research questions: (i) who are the stateless people living across ASEAN countries? (ii) what are the national health policies for stateless people across ASEAN countries? (iii) which countries have ratified and/or adhered to the core international human rights instruments recognise the right to health?

Identification of relevant studies: The researcher performed a systematic search on electronic databases including PUBMED, CINAHL, SCOPUS, Web of Science, and Wiley Online Library. Additionally, a grey literature search for unpublished policy documents and reports were undertaken from Google Scholar, relevant websites such as the WHO Library (South-East Asia Regional Office), Global Health Library, United Nations High Commissioner for Refugees (UNHCR), Department of ASEAN Studies, and Ministries of Health in ASEAN countries. Full-text articles and publications were retrieved through manual searching, citation tracking, and snowballing from reference lists and expert consultations [222].

A combination of search terms was used to increase the precision of finding the most relevant articles from the aforementioned databases (Table 12). The search terms were developed based on three broad concepts: population (stateless populations), issues (health policies/regulations), and settings (10 ASEAN countries). Stateless populations include both de jure stateless persons, where the states in question do not consider these resident populations as their nationals, and de facto stateless persons who do not have ineffective nationality even though they may be long-term residents, or even having been born in their country of residence [223]. The terms stateless persons, stateless people, and stateless populations are used interchangeably in this article.

Table 12 Searching terms using three concepts: populations, issues, and settings

Concept		Key term		Alternative terms
Populations		“stateless populations”	OR	"stateless people" OR Rohingya* OR "hill tribe*" OR "undocumented people"
Issues	AND	"healthcare policy"	OR	"health care" OR "public health" OR "health policy" OR "health insurance" OR "health financing" OR "health systems"
Settings	AND	ASEAN	OR	Brunei OR Cambodia “Lao PDR” OR Indonesia OR Malaysia OR Myanmar OR Philippines OR Singapore OR Thailand OR ““Viet Nam” OR Vietnam OR SEA OR “Southeast Asia”
	NOT			Africa OR Bangladesh OR Europe OR Kenya OR Roma OR "South Sudan" OR Uganda

Note: * truncation for precise results of terms/words with variant spelling; AND, OR, NOT are the Boolean operators used for advanced searching

Inclusion criteria: To be included, articles must meet the following criteria: (i) providing information about defining stateless populations in the country, (ii) providing information on national level health policies focussing on health financing for stateless and/or undocumented people in the country or providing information on ratification and/or adoption of international human rights treaties relating to the right to health, (iii) involving any of the 10 ASEAN countries: Brunei, Cambodia, Lao PDR, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam, (v) irrespective of languages and date of publication. The researcher followed PRISMA guidelines for conducting the scoping exercise [224, 225].

Charting the data: A standardized extraction form was used to extract key information from each of the included papers in the review with: (i) author, date, (ii) country of origin of publication, (iii) title of article, (iv) type of articles, and (v) health policies/regulations/laws/international human rights instruments. Then the extracted information was coded using Microsoft excel and synthesised afterwards. Two authors extracted and cross-checked data collected.

Collating and summarizing the findings: A narrative summary of findings was guided by our three research questions: defining stateless populations, healthcare policies for stateless populations, and ratification and adherence to international human rights instruments relating to the right to health. Finally, the researcher

synthesised the summary of results with common and distinctive features found in the above three subsections.

Stakeholder Consultation: The researcher conducted a stakeholder consultation exercise to have an expert opinion on the accuracy of the review findings. For this, the researcher shared our preliminary findings with stakeholders in the field (e.g. officials at the Ministry of Health, UNHCR, WHO Country Office) via email to validate the review results, identify additional sources of information, and incorporate opportunities for knowledge transfer [196, 219, 226]. The researcher received feedback/inputs from stakeholders in each of the ten ASEAN countries and incorporated their inputs on preliminary findings and revised the results accordingly.

Results

Selected studies for review

The literature search resulted in 464 records. Of these articles, 87 were excluded based on duplication, leaving a total of 377 articles for further screening. After screening 74 potentially relevant full-text papers, 26 were excluded for not being related to health policy for stateless population, 10 were excluded for being related to health issues of citizens, 10 were excluded for being related to health issues of minority population but not related to stateless people, and 4 were excluded for being related to migrant health determinants. Subsequently, 24 papers were included for review. The type of these documents were journal articles (4), review articles (4), journal editorials (1), and journal proceedings (1), website articles on health policy, (2), and health policy and human rights related reports (12). The overall article-screening process is presented in PRISMA flow diagram (Figure 10).

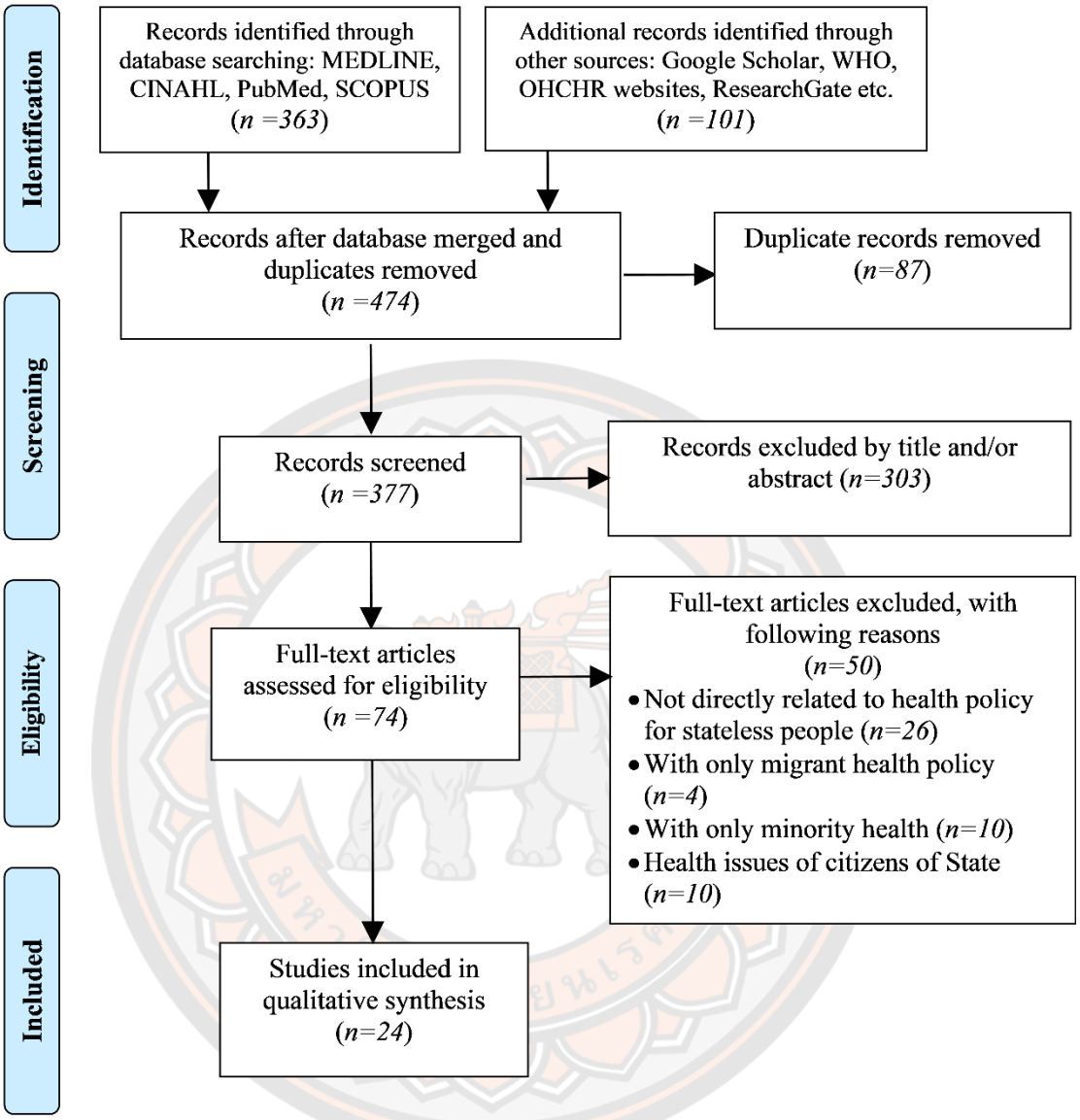


Figure 10 PRISMA flow diagram

Note: PRISMA stands for Preferred Reporting Items for Systematic Review and Meta-Analysis

Source: Author adopted from Moher et al. [224]

Study characteristics

Of 24 studies, nine exclusively focused on stateless persons including hill tribes [4, 5], stateless Rohingya [67, 70, 227], stateless refugees [228, 229], and those people who are at risk of statelessness [230, 231]; and five studies focused undocumented people including low skilled migrant workers [19, 192, 193, 232, 233].

In respect of health policies, nine studies focused on government-run health insurance for stateless and undocumented people [4, 5, 19, 192, 193, 228, 229, 232, 233]; three focused on legal barriers in accessing healthcare [67, 70, 227]; and two studies focused on the right to health following international human rights instruments [230, 231].

Regarding frequency of origin of publication, most frequently appeared countries were Malaysia and Thailand [4, 5, 19, 192, 193, 227-231, 233], followed by the Philippines, Myanmar [67, 70, 192, 193, 230-232], Cambodia, Indonesia, Lao PDR, Vietnam [192, 193, 230, 231], and Brunei and Singapore [192, 230, 231].

With reference to the type of reviewed studies, only four studies were empirical studies [4, 5, 19, 228], while the rest of the articles were related to health policies for stateless and undocumented people including the right to healthcare. In addition, we have included most recent Concluding Observations of the respective United Nations Treaty Bodies to the Conventions, reflecting implementation and/domestication of international human rights instruments ratified by the state parties in ASEAN countries [234-243].

Stateless populations in ASEAN countries

Table 13 demonstrates the definition, types, and quantity of stateless population across the 10 ASEAN countries. The definition and type of stateless people are not uniform across the countries. Additionally, there is no single official source of statistics on stateless populations across the countries [26, 70, 126, 244-248]. Based on UNHCR reports, Myanmar has the highest number of stateless population (e.g. Rohingya) in the country [249] followed by Thailand (e.g. hill tribes) [249], Cambodia (e.g. Khmer Krom ethnic minority group from southern Vietnam) [249], Vietnam (e.g. ethnic Chinese and Cambodian) [249], Brunei (e.g. ethnic Chinese)

[249], Indonesia (e.g. ethnic Chinese, Hazara refugees from Afghanistan) [247, 250], Malaysia (e.g. undocumented stateless refugees, asylum-seekers) [249], Lao PDR (e.g. some ethnic minorities) [26], Singapore (e.g. stateless permanent resident) [246, 249], and the Philippines (e.g. persons of Indonesian descent) [249].

Table 13 Definition and number of stateless populations in the 10 ASEAN countries

Country	Definition of stateless population	Type of stateless persons	Amount of stateless (year)	Source
Brunei	Stateless population are mostly ethnic Chinese who have been residing in the country for generations. While the Immigration and National Registration Department may have different definitions, as for healthcare policies for stateless people, the Ministry of Health categorises this group of population as 'Permanent Residents' in the country.	*De facto*	20,863 (2018)	[249]
Cambodia	Stateless population is the Khmer Krom ethnic minority group from southern Vietnam who have been living in the country for decades. However, the 1996 Nationality Law of Cambodia does not define statelessness in the country.	*De facto*	57,444 (2018)	[249]
Indonesia	Stateless population is mostly ethnic Chinese who have been residing in the country for generations. In 2017, Indonesia hosted refugees and asylum seekers from 49 countries and nearly 50% of those population were from Afghanistan (e.g. Hazara refugees) [250, 251]	*De facto*	13,840 (2017)	[247, 250]
Lao PDR	According to the nationality law, "stateless person refers to an individual residing in the territory of the Lao PDR who is not a Lao citizen and who is unable to certify his/her nationality. There are 49 ethnicities in Laos and some of them, living in a remote area, are at risk of statelessness due to lack of birth registration documents (e.g. Family Book, ID Card) in the country.	*De facto*	4,000 (2009)	[26]
Malaysia	Populations who are stateless or who are at risk of being stateless include persons of are ethnic Indian Tamils, descendants of Indonesian and Filipino migrant workers, indigenous peoples, and children without any birth registration who have been residing in West and East Malaysia for decades. There are also refugees and asylum seekers registered with UNHCR, who are mostly from	*De jure*	9,631 (2018)	[249]

Country	Definition of stateless population	Type of stateless persons	Amount of stateless (year)	Source
	Myanmar, including Rohingyas, Chins, Myanmar Muslims, Rakhines and Arakanese.			
Myanmar	The Rohingya people are stateless in the country based on the 1982 Citizenship Law.	*De jure*	620,939 (2018)	[249]
Philippines	Stateless persons include children without registration, foundlings, children of Filipino and Indonesian descent residing in Southern Mindanao for a long time. Majority of stateless persons are from Indonesian migrants who have lived in the Philippines for many years but many of those were naturalized in 2016 [248]. The other group of stateless people, but very few are foundlings e.g. babies whose parents are unknown. However, according to the Supreme Court decision in 2016, foundlings have been considered as citizens based on the 1934 Constitutional Convention.	*De facto*	1,068 (2018)	[249]
Singapore	Stateless persons include permanent residents (PRs) who have lost their foreign citizenship, children born to foreign nationals who are not recognized in their home countries, and people born in pre-independence Singapore who are unable to prove their country of birth.	*De facto*	1,303 (2018)	[249]; [246]
Thailand	Stateless persons are defined as nationals without a birth registration document stating Thai citizenship who have been residing in the country for generations especially along the Thai-Myanmar border area.	*De facto*	478,843 (2018)	[249]
Vietnam	Stateless populations are the former Cambodian refugees who have lived in the country for decades. Stateless population also includes out-of-wedlock children of Vietnamese migrants with people in other countries. Most of the migrants are undocumented and they live in the area near Vietnam's border with Laos, Cambodia and China. The Vietnamese government has had an agreement with the government of Lao PDR to grant citizenship for out-of-wedlock children of Vietnamese and Laotian (Decision 2627/Qd-TTg dated 31 December 2013). However, there is no similar agreement between Vietnam and Cambodia or China.	*De facto*	34,110 (2018)	[249]

Note: *De jure* stateless persons, where the states in question do not consider these resident populations as their nationals, and *de facto* stateless persons who do not have an effective nationality even though they may be long-term residents, or even having been born in their country of residence [223]. There might be co-existence of both types of stateless but the most prominent one is stated here in this table.

Healthcare policies for stateless populations

The summary of health policies for stateless people in each of the 10 ASEAN countries is presented as follows.

Brunei: Brunei does not have a National Health Insurance System. Although more efforts have been made to study the feasibility of introducing national health insurance, Brunei's healthcare financing is still primarily funded through general treasury and central budgetary control. It has a single pool for revenue collection, and natural resource revenues are the main source of revenue collection rather than general taxes and out-of-pocket payment. Brunei is, one of the leading ASEAN countries, moving towards UHC regarding essential service coverage and financial protection [252]. As mentioned earlier, stateless people are called 'Permanent Residents' in Brunei. This group has never been denied access to healthcare, in fact, they receive privileges that are almost the same as Brunei citizens. According to the Ministry of Health's Scheme of Charges "all medical services will be provided free of charge to a permanent resident and were applicable to his/her children below 18 years of age except for certain procedures or treatments". However, the Scheme of Charges is currently under review to further consider the privilege that should be given to permanent residents in the country. Stateless permanent residents can also obtain free education at government schools though. They are also given an International Certificate of Identity (ICI), which allows them to travel overseas [231]. For expatriates, employers typically buy private health insurance locally. In the case of a multinational company, employees are required to have an international medical insurance to cover emergency services.

Cambodia: The Cambodian government policies emphasize on pro-poor financing to ameliorate the effects of financial barriers to health service access by the poor and vulnerable populations in the country. As such, demand-side financing policies have been evolved including formal user fee exemptions, health equity funds (HEFs) run by government and development partners, vouchers and community-based health insurance (CBHI) since the mid-1990s. However, Cambodia does not have healthcare policy for stateless people in the country. The country faces multiple challenges including poor health infrastructure, shortage of health workers, and high out-of-pocket spending. Additionally, the UHC remains weak for its citizens let alone

stateless and irregular migrant workers in the country [193]. Although Cambodia may not have any specific policy related to the so-called stateless population, the Ministry of Health (MOH) does not discriminate against the health service provision by population groups, including Khmer Krom, migrants from Vietnam, and some other ethnic minority groups in the country. Nevertheless, the MOH does not have enough evidence of the health service utilization by stateless population.

Indonesia: Indonesian National Health Insurance scheme is called the Jaminan Kesehatan Nasional or JKN, which is administered by the Badan Penyelenggara Jaminan Sosial (Social Insurance Administration Organization) or BPJS since 2014 with an ambition to achieve UHC by 2019 [192]. There are two versions of BPJS: BPJS Kesehatan (the successor of PT Askes) and BPJS Ketanagakerjaan (the successor of Jamsostek). The first administers JKN for informal sectors including non-employees, and self-employed while the latter administers JKN for employees in the formal sector. Both schemes are applicable not only for the workers but also for the family members. As per the newest regulation (Presidential Decree No. 19/2016), the workers in the informal sector are required to pay a monthly premium, which is from IDR25,500 (US$2.10) to IDR80,500 (US$6.63) depending on ward class with two-five beds per room. The JKN is mandatory for all Indonesian citizens and it offers a range of personal health services, including promotional, preventive, curative and rehabilitative services. To obtain care, patients must first seek care from an authorized primary care facility (FasKes 1). FasKes 1s are typically small community clinics (Puskesmas), or general practitioners. English may not be spoken here. Patients may want to bring someone to help translate if needed. They have to bring your BPJS/Kartu Indonesia Sehat (KIS) card, copies of passport or resident Identity Card (KTP), and referral letters from FasKes 1 if they refer you to a specialized care facility [253]. The government covers the insurance premiums for the bottom 40% of Indonesia's income distribution. Nevertheless, Indonesia does not have a health insurance policy for the stateless population [192].

Although Indonesia is not a state party to either of the UN Statelessness Conventions, and the 1951 Refugee Convention or its 1967 Protocol, the Indonesian Government has authorized UNHCR to help protect and find solutions for vulnerable populations, including refugees, asylum-seekers, and stateless persons. As such, under

its statelessness mandate, UNHCR provides support to Government initiatives to prevent statelessness through promoting universal birth registration for all those children born in the country. Regarding healthcare services for these persons of concern, UNHCR collaborates with various partners reduce major health risks and to ensure access to primary (e.g. compulsory vaccinations for children, health education on common illnesses and communicable diseases) and secondary medical care (e.g. HIV/AIDS treatment) through public health facilities, including community maternity and child care centers [254].

In 2006, Indonesia established the National Agency for the Placement and Protection of Indonesian Migrant Workers (BNP2TKI) to protect Indonesian migrant workers abroad. In 2012, Indonesia ratified the International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families (CMW) to protect its migrant workers abroad. As migrant sending country, Indonesia has bilateral agreement with Malaysia and Singapore under the Placement and Protection of Indonesian Migrant Workers Law because those countries have yet to ratify the CMW [255]. Additionally, in 2017, the government issued an updated law on the protection of Indonesian migrant workers abroad, which states three conditions that a receiving country must meet: (i) the receiving country must have a law that protects foreign workers, (ii) there needs to be a written agreement between receiving country and the Indonesian government, (iii) there must be a social security or insurance system that covers migrant workers in the country. According to BNP2TKI, as of 2018, there are about 4.5 million Indonesian migrant workers. The majority are in the domestic sector and 70% of them are women [256]. The country has a long term plan to reach the target of "zero domestic workers" (e.g. no multitasking domestic workers and all Indonesian migrant workers shall perform a skill-specific job) in destination countries [255]. As a receiving country, Indonesia allows migrants to enrol in the JKN, who have worked for at least six months in the country. However, foreigners in Indonesia are reluctant to join the JKN as they are already provided with private health insurance by their employers [192].

Lao PDR: The government of Lao PDR passed the Law on Health Care in 2005 which recognizes the right to healthcare for all Laotian citizens [193]. In 2016, the country has introduced the National Health Insurance (NHI) scheme or health

insurance for all (Health Insurance Law, number 114/NA, National Health Insurance Decree number 470/Gov), which was approved by the Lao National Assembly in 2018. As of 2018, the NHI coverage was 94.3% of the population and all Lao citizens, despite their status as migrant workers, are entitled to this health insurance. However, the NHI does not cover foreign illegal migrant workers unless their employers insure them in the country. Foreign migrant workers could also enrol with the voluntary health insurance scheme or directly pay (e.g. OOP) in health facilities for using public health services in the country. There are many vulnerable people in the remote areas living without the Family Book, and the ID card. But when they get sick, they could enjoy the National Health Insurance benefits with the residential documents approved by the respective Village Chief.

Malaysia: Malaysia does not have an explicit healthcare policy for stateless people in the country. Stateless persons do not have formal access to subsidised healthcare services at government health facilities [228]. All foreigners including stateless persons, refugees and asylum seekers need to pay for services provided at the government health facilities. As such, stateless patients have to pay medical bills like foreigner's fees for service at the government hospitals which is exorbitant for them compared to Malaysian citizens [192, 227, 257]. According to the Malaysian Ministry of Health (MOH), immunization services are available for all children, including those without documentation, at all health facilities under the MOH [258]. Stateless and undocumented children have to pay immunization fees based on the Children Healthcare Services Fee under the Fees (Medical) (Cost of Services) Order 2014, such as RM40 (USD10) for registration, consultation, and medication, and RM40 (USD10) for vaccine. However, under the Control of Infectious Disease Act, immunization is provided to all eligible children free-of-charge in the event of a vaccine-preventable outbreak [258]. Most recently, Asia Pacific Paediatric Association has proposed the MOH a policy to make diphtheria and measles vaccination compulsory for children to be enrolled in schools, including kindergartens and nurseries in the country [259].

Additionally, the new education policy allows six-year basic education for undocumented children in government schools since 2018. The policy only covers certain categories of children who are non-citizens but who are not stateless, and/or certain undocumented non-citizen children whose one or both and birth or adoptive

parent(s) are Malaysian. However, the basic education is not free as non-citizen children are subject to a fee (e.g. RM120 (USD30) per year per student for primary school, RM240 (USD60) per year per student for secondary school). Nevertheless, this new education policy does not cover all stateless children in the country [260].

Although Malaysia does not have explicit health policy for stateless people, asylum seekers and refugees registered with UNHCR are entitled to a 50% discount off the foreigner's rate at public hospitals since 2006 and there was a circular on this issued by the Ministry of Health (MOH) [261]. However, the cost of medical care after even 50% discount remains exorbitant and always incurs high out-of-pocket payments that effectively compromises their ability to seek healthcare services. To reduce such financial barriers and improve access to secondary and tertiary medical care, UNHCR initiated the Refugee Medical Insurance (REMEDI) in 2014. It is an annual premium based insurance, and only UNHCR documents (e.g. cards and letters) holders are eligible to buy this insurance [228]. However, the enrolment rate was low, such as 12.2% in 2017 among UNHCR cardholders in the country [229]. The REMEDI program has since expired because it was found to be non-viable financially. Additionally, due to the non-compulsory nature of the scheme combined with low enrolment rates and the exponential increase of foreigner's rates at public health facilities in 2016. It should be mentioned here that, as UNHCR recognized, refugees enjoyed the 50% discount on foreigners' rates since 2006 but asylum seekers only enjoy this since 10 August 2018.

Chubb Insurance Malaysia Berhad (formerly known as ACE Jerneh Insurance Berhad), one of the 25 panel insurance companies appointed and approved by the Ministry of Health (MOH), has been implementing the Skim Perlindungan Insurans Kesihatan Pekerja Asing or Foreign Worker Hospitalisation and Surgical Scheme (SPIKPA/FWHS) since 2011 to underwrite foreign workers with this insurance [262]. All foreign workers in Malaysia are required to buy the SPIKPA with a premium RM120 (USD30) per year subject to SST 6% plus RM10 (USD0.25) that provides maximum medical coverage RM20,000 (USD5,000) per year for using any health services at public health facilities in the country. For maid or house helpers, the employer must buy the Maid Insurance/Domestic Help Insurance (MAID) with a premium RM70 (USD17.5) per year that provides RM30,000 (USD7,500) annual

coverage [263]. However, undocumented migrants are not allowed to enrol in the SPIKPA scheme [192, 233].

Hospital personnel are legally obliged to report unregistered persons to the police or immigration authorities (Malaysian Ministry of Health Circular No: 10/2001), who may then arrest and detain such persons upon completion of treatment. As such, many undocumented Rohingya asylum-seekers do not seek care from government hospitals due to fear of arrest and the possibility of detention and deportation. In practice, smaller government clinics accept the 'community card' for undocumented migrants as a form of valid documentation, and provide treatment at the full non-citizen rate [227]. Besides, the public sector health providers technically cannot refuse emergency care to those who cannot pay via prepaid insurance or out-of-pocket, including undocumented people [192].

Myanmar: Myanmar has National Health Plan (NHP 2017-2021) for achieving UHC for its citizens and designated ethnic groups through extending access to a Basic Essential Package of Health Services (EPHS) by 2020. However, stateless people (e.g. Rohingya minorities) are not included into the NHP in the country [193, 264]. Even the 2014 Population and Housing Census, Myanmar's first national census in 30 years, excluded Rohingya respondents from the census. The Rohingya people face a cycle of poor infant and child health, malnutrition, waterborne illness, and lack of prenatal and obstetric care. Additionally, travel restrictions coupled with arbitrary discrimination, at the government health clinics, severely limit their access to maternal and child healthcare [67]. Consequently, the maternal mortality ratio in the Rakhine State is more than double compared to national estimates. Myanmar government also enacted a law in 2013 called 'a two-child policy' for Rohingya couples with maintaining a minimum of 36 months birth spacing between pregnancies. Rohingya children born in Myanmar are not eligible for citizenship and even face restrictions on birth registration at government hospitals [67, 70]. However, according to a recent report of the Ministry of Health and Sports (MOHS), all communities in Rakhine State irrespective of religion, ethnicity, race, gender, and citizenship status, have equal access to healthcare services. The MOHS treats patients from all communities at the public health facilities across Rakhine State following medical ethics without any kind of discrimination. As of January 31, 2018, the MOHS

provided inpatients and outpatient services to 22,772 Bengali patients (Rohingyas are termed as Bengali), which was 24% of all patients [265].

The Philippines: In early 2019, the Philippines has enacted new universal health care (UHC) law (e.g. Republic Act No. 11223) that automatically enrols all Filipino citizens in the National Health Insurance Program, which is reportedly to be more efficient and effective. While there is no explicit health policy for stateless people, there is a commitment to stateless persons that the National Health Insurance Program is willing to register them following the usual rules and guidelines. For instance, the Philippines Health Insurance Corporation known as PhilHealth, under the Philippines Ministry of Health, is committed to protect Persons of Concern (POC) including stateless living in the country. In 2018, the PhilHealth has signed Inter-Agency Agreement for the protection of POC in the country. The PhilHealth shall provide social health insurance protection to the POC through existing mechanisms and requirements applicable for foreigners in the country. For instance, the POC shall be enrolled in the National Health Insurance Program, either under the Sponsored Program or through the individual or group enrolment to have access to health services [232]. The premium based PhilHealth insurance also allows undocumented migrants in the country to enrol for accessing government health services [192].

Singapore: While Singapore has three layers of government-run contributory health insurance schemes, such as Medisave, MediShield (MediShield Life since 2015), and MediFund for citizens, there is no healthcare policy for stateless and undocumented migrant workers. Undocumented migrants are not entitled to enrol any these above insurance schemes. All migrant workers are required to purchase private medical insurance available for them in the country. They are also ineligible for government medical subsidies [192]. However, around 85% of all stateless persons are stateless permanent residents (PRs) who are eligible for healthcare, education and housing benefits in the country while 15% non-PRs stateless face difficulties in assessing government services in the country [246].

Thailand: Thailand achieved universal health coverage in 2002 by introducing the Universal Coverage Scheme (UCS) for Thai citizens. Since then stateless populations were left uninsured who were previously insured by the low-income card scheme (LICS). Hence, stateless people faced financial barriers to access care that led

to low health service utilization and catastrophic spending. It also increased the unpaid debt of public hospitals in border areas due to the exemptions of medical bills of stateless patients.

In 2010, the Thai Cabinet instigated the 'Health Insurance for People with Citizenship Problems' (HIPCP) policy to address the problems (e.g. accessibility, affordability) faced by the stateless people. The benefit package is comprehensive and similar to that of the UCS [4]. According to the policy, to access the HIPCP, stateless people first need to be registered with the Ministry of Interior (MOI) and given the 13-digit national ID. However, the registration process is slow due to lack of coordination between the MOI and the Ministry of Public Health (MOPH). Despite similar benefit packages, unlike the UCS, the HIPCP stemmed from its weak legal basis. For instance, the HIPCP was the outcome of the Thai Cabinet Resolution in March 2010 under pressure from civil society and international actors [5, 266]. In addition, unlike the UCS, the HIPCP scheme is not supported by any higher legal instruments (e.g. act or constitution) [5].

In 2004, the Ministry of Public Health (MOPH) introduced the 'Health Insurance Card Scheme' (HICS) for undocumented migrants working in the informal sector [19]. The characteristics of the UCS, HIPCP, and HICS are presented earlier in Table 3. Although the MOPH initiated the HICS, it does not have a specific legal instrument that can force undocumented migrants to enrol in the scheme and punish employers if they refuse to purchase the insurance card for their employees. In essence, the HICS policy is not as "compulsory" as it was intended to be. So, the MOPH is de facto powerless and lacked the capacity to keep pace with the problems regarding human mobility due to its outdated bureaucracy [19].

Vietnam: Vietnam's National Health policies refer to citizens only and the country has Health Insurance Law 2008 that aims at achieving UHC. It has government-run social health insurance (SHI) while the government subsidies premiums in poor areas of the country. The government also subsidizes premium for vulnerable groups such as the poor, the ethnic minority, children under-6, and the elderly above 80 years old. As of 2018, 87% of the Vietnamese population is covered by the SHI. However, Vietnam does not have any health policy for stateless and

migrant workers. The government works in collaboration with donors to control infectious diseases along the border areas [193].

Ratification of and adherence to international human rights instruments

To advocate for health based on human rights, there was an agreed goal amongst over 100 countries of the World Health Organization (WHO)'s 6th Global Conference on Health Promotion, held in Bangkok, Thailand, in 2005. Thus, the 2005 Bangkok Charter has identified actions, commitments and pledges required to address the determinants of health through health promotion. Although human rights are enshrined in the 2008 ASEAN charter, they are too often absent in health and the social determinants of health in these 10 countries regarding equitable access to care through ratification of international human rights instruments followed by the domestication of those international laws. Ratification implies that the country is morally obliged to protect the health of all vulnerable peoples including stateless and undocumented people in the country [267].

Ratification of international human rights instruments: The ratification of international treaties is a crucial step for a country as it mirrors the recognition of respecting and promoting the human rights of its citizens as well as norms and morals of the international community. Table 14 and 15 demonstrate the ratification status (e.g. signature, ratification, accession) of 18 international human rights treaties, including nine optional protocols, by the state parties in ASEAN countries [121, 268]. Most of the treaties (e.g. 10 out of 18) were entered into force, when a treaty becomes legally binding on the state parties to the treaty, between 2000 and 2014.

Regarding ratification status, the Philippines is seemed to be the pioneer who ratified or acceded the highest number of international human rights laws, including optional protocols (15) followed by Cambodia (12), Thailand (12), Indonesia (10), Vietnam (9), Lao PDR (8), Malaysia (5), Myanmar (5), Singapore (5), and Brunei (4). Six of the nine core human rights treaties are related to right to health [269] and only three ASEAN countries: Cambodia, Indonesia, and the Philippines, have ratified all core international human rights instruments recognizing the right to health including the 1966 International Convention on the Elimination of All Forms of Racial

Discrimination (ICERD 1966), the 1966 International Covenant on Economic, Social and Cultural Rights (ICESCR 1966), the 1979 Convention on the Elimination of All Forms of Discrimination against Women (CEDAW 1979), the 1989 Convention on the Rights of the Child (CRC 1989), the 1990 International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (ICMW 1990), and the 2006 Convention on the Rights of Persons with Disabilities (CRPD 2006) [230, 269].

The Brunei government had signed the CRPD in 2016 even after eight years when the convention entered into force in 2008. On the other hand, the Myanmar government ratified the ICESCR in 2017 though the convention came into force in 1976. The most recent core international human rights treaty is the International Convention for the Protection of all Persons from Enforced Disappearance (ICPPED), which came into force in 2010. The ICPPED defines the crime of enforced disappearance (Article 2) and obligates each state party to act appropriately to investigate the allegations of enforced disappearance (Article 3). However, none of the ASEAN countries have ratified the ICPPED except Cambodia (Table 14 and 15).

All ASEAN countries have ratified the CRC 1989 and the CEDAW 1979 and Thailand is the only country that has also ratified all three optional protocols to the CRC (Table 14 and 15). These two treaties have placed an obligation on state parties to prohibit gender discrimination in matters of nationality and require immediate birth registration. Article 24 of the CRC 1989 stipulates that “States Parties recognize the right of the child to the enjoyment of the highest attainable standard of health and facilities for the treatment of illness and rehabilitation of health. States Parties shall strive to ensure that no child is deprived of his or her right of access to such health care services”. Additionally, Article 7 of the CRC 1989 specifies that every child has the right to be registered at birth without any discrimination [230, 269]. Although the right to nationality was reiterated in the International Covenant on Civil and Political Rights (ICCPR), Brunei, Malaysia, Myanmar, and Singapore have yet to ratify this convention.

Thailand and Vietnam ratified all legal instruments related to the right to health except the ICMW 1990. Brunei, Malaysia, and Singapore are not ever a signatory of the ICESCR 1966 which is the core instrument recognizing the right to health. Article

12 of the ICESCR 1966 stipulates that “the States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health” [230, 269]. The Philippines is the only ASEAN member country that has ratified the 1954 Convention relating to the Status of Stateless Persons in 2011.

Adherence to international human rights instruments: Although Brunei is a state party to the Rights of the Child (CRC), however, the country does not currently follow the guidelines of the convention. The nationality law allows only the father of a child to pass citizenship. While Malaysia has adopted the CRC 1989 which gives all children the right to a legal identity, foundlings cannot acquire nationality automatically, and the Home Minister apparently decides the citizenship of undocumented people in the country, which is inconsistent with the convention. Myanmar has been a state party to the ICESCR 1966 since 2017, but the Rohingya people do not have any fundamental rights to be exercised in the country. Additionally, the Rohingya people are one of the most persecuted communities in the world and are forced to flee their homes to escape conflict and persecution in the country especially in the northern Rakhine State. There was an exodus of Rohingya people from Myanmar to Bangladesh since violence erupted in the country on August 25, 2017 [67, 70, 180].

However, recently the Myanmar Government, in cooperation with Bangladesh and UN, has planned to receive the displaced Rohingya people which meet the criteria to return back to Myanmar, and they would be provided appropriate and quality points of entry services including primary healthcare services, public health services, and camp clinical services on arrival [270]. On the other hand, the Philippines has been a state party to the 1954 Convention Relating to the Status of Stateless Persons since 2011 though statelessness is not a big problem in the country [230].

The specific concerns of the Committees of the respective United Nations treaties regarding domestication and/or implementation of the ratified human rights treaties by the state parties in ASEAN countries are discussed in the following section. It reflects, in detail, adherence to international human rights laws by the member countries.

The summary of the Concluding Observations of the respective Treaty Bodies

The Concluding Observations are assessments of the implementation or domestication of human rights treaties by a state party, which are issued by the respective treaty bodies based on State Reports, and information from national and/or international non-governmental organizations in the respective countries. Treaty bodies are independent experts who monitor the implementation of the nine-core international human rights treaties or conventions.

Table 14 and 15 demonstrate the key concerns of the treaty bodies regarding the implementation and/or domestication of the nine-core international human rights laws ratified by state parties in ASEAN countries [234-243, 271-306].

Table 14 The International Human Rights Instrument (Treaties) and their ratification status by the 10 ASEAN countries (part-1)

Human Rights Instrument: **Date of entry into force**	**Ratification Status**	**Brunei**	**Cambodia**	**Indonesia**	**Lao PDR**	**Malaysia**
1. International Convention on the Elimination of All Forms of Racial Discrimination:1969	S	NA				NA
	R	NA	1983			NA
	A	NA		1999	1974	NA
2. International Covenant on Civil and Political Rights:1976	S	NA			2000	NA
	R	NA			2009	NA
	A	NA	1992	2006		NA
3.Optional Protocol to the International Covenant on Civil and Political Rights:1976	S	NA	2004	NA	NA	NA
	R	NA		NA	NA	NA
	A	NA		NA	NA	NA
4. Second Optional Protocol to the International Covenant on Civil and Political Rights, aiming at the abolition of the death penalty:1991	S	NA	NA	NA	NA	NA
	R	NA	NA	NA	NA	NA
	A	NA	NA	NA	NA	NA
5. International Covenant on Economic, Social and Cultural Rights:1976	S	NA	1980		2000	NA
	R	NA			2007	NA
	A	NA	1992	2006		NA
6. Optional Protocol to the International Covenant on Economic, Social and Cultural Rights:2013	S	NA	NA	NA	NA	NA
	R	NA	NA	NA	NA	NA
	A	NA	NA	NA	NA	NA
7. Convention on the Elimination of All Forms of Discrimination against Women:1981	S		1980	1980	1980	
	R			1984	1981	
	A	2006	1992			1995

Human Rights Instrument: **Date of entry into force**	**Ratification Status**	**Brunei**	**Cambodia**	**Indonesia**	**Lao PDR**	**Malaysia**
8. Optional Protocol to the Convention on the Elimination of All Forms of Discrimination against Women:2000	S	NA	2001	2000	NA	NA
	R	NA	2010		NA	NA
	A	NA			NA	NA
9. Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishmen:1987	S	2015		1985	2010	NA
	R		1992	1998	2012	NA
	A					NA
10. Optional Protocol to the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment:2006	S	NA	2005	NA	NA	NA
	R	NA	2007	NA	NA	NA
	A	NA		NA	NA	NA
11. Convention on the Rights of the Child:1990	S			1990		
	R			1990		
	A	1995	1992		1991	1995
12. Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict:2002	S		2000	2001	2006	
	R		2004	2012		2012
	A	2016				
13. Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography:2002	S		2000	2001		
	R		2002	2012	2006	2012
	A	2006				
14. Optional Protocol to the Convention on the Rights of the Child on a communications procedure:2014	S	NA	NA	NA	NA	NA
	R	NA	NA	NA	NA	NA
	A	NA	NA	NA	NA	NA
15. International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families:2003	S	NA	2004	2004	NA	NA
	R	NA		2012	NA	NA
	A	NA			NA	NA
16. International Convention for the Protection of all Persons from Enforced Disappearance:2010	S	NA		2010	2008	NA
	R	NA				NA
	A	NA	2013			NA
17. Convention on the Rights of Persons with Disabilities: 2008	S	2007	2007	2007	2008	2008
	R		2012	2011	2009	2010
	A					
18. Optional Protocol to the Convention on the Rights of Persons with Disabilities: 2008	S	NA	2007	NA	NA	NA
	R	NA		NA	NA	NA
	A	NA		NA	NA	NA

Note: Ratification Status: S: Signature, R: Ratification, A: Accession, NA: No Action on either S, R, or A was taken as of 20 August 2019, Blank cell: when a country has taken action on either S, R or A or any combinations but not all in such case the remaining cell(s) of that country is kept blank

Signature: A representative may sign a treaty which is confirmed by the state. It is a means of authentication and expresses the willingness of the signatory state to continue the treaty-making process and the signature does not establish consent to be legally bound by a treaty's specific provisions and obligation. The signature is subject to ratification, acceptance or approval.
Ratification: Ratification defines the international act whereby a state indicates its consent to be bound to a treaty if the parties intended to show their consent by such an act. The institution of ratification grants states the necessary time-frame to seek the required approval for the treaty on the domestic level and to enact the necessary legislation to give domestic effect to that treaty.
Accession: Accession is the act whereby a state accepts the offer or the opportunity to become a party to a treaty already negotiated and signed by other states. It has the same legal effect as ratification. Accession usually occurs after the treaty has entered into force.

Source: Compiled from World Health Organization [269]; United Nations Treaty Collection[121]; Clarke [230], and Ahmad, Rahman and Mohamed [307]; United Nations Human Rights Office [268]

Table 15 The International Human Rights Instrument (Treaties) and their ratification status by the 10 ASEAN countries (part-2)

Human Rights Instrument: Date of entry into force	Ratification Status	Myanmar	Philippines	Singapore	Thailand	Vietnam
1. International Convention on the Elimination of All Forms of Racial Discrimination:1969	S	NA	1966	2015		
	R	NA	1967	2017		
	A	NA			2003	1982
2. International Covenant on Civil and Political Rights:1976	S	NA	1966	NA		
	R	NA	1986	NA		
	A	NA		NA	1996	1982
3.Optional Protocol to the International Covenant on Civil and Political Rights:1976	S	NA	1966	NA	NA	NA
	R	NA	1989	NA	NA	NA
	A	NA		NA	NA	NA
4. Second Optional Protocol to the International Covenant on Civil and Political Rights, aiming at the abolition of the death penalty:1991	S	NA		NA	NA	NA
	R	NA	2006	NA	NA	NA
	A	NA	2007	NA	NA	NA
5. International Covenant on Economic, Social and Cultural Rights:1976	S	2015	1966	NA		
	R	2017	1974	NA		
	A			NA	1999	1982
6. Optional Protocol to the International Covenant on Economic, Social and Cultural Rights:2013	S	NA	NA	NA	NA	NA
	R	NA	NA	NA	NA	NA
	A	NA	NA	NA	NA	NA
7. Convention on the Elimination of All Forms of Discrimination against Women:1981	S		1980			1980
	R		1981			1982
	A	1997		1995	1985	
8. Optional Protocol to the Convention on the Elimination of All Forms of Discrimination against Women:2000	S	NA	2000	NA	2000	NA
	R	NA	2003	NA	2000	NA
	A	NA		NA		NA
9. Convention against Torture and	S	NA		NA		2013

Human Rights Instrument: Date of entry into force	Ratification Status	Myanmar	Philippines	Singapore	Thailand	Vietnam
Other Cruel, Inhuman or Degrading Treatment or Punishmen:1987	R	NA		NA		2015
	A	NA	1986	NA	2007	
10. Optional Protocol to the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment:2006	S	NA		NA	NA	NA
	R	NA		NA	NA	NA
	A	NA	2012	NA	NA	NA
11. Convention on the Rights of the Child:1990	S		1990			1990
	R		1990			1990
	A	1991	2000	1995	1992	
12. Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict:2002	S	2015	2003	2000		2000
	R			2008		2001
	A				2006	
13. Optional Protocol to the Convention on the Rights of the Child on the sale of children, child prostitution and child pornography:2002	S		2000	NA		2000
	R		2002	NA		2001
	A	2012		NA	2006	
14. Optional Protocol to the Convention on the Rights of the Child on a communications procedure:2014	S	NA	NA	NA	2012	NA
	R	NA	NA	NA	2012	NA
	A	NA	NA	NA		NA
15. International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families:2003	S	NA	1993	NA	NA	NA
	R	NA	1995	NA	NA	NA
	A	NA		NA	NA	NA
16. International Convention for the Protection of all Persons from Enforced Disappearance:2010	S	NA	NA	NA	2012	NA
	R	NA	NA	NA		NA
	A	NA	NA	NA		NA
17. Convention on the Rights of Persons with Disabilities: 2008	S		2007	2012	2007	2007
	R		2008	2013	2008	2015
	A	2011				
18. Optional Protocol to the Convention on the Rights of Persons with Disabilities: 2008	S	NA	NA	NA		NA
	R	NA	NA	NA		NA
	A	NA	NA	NA	2016	NA

Note: Ratification Status: S: Signature, R: Ratification, A: Accession, NA: No Action on either S, R, or A was taken as of 20 August 2019, Blank cell: when a country has taken action on either S, R or A or any combinations but not all in such case the remaining cell(s) of that country is kept blank.

Signature: A representative may sign a treaty which is confirmed by the state. It is a means of authentication and expresses the willingness of the signatory state to continue the treaty-making process and the signature does not establish consent to be legally bound by a treaty's specific provisions and obligation. The signature is subject to ratification, acceptance or approval.

Ratification: Ratification defines the international act whereby a state indicates its consent to be bound to a treaty if the parties intended to show their consent by such an act. The institution of ratification grants states the necessary time-frame to seek the required approval for the treaty on the domestic level and to enact the necessary legislation to give domestic effect to that treaty.

Accession: Accession is the act whereby a state accepts the offer or the opportunity to become a party to a treaty already negotiated and signed by other states. It has the same legal effect as ratification. Accession usually occurs after the treaty has entered into force.

Source: Compiled from World Health Organization [269]; United Nations Treaty Collection[121]; Clarke [230], and Ahmad, Rahman and Mohamed [307]; United Nations Human Rights Office [268]

While the CEDAW outlines women's protection from gender discrimination, the Islamic countries reserve those rights related to equal rights of women in marriage and divorce. For instance, Brunei, Indonesia (Aceh Province), Malaysia requires that the respective human rights treaty provisions be interpreted following Sharia Law (Islamic law). Marginalized communities, such as undocumented migrants, displaced and stateless persons, ethnic minorities, women, and sexual minorities (transgender persons) are at risk of violations of their human rights in all countries to some extent. Lack of a clear definition of torture, and gender discrimination in the domestic laws leaves the scope of human rights violations in the respective countries (Table 16). Although all countries have ratified the CRC, the birth registration and nationality among children belonging to minority groups are found to be the common problems in all countries. Enforced disappearance is evident in Lao PDR and Thailand (Table 16). The overall findings of the 10 ASEAN countries regarding healthcare policies for stateless and undocumented migrants show that only Thailand has explicit healthcare policies for stateless populations in the country. Only three countries (Indonesia, the Philippines, Thailand) have health policies for undocumented migrants in the country. All countries have universal birth registration policies except Singapore. All countries have ratified at least one of the six international human rights instruments recognizing the right to health. The Philippines is the only country in ASEAN that has ratified the 1954 Convention relating to the status of stateless persons.

Table 16 Summary of the concluding observations of the UN Treaty Bodies

Treaty	Main points/concerns of the Committee (UN Treaty Bodies)
Brunei	
CEDAW	(i) Constitutional framework and discriminatory laws, (ii) Persistence of the practice of female circumcision, (iii) Domestic laws discriminate against women and girls by punishing with public flogging, and with fines, (iv) Customary laws allow very low minimum age for marriage [282, 308].

Treaty	Main points/concerns of the Committee (UN Treaty Bodies)
CRC	(i) Disparities in birth registration of children of irregular migrants, and children in Kampong Ayer (water village), (ii) Children of Bruneian women married to foreign nationals are not entitled to Brunei nationality while the children of Bruneian fathers are granted Brunei citizenship automatically, (iii) Practice of corporal punishment in schools [234].
Cambodia	
CERD	(i) Deportation of ethnic minorities (e.g. Uighurs to China), (ii) Khmer Krom minorities face problems for Cambodian citizenship, (iii) Children from indigenous communities and minorities in remote provinces face problems in accessing education [237].
ICCPR	(i) The Khmer Krom and ethnic Vietnamese people are at risk of statelessness, (ii) Persons belonging to minorities are not sufficiently consulted for using their land for communal purpose [237].
ICESCR	(i) Lack of formal education curriculum for the various ethnic minorities, (ii) Domestic legislation still allows *Chbap Srey* (didactic code) in primary education curriculum which legitimizes the inferior role of women, such as work at home rather than work in society [275].
CEDAW	(i) Women of Vietnamese origin have to face considerable difficulties in the registration of births and the acquisition of Cambodian citizenship, (ii) High female school dropouts rates among females in secondary and tertiary levels due to poverty, late school entry, and teenage pregnancies, (iii) Prevalence of unsafe abortions [272].
CAT	(i) Domestic law refers to the term "torture" in a general context (e.g. any actions causing injury on individuals or a criminal offence) which is inconsistent to the convention, (ii) The political interference and corruption disrupt law enforcement services, (iii) The lack of independence and effectiveness of the judiciary hinders the full enjoyment of human rights, (iv) Consistent allegations of torture against and ill-treatment of detainees in police stations, (v) The poor women and children are the victims of sexual violence who have limited access to justice, medical services and psychosocial support [309].
CRC	(i) Low level of birth registration in remote areas and villages and among street children due to ineffective birth registration system, (ii) The domestic law does not explicitly criminalize the recruitment and/or use of children under 18 years by armed forces [237], (iii) Children in institutions and orphanages are being exposed to sexual exploitation (so-called orphanage tourism) by foreign tourists and volunteer workers in the country [302].
Indonesia	
ICESCR	(i) the local laws and by-laws discriminate women and marginalized individuals and groups (e.g. LGBT) in force, (ii) unavailability and poor quality of government services in remote areas (e.g. Papua Province), (iii) low coverage by social security programmes (e.g. *Jamsostek* or state pensions) while Indonesia does not have insurance scheme for the unemployed people [276].
CEDAW	(i) Domestic law continues to impose abusive, unscientific, and discriminatory "virginity testing" on female victims/applicants [309], (ii) A high number of girls becomes victims to female genital mutilation (FGM) or so-called female circumcision in the country, (iii) Inferiority of women over men in the family and in society [280].
CAT	(i) Lack of definition of torture and appropriate penalties for acts of torture, (ii) Domestic law authorises corporal punishment for certain offences (e.g. flogging or caning) that contravene the international laws, (iii) The Ahmadiyah, ethnic Chinese Buddhist, Christian cannot enjoy freedom of religion and belief due to the country's dangerously ambiguous blasphemy law [309], (iv) The women migrant workers are reportedly abused by Indonesian recruiting companies and they are the victims of debt bondage, forced labour, sexual abuse while abroad [271].
CRC	(i) Domestic law allows girls to be married off at 16 which is inconsistent to the Convention (e.g. age of 18), and children who are married are considered to be adults, (ii) Non-Muslims are explicitly required to follow Sharia law (Islamic law) in Aceh

Treaty	Main points/concerns of the Committee (UN Treaty Bodies)
	Province and non-Muslim students face social pressure to wear the Islamic dress at school and religious minorities [301], (iii) Lack of legal aid and government services for asylum-seeking and refugee children in the immigration detention facilities [301, 309].
CMW	(i) Lack of comprehensive legislation to protect the rights of Indonesian migrants abroad, (ii) Domestic immigration law criminalizes the irregular entry into and exit from Indonesia as a criminal offence followed by punishing imprisonment for up to a year, (iii) Indonesian migrant workers are not legally allowed to work for an individual in the Middle East, (iv) A large number of Indonesian migrant workers abroad face obstacles registering their children's births and obtaining identity documents [238].
Lao PDR	
CERD	(i) Lack of government services among ethnic groups in remote areas, (ii) Involuntary repatriation of Hmong people and the international monitors are not allowed access to returnees in the country [289].
ICCPR	(i) The current domestic law does not comply with the comprehensive protection against discrimination by race, colour, sex, political opinion, property, birth, sexual orientation, and gender identity, (ii) The domestic law still prescribes the death sentences for drug-related offenses/crimes that do not meet the threshold of the "most serious crimes" under international laws, (iii) The enforced disappearance of civil society leader (e.g. Sombath Somphone in 2012) and a number of people from the Hmong community, (iv) The criminalization of abortion and unsafe abortions put women's health at risk while there is a high rate of teenage pregnancy coupled with limited access to sexual and reproductive health services for them, (v) Forced relocation of minorities to use their land for commercial purpose in Thateng District [306].
CEDAW	(i) A large number of Lao women use informal channels to migrate to other countries for employment due to lack of adequate institutional support, (ii) Lack of social security services for migrant women, poor women, and unpaid women in the country, (iii) Disproportionately high prevalence of HIV/AIDS cases among women, (iv) Low birth registration among ethnic minority groups in remote areas [286].
CRC	(i) Disparity in education by gender and ethnicity of children, (ii) Chronic malnutrition and stunting are serious problems in Lao PDR due to inadequate feeding practices, lack of nutrition interventions for mother and child, poor hygiene and sanitation, (iii) High maternal and child mortality among ethnic groups and people with low socioeconomic status, (iv) Disabled children are still stigmatized in society impeding their access to education, health care and future employment, (v) High child marriage among girls in ethnic groups [235].
Malaysia	
CEDAW	(i) Lack of definition of discrimination against women and discriminatory Syariah laws and co-existence of civil law (for non-Muslims) and Syariah law (for Muslims) has created a gap in the protection of women against discrimination based on their religion, (ii) Undocumented migrant women do not have access to legal aid services in the country, (iii) Female genital mutilation/cutting (FGM/C) is obligatory for Muslim women according to Syariah laws which is inconsistent to the convention, (iv) The Syariah courts use whipping women as a form of punishment, (v) Unlike men, Malaysian women married to foreigners cannot legally transfer nationality to their children, (vi) Undocumented migrant women compromise essential healthcare services due to fear of arrest and detention in the country, (vii) Migrant domestic workers cannot enjoy equal labour rights as other migrant workers, (viii) Muslim women do not have equal rights as men regarding family and marriage matters [240].
CRC	(i) The definition of the child (14 years) in existing laws is not consistent with the Convention (18 years), (ii) Low birth registration among asylum-seeking and refugee children, children of undocumented migrant workers, children of single mothers, and children born in remote areas of the country, (iii) Lack of disaggregated data on

Treaty	Main points/concerns of the Committee (UN Treaty Bodies)
	undocumented vulnerable children [294].
Myanmar	
CEDAW	(i) High prevalence of sexual violence against rural ethnic women by members of the armed forces in the country, (ii) Very high maternal and infant mortality rates in rural ethnic areas, (iii) Women and girls are at risk of HIV/AIDS and unwanted pregnancies, (iv) Violence against Muslim women and girls in northern Rakhine State, (v) Lack of nationality of Rohingya people who are identified as "Bengali" in the country [241].
CRC	(i) Children are at risk of forced and hazardous labour in extractive industry as Myanmar's domestic law does not protect workers against adverse impacts of activities, (ii) A high level of distrust between civil society and the government while individuals and organizations are punished for promoting international human rights, (iii) Discrimination against children from ethnic and religious minority groups (e.g. Rohingya children) in the country, (iv) Rohingya children are stateless due to Myanmar's arbitrary 1982 Citizenship Law, (v) A large number of Rohingya children remains unregistered due to lack of awareness-raising of birth registration, (vi) Lack of formal education for children with disabilities, (vii) High prevalence of chronic malnourishment, underweight, and stunting among children, (viii) Deported migrant girls are sold to brothels or brokers while boys are conscripted to armed services in Myanmar [295].
The Philippines	
CERD	(i) The indigenous peoples are not adequately consulted to use their land properties for commercial purposes, (ii) Destruction of sacred sites of indigenous people for commercial purpose [287].
ICCPR	(i) Domestic law allows arresting and prosecution the LGBT person for grave scandal, (ii) Domestic law prohibits abortion that puts women and teenagers at risk of seeking harmful abortion services [304].
ICESCR	(i) Indigenous people are not represented in local decision-making bodies which are mandatory though, (ii) Legitimizing violence against drug users increases extrajudicial killings, arbitrary arrest since 2016 in the country, (iii) Low birth registration among indigenous children, Muslim children, and children of overseas Filipino workers, which limits their access to public services [279].
CEDAW	(i) Muslim laws and customary laws, applicable to Muslim and indigenous communities, allow for unequal relations between husband and wife (e.g. polygamy, and child and forced marriage, and inheritance), (ii) The Philippines remains a source country for international and internal trafficking for sexual exploitation, forced labour, domestic slavery, and organ transplantation, (iii) Lack of legal protection for Filipino women migrant workers working abroad as domestic workers [284].
CAT	(i) Increasing number of torture cases due to ineffective implementation of the domestic laws, (ii) The law enforcement personnel torture the suspects to extract information and/or confessions during criminal proceedings, (iii) Substandard detention facilities which do not meet minimum international standards [274].
CRC	(i) Some foreigners are sexually exploiting a large number of children in the areas of Sabang, Puerto Galera, Cebu City, Angeles City and Pasay City, (ii) Lack of legal services to recover and reintegrate the child victims in the country [300].
CMW	(i) The domestic immigration law prohibits entry or expulsion of the immigrant workers suffering from an infection or illness or is pregnant, (ii) The prosecution rate for trafficking women and children remains low due to difficulties in law enforcement in the country [292].
CRPD	(i) Women with disabilities are excluded from decision-making processes that affect their wellbeing, (ii) Children with disabilities are at risk of exclusion to promote their interests due to lack of adequate information, (iii) Persons with disabilities are discriminated in education due to lack of universal design for [243].
Singapore	

Treaty	Main points/concerns of the Committee (UN Treaty Bodies)
CEDAW	(i) Lack of definition of the discrimination against women in the domestic, (ii) Migrant domestic workers cannot enjoy equal labour rights as other migrant workers in the country, and domestic law requiring migrant workers to undergo mandatory and regular testing for pregnancy and HIV followed by deportation on the grounds of pregnancy or diagnosis of HIV, (iii) Non-Singaporean wives may not obtain permanent residency status in Singapore, (iv) The lack of protection under the law to ensure that children born in Singapore to acquire Singaporean nationality [285].
CRC	(i) The new Administration of Muslim Law Act allows girls to get married at their puberty in exceptional cases while the minimum age of marriage raised to 18 years, (ii) The Constitution does not allow all Singaporean mothers to transfer their nationality to their children, (iii) The corporal punishment (e.g. caning) remains legal in all settings except in early childhood development centres in Singapore, (iv) Children in irregular migrants are at risk of separation from their parents or deportation to the country of origin [236].
Thailand	
CERD	(i) Lack of definition of racial discrimination into domestic legislation, (ii) The lack of information on court decisions relating to racial discrimination does not allow assessing the effectiveness of laws and policies, (iii) Discriminatory categorization (i.e. rootless persons, aliens, unsurveyed persons, persons with status problems) of undocumented people in the country [290].
ICCPR	(i) Forced deportation of aliens (ethnic Uighur to China, and Rohingya to Myanmar) without adequate assessment of needs of international protection, (ii) Domestic law allows for exceptions to gender discrimination on grounds of religion and national security, (iii) Trafficking and forced labour in fishing, agriculture, and domestic work are prevalent in the country, (iv) A high number of stateless people are at risk of criminal trafficking [305].
ICESCR	(i) A large number of births among ethnic stateless groups, migrants, refugees and asylum are not registered in practice, (ii) Although Thai authorities host asylum seekers in the country, it does not have a legal framework or formal national refugee status determination procedure to protect those people, (iii) Irregular migrant workers are reportedly abused and exploited in their workplace (e.g. special economic zones). (iv) Marginalized people living in remote rural areas are not covered by the universal healthcare scheme, (v) Low quality education and high dropout rates among the children with disabilities, ethnic groups in upper secondary schools in the country [278].
CEDAW	(i) There is persistence of harmful practices (e.g. female genital mutilation, bride kidnapping) among Muslim communities in the southern border provinces, (ii) Constitutional and legislative framework does not apply in the southern border provinces and discrimination by gender is allowed to some extent, (iii) A disproportionate number of ethnic minority and indigenous women is left without nationality as men are reportedly given priority to register for nationality, (iv) High rates of maternal mortality in the southern border provinces and women belonging to ethnic minority groups, and women with disabilities are subjected to forced sterilization and abortion [239].
CAT	(i) The domestic legislation does not recognize enforced disappearance as a criminal offense in Thailand, (ii) Substandard conditions of detention facilities which do not meet the international standard [273].
CRC	(i) Former child soldiers among refugees/asylum-seekers, and children in the camps are at risk of recruitment and re-recruitment by non-State armed groups from Myanmar operating inside the Thai border, (ii) The domestic law does not explicitly criminalize the recruitment and/or use of children under 18 years by armed [296], (iii) Lack adequate legislative procedures to prevent child sex tourism in the country [297, 298].
CRPD	(i) The national law does not have a formal system of monitoring, sufficient capacity, and human resources to ensure the implementation of the law, (ii) exclusion of non-

Treaty	Main points/concerns of the Committee (UN Treaty Bodies)
	Thais from disability benefits, (iii) Lack of policies for women and girls with disabilities in the country [293].
Vietnam	
CERD	(i) Lack of definition of racial discrimination in domestic law, (ii) High income inequality between majority *Kinh* and minority ethnic groups, (iii) Lack of freedom of belief and religion among *Khmer Krom*, *Degar* (Montagnard), and Hmong ethnic minorities in the country [291].
ICESCR	(i) The internal migrants and ethnic minorities face obstacles accessing government services due to cumbersome household registration system, (ii) Lack of policies for protecting Vietnamese migrant workers abroad, (iii) Low coverage of health insurance among marginalized groups in remote areas, (iv) Promotion of commercial tourism negatively impacts on the cultural activities of ethnic minorities (e.g. the Bay Nui bull race, and the Dragon Boat race) in the country [277].
CEDAW	(i) The persistence of patriarchal attitudes overemphasizes the subordinate and caring roles of women in practice, (ii) violence against women and girls in various forms, (iii) trafficking women and children for purposes of sexual and labour exploitation, and fraudulent internationally brokered marriage, (iv) A strong preference for male offspring results in the sex selection of foetuses that leads to imbalance of the sex ratio at birth [283].
CAT	(i) Domestic law does not criminalize torture as crime, (ii) disproportionate detention of members of religious and ethnic communities, (iii) Substandard conditions of detention facilities which do not meet the minimum international standards [242].
CRC	(i) Lack of standard definition of the child in domestic law, (ii) Discrimination against various vulnerable groups of children in accessing government services, (iii) Low birth registration in in the North West and the Central, (iv) Poor health status of children belonging to ethnic minorities, (v) Lack of reproductive health services for adolescent girls [299].

Notes: CERD: Convention on the Elimination of all Forms of Racial Discrimination, ICCPR: Covenant on Civil and Political Rights, ICESCR: Covenant on Economic, Social and Cultural Rights, CEDAW: Convention on the Elimination of All Forms of Discrimination Against Women, CAT: Convention Against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment, CRC: Convention on the Rights of the Child, CMW: International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families, CRPD: Convention on the Rights of Persons with Disabilities.

The overall findings of the 10 ASEAN countries regarding healthcare policies for stateless and undocumented migrants show that only Thailand has explicit healthcare policies for stateless populations in the country. Only three countries (Indonesia, the Philippines, Thailand) have health policies for undocumented migrants in the country. All countries have universal birth registration policies except Singapore. All countries have ratified at least four of the 18 international human rights instruments including optional protocols to the conventions. The Philippines is the only country in ASEAN who has ratified the 1954 Convention relating to the status of stateless persons

Discussion

Lack of explicit health policies for stateless people: The researcher has found that, unlike Thailand, none of the ASEAN countries have explicit healthcare policies for stateless populations including undocumented migrants. Countries, such as Brunei, Lao PDR, Indonesia, the Philippines, Singapore, and Vietnam drastically reduced stateless people in the country through effective implementation of the nationality law, as well as the naturalization of stateless people over the years. All countries ratified at least four international human rights instruments including optional protocols, and domesticated international laws to some extent. However, the ratification of international human rights instruments does not necessarily ensure the provision of health policies for all people in the country including stateless people. Additionally, the researcher observed that the volume of stateless people living across the countries is not necessarily a predictor of having health policies for those vulnerable populations. Even, in some cases, countries like Myanmar seem to have policies against stateless people (e.g. Rohingya Muslims) in the country including restricted mobility, human rights violations, and arbitrary discriminations (denial of citizenship).

On the other hand, the Philippines has strived to accommodate stateless people into their national health insurance program (e.g. PhilHealth) and the Philippines is only ASEAN country which has ratified the stateless convention 1954. Some countries, such as Malaysia, works in collaboration with the government to address the barriers to access health services in the country especially when healthcare services are expensive without being insured. As such, UNHCR initiated the Refugee Medical Insurance (REMEDI) scheme for asylum seekers and refugees in Malaysia.

Lack of domestication and implementation of human rights treaties: Despite being migrant recipient countries, Brunei, Malaysia, Singapore, and Thailand are not legally bound to protect the interests of migrants, including access to health services in the country as none of these countries are signatories of the 1990 International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (ICMW 1990). In contrast, as migrant sending countries, Indonesia and the Philippines ratified the ICMW 1990 and they mostly provide health services to their citizens working in the destination countries.

The inherent challenges of the HIPCP to be implemented in Thailand: The HIPCP policy has some inherent challenges and weaknesses that may hinder its smooth implementation: First, unlike the UCS, the HIPCP stemmed from its weak legal basis. For instance, the HIPCP was the outcome of the Thai Cabinet Resolution in March 2010 under pressure from civil society and international actors [5, 266]. Hence, the HIPCP scheme is more like a special funding stream from the central government to the MOPH for stateless people rather than a government-run insurance scheme supported by any higher legal instruments such as UCS for Thais is supported by the 2002 National Health Act [5]. One might even contend that the instigation of the HIPCP did not originate from the MOPH bureaucracy per se, but arose from media pressure from NGOs [4, 5].

Second, according to the Thai Cabinet Resolution adopted on 7 Dec 2016, some 80,000 stateless children of migrants and displaced people would be eligible to apply for Thai citizenship through naturalization. Eligible criteria are: (i) they were born in Thailand to parents from ethnic minority groups, registered by the Ministry of Interior (MOI), and have lived in Thailand for no less than 15 years; (ii) they were born in Thailand to members of international groups and have graduated from university. An eligible applicant has to meet one of the above criteria for citizenship. If a student has not graduated yet, the MOI shall consider each case on an individual basis. The supporting documents of each application include birth certificates, household registration (e.g. Tor Ror-14) or profile registration (e.g. Tor Ror-13), and ID cards (e.g. 13-digit identification number). In addition, an abandoned child, whose parents are unknown, are also eligible for Thai citizenship. But he/she has to be certified by the Thai Ministry of Social Development and Human Security (MSDHS), and has lived in Thailand for no less than 10 years [33].

Additionally, the Thai Nationality Act was revised in 2012 to allow some 30,000 displaced Thais residing in the country who have strong links to Thai-national ancestors what is called "reference subjects" who are their living relatives to determine whether the applicant has blood relationship with Thai citizens. However, the process of nationality verification is slow due to its cumbersome steps for Thai citizenship, such as DNA testing which is conducted by the Central Institute of Forensic Science (CIFS), a government organization under the Ministry of Justice, to

prove the ethnicity of stateless people and help them acquire citizenship. Alternatively, the authority can interview the witnesses of their birth of the applicant. It should be mentioned here that the primary cause of statelessness is the failure of parents to report the births of their children, which could stem from their lack of understanding of the law and procedures required [15, 310].

According to the HIPCP policy, stateless people first need to register with the MOI to access the insurance. Upon successful registration, a 13-digit national identification card, starting with '0', is issued for a stateless person. This card is just a recognition of the citizenship status of a person rather than a Thai nationality. However, a '0' cardholder is eligible to apply for Thai nationality if he/she does not have nationality of another country and has been living in Thailand for at least for five years. However, the registration process is slow due to lack of coordination between the MOI and the Ministry of Public Health (MOPH) [4, 5].

Third, the National Security Council (NSC) endorsed the Stateless Strategy, the National Strategy in Addressing Right and Citizenship Status of a Person 2005, to address the stateless problem through a comprehensive registration of all persons with citizenship problems as well as to affirm of the basic human rights of a stateless person [132] as cited in [15]. [3, 133]. Following the strategy, on 5 July 2005, the Thai Cabinet approved the draft regulation of the Ministry of Education (MOE) on education policy for non-Thai people including undocumented migrants and stateless people in the country. Since then basic education (grade 1-9) has been free for all children regardless of their nationality in the country. The MOE also issues 13-digit ID ‘G-series’ cards for undocumented non-Thai children to enjoy free essential education in the country and to be included in capitation budget accordingly [15]. Unlike the MOE, the MOPH was reluctant to grasp that opportunity and took five more years to launch the HIPCP for the stateless population in 2010 [15].

Fourth, a recent domestic study by Suphanchaimat et al. [4] found multiple challenges to implementing the HIPCP policy in practice regarding health systems components: leadership and governance, health financing, health information, human resources for health, medical product procurement, and service delivery [4]. While all these components are key to promote the HIPCP, unclear guidelines could yield a poor outcome of the policy. For instance, local providers are responsive more to the

UCS than to the HIPCP due to the limited technical and human-resource capacities of the policy governing body. Similarly, the poor collaboration between the MOI and the MOPH affects the capitation budget for stateless people which is based on the accuracy of population numbers in specific areas registered with the MOI. Although there is shortage of Thai staff to deal with the health issues of the undocumented people including the stateless and immigrants, the Thai Civil Service does not allow health facilities to formally provide official posts to stateless people while migrant health workers (MHWs) and migrant health volunteers (MHVs) are key health workers to address the health problems of stateless people and undocumented migrants. service delivery, unclear guidelines regarding the permitted scope of expenditure hinders providers to deliver services to stateless patients especially those who are not registered with health facilities of their domicile but come from outside the local area [4].

Finally, regarding non-health system-related factors, the occupation of hill-tribe people also affects the policy to achieve its goal. For instance, most stateless people keep busy with farming activities especially during maize harvesting seasons which is their main livelihood. During the farming season, parents do not bring their kids to the hospital or health center for vaccination following pre-scheduled dates. In addition, the full immunization rate (who received five doses of vaccine) has been reduced from about 81% in 2014 to 75% in 2016 in Phop Phra District. This situation might put children at risk of vaccine preventable diseases due to a lack of vaccine efficacy and effectiveness (Informal discussion). Similarly, the most frequently reported diseases in Umphang District are malaria, dengue fever, tuberculosis, and diarrhoea while the majority of the non-Thai patients are uninsured. These underprivileged populations such as hill-tribes and undocumented aliens (e.g. low-skilled migrants) would sick and have been left untreated it is highly likely that other people including Thais would be contaminated with the disease (Informal discussion).

The study by Suphanchaimat et al. [4] suggested improving collaboration between the MOPH and the MOI to stabilize the funding flow through capitation. The MOPH should develop clear and practical guidelines concerning budgeting and scope of service provision should be fine-tuned to assist health personnel, who are unaware of the HIPCP policy, to cope with citizenship problems of patients. Additionally, in

the long run, the nationality verification process for stateless people should be expedited to end the statelessness in the country.

CHAPTER V

RESULTS: QUANTITATIVE ANALYSES

Introduction

In the previous chapter the author has presented findings of objective-1 employing the scoping review method. In this chapter the author describes the results of the objective-2 and objective-3 of the study applying quantitative analyses. Each of the objectives is further split into sub-sections as follows: introduction, methods, results, and discussion. The results of objective-2 are presented under these two broad sub-sections: (i) outpatient utilization, (ii) inpatient utilization. Similarly, the results of objective-3 are presented under two broad sub-sections: (i) presence of cases with diseases, (ii) incidence of death.

Objective-2: To compare healthcare service utilization of children by insurance status: UCS, HIPCP, and uninsured

Introduction

Thailand achieved universal health coverage in 2002 by introducing the Universal Coverage Scheme (UCS) for Thai citizens [107]. Since then stateless populations were left uninsured who were previously insured by the low-income card scheme (LICS) [4]. Hence, stateless people faced financial barriers to access care that led to low health service utilization and catastrophic spending. It also increased the unpaid debt of public hospitals in border areas due to the exemptions of medical bills of stateless patients [178]. To address the problems, the Thai Cabinet instigated the "Health Insurance for People with Citizenship Problem (HIPCP)" scheme (or "Stateless Insurance" from now on) in 2010 [4]. The benefit package of the stateless insurance scheme is comprehensive and quite similar to that of the UCS, including outpatient and inpatient services, health promotion and disease prevention, and high-cost care. Despite the HIPCP policy in place since 2010, little is known about the magnitude of use of medical services amongst the stateless children.

Empirical studies suggest that healthcare utilization differs by insurance status. Utilization rate is greater among insurees compared with the uninsured. However, utilization is consistently lower among stateless and migrant insurees compared with the UCS Thai population [5, 15]. Suphanchaimat found that both outpatient and inpatient utilization rates were greater among the insured migrants and the UCS beneficiaries compared with the uninsured [15]. The study also suggested that outpatient utilization was much higher among younger children compared with older children regardless of insurance status [15]. Hu found that the utilization rate increased among the stateless people after one year of inception of the stateless insurance but it was lower than the UCS beneficiaries [152]. Similarly, the crude utilization rate was lower among insured migrants compared with the UCS Thais [179].

Regarding econometric methods most recent studies applied Difference-in-Difference (DID) [5], Ordinary Least Square (OLS), Poisson regression, and Negative binomial regression [15] for evaluating the impact of insurance policy on healthcare utilization using facility-based health data. Following the previous studies, in this study, the researchers hypothesised that outpatient utilization rate would differ by insurance status and lower utilization has been expected among the stateless insurees compared with the UCS counterpart. The objective of this study was to compare outpatient and inpatient healthcare service utilization by three levels of insurance status: uninsured, stateless, and universal coverage scheme (UCS) children. The retrospective study applied multivariate analysis techniques to measure the effect of exposure on the outcome using routinely collected health data from four selected districts in Tak Province.

Methods

Data sources: Routinely collected health data was retrieved from January 1, 2013 to December 31, 2017 through Provincial Public Health Office (PPHO) in Tak Province. Details data acquisition process has been discussed in the methodology chapter. Additionally, the researcher used informal interviews with hospital

management teams as a means to complement the findings of quantitative analyses (see the methodology section for details).

Participants: The study included children aged 0-15 years who had an outpatient (OP), and inpatient (IP) visit between January 1, 2013 and December 31, 2017 to any health facilities including health centers and district hospital in each of these four selected districts: Mae Ramat, Phop Phra, Tha Song Yang, and Umphang.

Variables: Three sets of variables were used in the quantitative analysis: outcome variable, exposure variable, and covariates/confounders. The outcome variables were measured by outpatient utilization rate (visits/person/year) and inpatient utilization rate (admissions/person/year). The exposure variable was the three levels of insurance status (uninsured, stateless, UCS). Aside from the exposure, the analysis also took into account the effect of the key confounders, namely age group (0-1, 2-3, 4-5, 6-10, and 11-15 years), sex (male/female), domicile (four districts), facility level (district hospital/ health center), and year of utilization (2013-2017). Inpatient data analysis was limited to the hospital level. The description of outcome, exposure, and covariates/confounders used in the quantitative analysis can be found in the research methodology chapter.

Results

Results are presented by two broad sub-sections: (i) outpatient utilization, (ii) inpatient utilization, as follows.

Outpatient utilization

Participants: Figure 11 shows the selection of individual outpatient and the records of their corresponding visit over the study period between 2013 and 2017. The researcher identified 76,905 insurance beneficiaries, comprised of 1,118 (1.4%) uninsured, 1,008 (1.31%) stateless, and 74,779 (~97%) UCS children who had at least one outpatient department (OPD) visit between 2013 and 2017 (Table 17). The highest records (~33%) were drawn from Tha Song Yang district followed by Mae Ramat (~26%), Phop Phra (~26%) and Umphang districts (15%). Around 51% of all beneficiaries were males. Majority of the participants were aged six and above. For

example, children aged between 0-1 year accounted for 25% of all participants while 2-3 years 4-5 years 6-10 years, and 11-15 years groups accounted for 11%, 13%, 25%, and 26%, respectively.

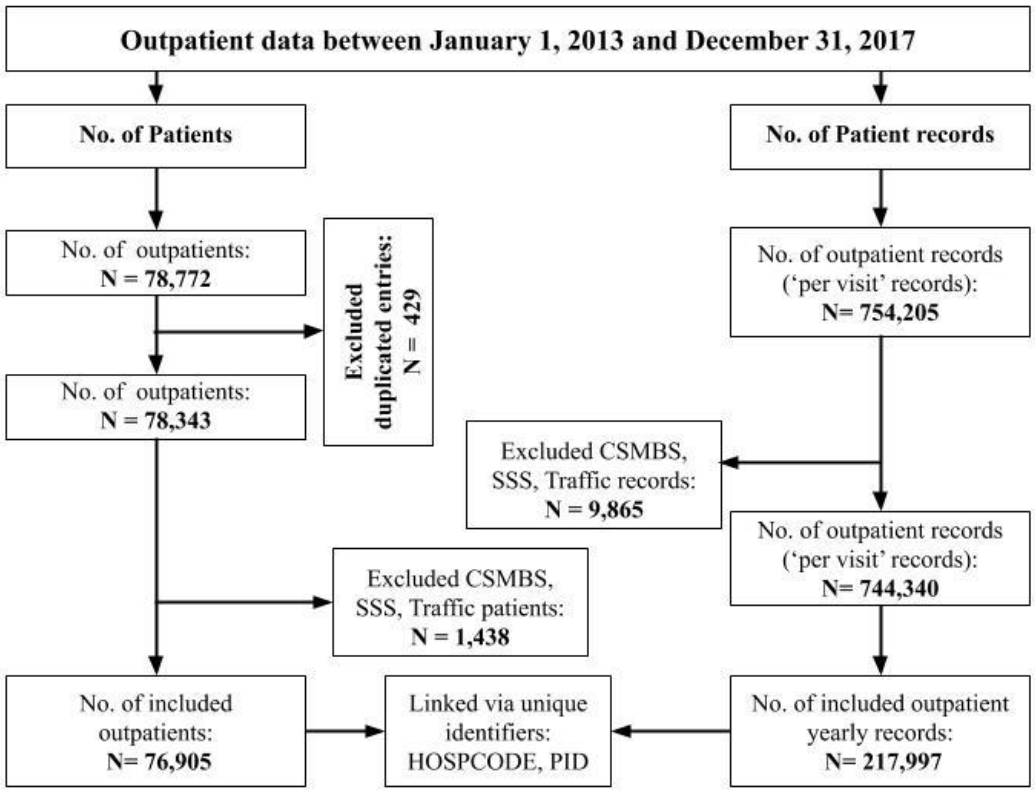


Figure 11 Flowchart of the selection of outpatients and records of their corresponding visits

Note: CSMBS: Civil servant medical benefit scheme, SSS: Social security scheme, HOSPCODE: Hospital code, PID: Personal identification number

Descriptive statistics of participants by insurance status: The researcher identified a total of 744,340 outpatient visits records between 2013 and 2017. Of these records, 3,720 visits (~0.5%) were made by the stateless patients while 0.7% and 99% of visits were made by the uninsured and the UCS patients, respectively (Table 18). Total visits made by males outnumbered females in all beneficiary types except uninsured. However, there was no significant difference between males and females

in the OP utilization in all beneficiary types. The greatest proportion of OP visits was amongst patients under two (0-1 year) in all beneficiary types except the uninsured. The proportion of OP visits were consistently higher among the uninsured aged 6-10 years and above than that of the stateless and the UCS insurees.

Table 17 Number and proportion of individual (outpatients) participants by insurance status, age group, sex, health facility level, and domicile

Variable	Count (n)	%
Insurance status		
Uninsured	1,118	1.45
HIPCP	1,008	1.31
UCS	74,779	97.24
Age group		
0-1 year	19,250	25.03
2-3 years	8,543	11.11
4-5 years	9,824	12.77
6-10 years	19,601	25.49
11-15 years	19,687	25.6
Sex		
Male	38,972	50.68
Female	37,933	49.32
Facility level		
District Hospital	11,222	14.59
Health Center	65,683	85.41
Domicile of children		
Mae Ramat	19,743	25.67
Phop Phra	19,763	25.7
Tha Song Yang	25,671	33.38
Umphang	11,728	15.25

The largest proportion of OP visits amongst the uninsured and the UCS patients took place in Tha Song Yang district while the largest proportion of visits amongst the stateless insurees took place in Mae Ramat District. Unlike the stateless patients, the largest proportion of the OP visits took place in health center levels amongst the uninsured and UCS beneficiaries. The largest proportion of OP visits

took place in the year 2014 amongst the stateless and the UCS patients while this figure was true in 2017 for the uninsured patients (Table 18).

Table 18 Comparing the sum of the OP visits by personal attributes and insurance status

Variables	Uninsured (n=5,238)	HIPCP (n=3,720)	UCS (n=735,382)	p-value	test
Age group (%)					
• 0-1 year	1,323 (21.7)	1,551 (41.4)	169,832 (23.1)	<0.001	Chi-square
• 2-3 years	961 (15.8)	576 (15.4)	165,978 (22.6)		
• 4-5 years	778 (12.8)	488 (13.0)	135,854 (18.5)		
• 6-10 years	1,715 (28.1)	510 (13.6)	152,715 (20.8)		
• 11-15 years	1,323 (21.7)	624 (16.6)	111,006 (15.1)		
Sex (%)					
• Male	2,620 (50.0)	1,872 (50.3)	376,605 (51.2)	0.128	Chi-square
• Female	2,618 (50.0)	1,848 (49.7)	358777 (48.8)		
Domicile (%)					
• Mae Ramat	1,225 (20.1)	1,701 (45.4)	201,399 (27.4)	<0.001	Chi-square
• Phop Phra	729 (12.0)	303 (8.1)	201,377 (27.4)		
• Tha Song Yang	3,143 (51.5)	410 (10.9)	240,580 (32.7)		
• Umphang	1,003 (16.4)	1,335 (35.6)	92,029 (12.5)		
Facility level (%)					
• District Hospital	464 (7.6)	2,933 (78.2)	30,327 (4.1)	<0.001	Chi-square
• Health Center	5,636(92.4)	816 (21.8)	70,5058(95.9)		
Year of OP visit (%)					
• 2013	874 (14.3)	767 (20.5)	134,554 (18.3)	<0.001	Chi-square
• 2014	1,151 (18.9)	1,105 (29.5)	171,086 (23.3)		
• 2015	1,258 (20.6)	748 (20.0)	152,204 (20.7)		
• 2016	1,297 (21.3)	490 (13.1)	148,697 (20.2)		
• 2017	1,520 (24.9)	639 (17.0)	128,844 (17.5)		

Outcome: To calculate outpatient (OP) utilization rate, the dataset was converted from 'per visit' to 'per person per year visit' through linking multiple visits via common identifiers (e.g. HOSPCODE, PID). Figure 12 displays distribution of outcome data with density plots with by insurance status. It clearly shows the asymmetric distribution (skewed to the right) of outcome data and the UCS patients seem to account for the overall skewness. The mean greater than median also indicates right skewed data (3.41 vs 2 visits/person/year, respectively). Comparing the mean utilization rate across insurance status, the UCS patients seemed to experience the greatest number of OP services followed by the uninsured and the HIPCP (3.44 vs

2.30 vs 1.89 visits/person/year). The differences across groups showed statistical significance (Table 19). The distribution of outpatient utilization rate by age group, sex, domicile, and year of utilization and corresponding insurance status in shown in Figure 13, Figure 14, Figure 15, and Figure 16, respectively. The outpatient utilization rate by age group, sex, facility level, domicile, and year of utilization can be found in the Appendix D. For instance, utilization rates among children aged 0-1 year and 2-3 years were 4.34 and 4.85 visits/person/year, respectively. On the other hand, the OP utilization rate subsequently declined among older children aged six and above. For instance, 4.03, 2.76, and 2.21 visits/person/year for children aged 2-3 years, 6-10 years, and 11-15 years, respectively (Appendix D).

Table 19 Comparing mean and median of OP utilization rate (visits/person/year) by insurance status and by facility levels

Particulars	**Uninsured**	**HIPCP**	**UCS**	**p**	**test**
Both Health Centers and District Hospitals					
n	**2,274**	**1,966**	**213,757**		
Mean (SD)	2.30 (2.03)	1.89 (1.34)	3.44 (3.27)	<0.001	ANOVA
Median [IQR]	2.00 [1, 3]	1.00 [1, 2]	2.00 [1, 4]	<0.001	Kruskal-Wallis
Only Health Centers					
n	**2,030**	**316**	**196,259**		
Mean (SD)	2.42 (2.10)	2.55 (2.00)	3.59 (3.36)	<0.001	ANOVA
Median [IQR]	2.00 [1, 3]	2.00 [1, 3]	2.00 [1, 5]	<0.001	Kruskal-Wallis
Only District Hospitals					
n	**244**	**1,650**	**17,498**		
Mean (SD)	1.37 (0.84)	1.77 (1.13)	1.73 (1.14)	<0.001	ANOVA
Median [IQR]	1.00 [1, 1]	1.00 [1, 2]	1.00 [1, 2]	<0.001	Kruskal-Wallis

Note: SD: Standard Deviation, IQR: Interquartile Range; Uninsured and the UCS beneficiaries seem mostly bound to health centers while the stateless beneficiaries seem bound to district hospitals for outpatient services

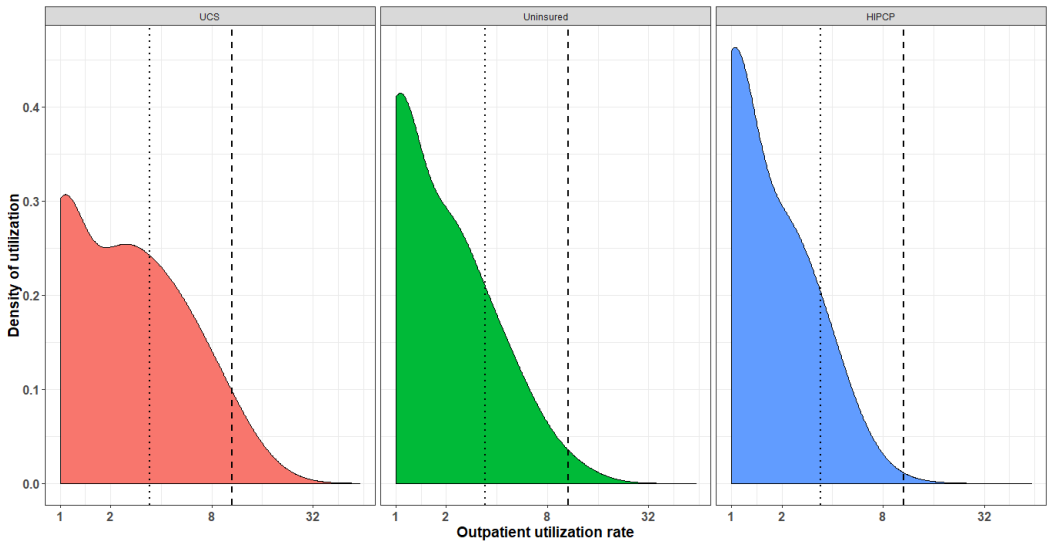


Figure 12 Distribution outpatient utilization rate (visits/person/year) by insurance status

Note: Dotted and dashed lines denote the mean and variance of outcome in which variance is much larger than mean

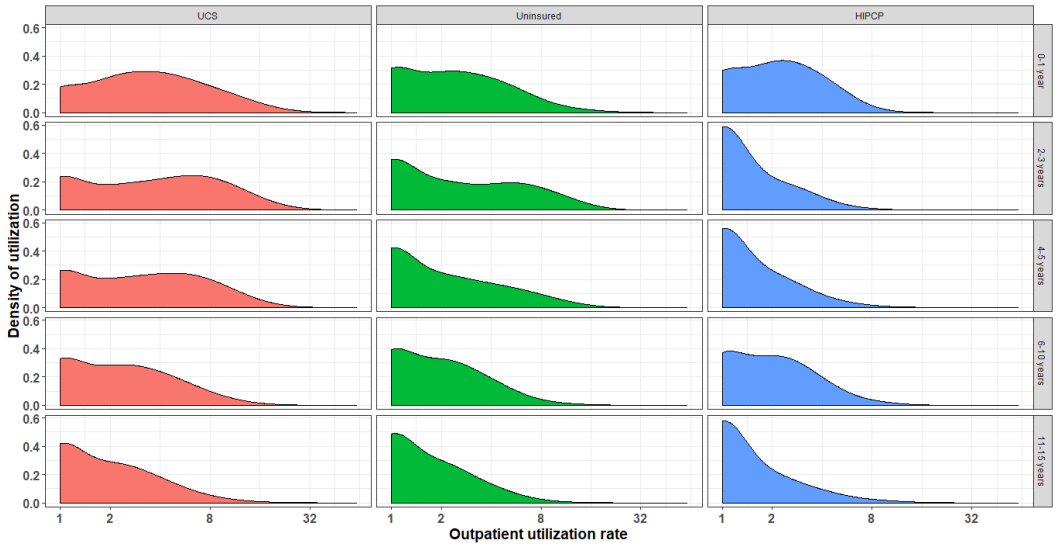


Figure 13 The distribution of outpatient utilization rate by insurance status and the age group of children

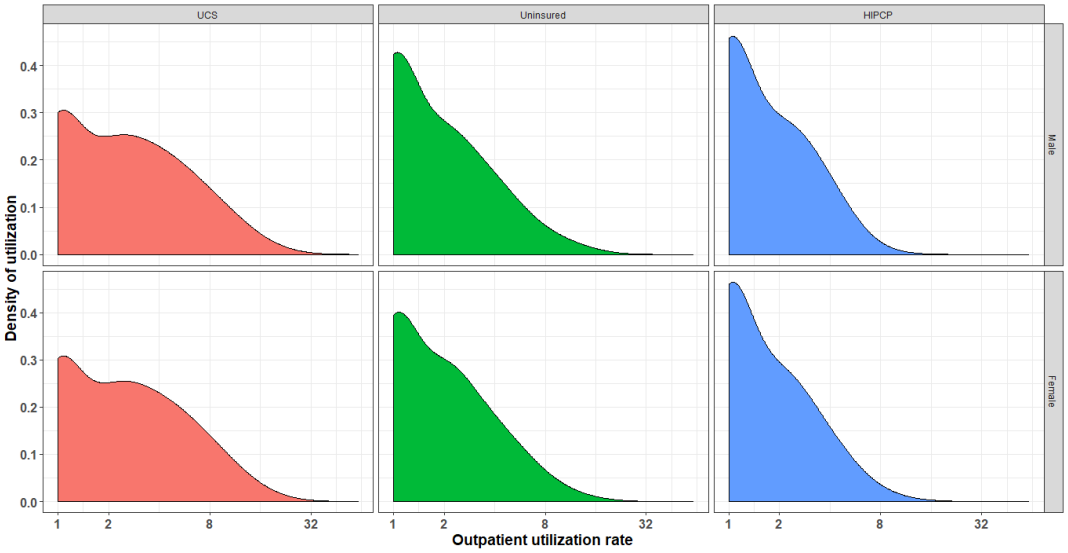


Figure 14 The distribution of outpatient utilization rate by insurance status and the sex of children

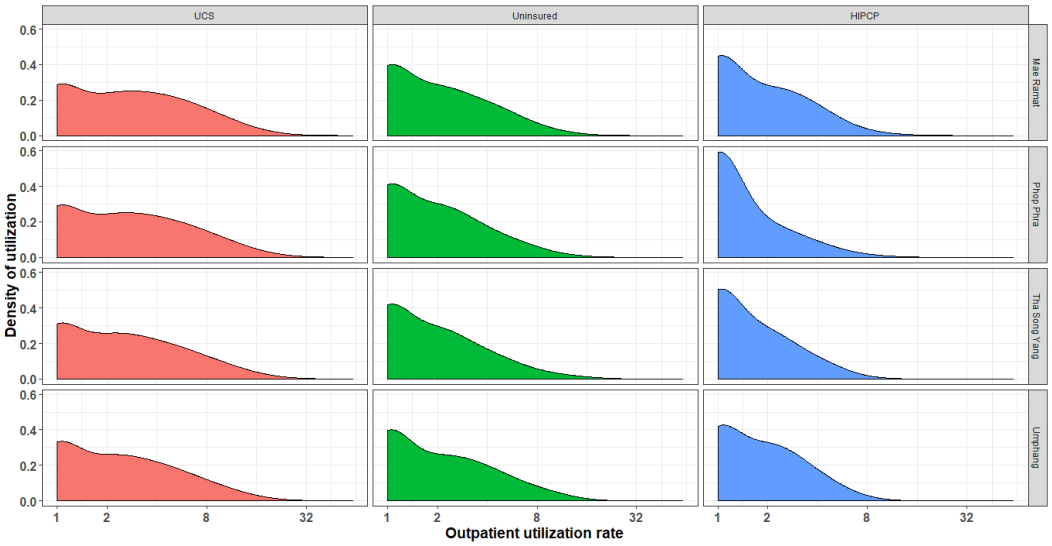


Figure 15 The distribution of outpatient utilization rate by insurance status and the domicile of children

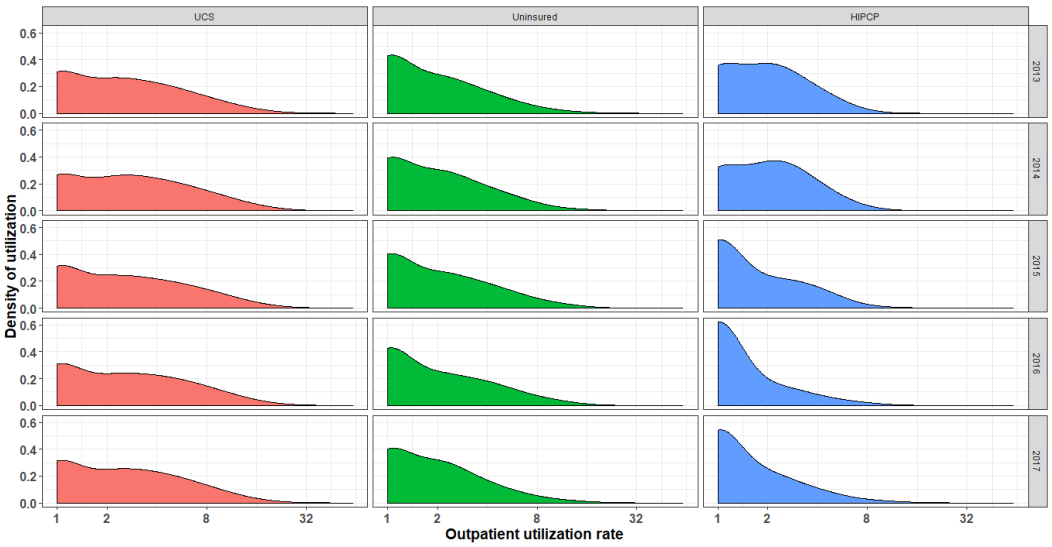


Figure 16 The distribution of outpatient utilization rate by insurance status and the year facility visit of children

Main results: Multivariate Negative binomial regression was performed as the variance of the outcome variable was much larger than its means (10.6 vs 3.41 visits/person/year respectively). This difference suggests that overdispersion was present and that a Negative binomial model is more appropriate for counted data than the Poisson regression. Table 20 displays results of the in terms of incidence rate ratio (IRR). Negative binomial always gives a shape parameter (theta) or so-called dispersion parameter. The theta of the naïve model was 2.460 with statistical significance. Should theta greater than one suggests that overdispersion exists in the dataset and the Negative binomial regression was relevant. The dispersion parameter (theta) in the final model gives the largest value, suggesting the least variability in the data. The multivariate analysis with confounders confirmed the findings from univariate analysis, that is, OP utilization rate of stateless patients was 49% lower than that of UCS patients while OP utilization rate of the uninsured patients was 28% lower than that of the UCS patients. In other words, both the HIPCP and the uninsured had a lower volume of OP utilization, compared with the UCS beneficiaries. OP utilization was found to be the highest among the youngest group (0-1 year), which was subsequently declined as they grew older. For instance, OP use reduced by 10%, 41%, 54% for 4-5 years, 6-10 years, and 11-15 years groups respectively compared with their youngest counterpart (0-1 year). OP visits did not

differ by gender of children. Children living in Phop Phra, Tha Song Yang, and Umphang had 3%, 7%, and 15% fewer visits than that of children living in Mae Ramat District. However, the OP utilization rate increased among children over time, such as from 14% in 2014 to 27% in 2017 compared with the utilization in 2013 which was nearly doubled.

Table 20 Multivariable analysis of OP utilization rate by Negative Binomial regression

Variable	IRR	[95% CIs]	p-value
Status (vs. UCS)			
• Uninsured	0.720***	[0.70, 0.75]	<0.001
• HIPCP	0.510***	[0.49, 0.53]	<0.001
Age group (vs. 0-1 year)			
• Age 2-3	1.050***	[1.040, 1.060]	<0.001
• Age 4-5	0.860***	[0.850, 0.870]	<0.001
• Age 6-10	0.590***	[0.580, 0.590]	<0.001
• Age 11-15	0.460***	[0.460, 0.470]	<0.001
Sex (vs. Male)			
• Female	0.990	[0.990, 1.000]	0.061
Domicile (vs. Mae Ramat)			
• Phop Phra	0.970***	[0.960, 0.980]	<0.001
• Tha Song Yang	0.930***	[0.920, 0.940]	<0.001
• Umphang	0.850***	[0.840, 0.860]	<0.001
Year of visits (vs. 2013)			
• Year 2014	1.140***	[1.130, 1.150]	<0.001
• Year 2015	1.130***	[1.120, 1.140]	<0.001
• Year 2016	1.260***	[1.250, 1.270]	<0.001
• Year 2017	1.270***	[1.260, 1.280]	<0.001
Constant	1.540***	[1.510, 1.580]	<0.001
Observations		217,997	
Log Likelihood (LL)		-958,270	
Theta (standard error)		3.094*** (0.016)	
Akaike Information Criterion (AIC)	958,302		

Note: *p<0.1; **p<0.05; ***p<0.01, IRR: Incidence Rate Ratio; CI: Confidence Intervals. In R, Negative binomial output displays the dispersion statistics called theta or shape parameter, and it allows the researcher to parameterize *alpha*, giving parameter estimates for the dispersion. This allows researchers to assess which predictors add to the extra-dispersion of the model by reducing theta value. In R variance = mean + mean^2/theta while in Stata variance = mean + alpha*mean^2 [alpha=inverse of theta]. Bigger theta indicates lower variability in the outcome data and the researcher selected the final model accordingly.

The interaction terms, namely the interaction between insurance and age group and the insurance and facility level, insurance and domicile, insurance and utilization

year were already checked to justify their inclusion in the equation. Although the LR test showed statistical significance after the interaction terms were added, the dispersion parameter (theta value) remained the same with subsequent addition of interaction terms implying that these additional interaction terms did not significantly improve the goodness of fit of the equation (not shown). Additionally, coefficients were statistically significant in the model with interaction terms but at the cost of wider confidence intervals (CIs) that might weaken the reliability of estimates. As such the researcher selected the final model without interaction terms.

Major reasons for outpatient utilization

The major reasons of outpatient department visits, based on topmost frequently appeared ICD-10TM codes were: treatments for minor illness and disease prevention activities and routine immunization regardless of insurance affiliations of children. However, a closer look revealed that the OP visits of the UCS and uninsured children were more diverse, including the routine child health examination, common cold, the examination of ears, hearing, dental and vision, the health promotion and disease prevention, childhood growth monitoring, and immunization. This finding was in contrast to the stateless insurees who seemed to be visiting health facilities for receiving only essential vaccinations, including measles, mumps, rubella, polio, and tuberculosis (see Appendix G for details).

Subgroup analysis

The researcher performed a subgroup analysis to examine potential concerns and sources of bias. For this, the researcher repeated the multivariate Negative binomial regression models using subset of data by two separate facility levels: health centers, district hospitals while former is a lower level facility at sub-district levels and the latter is an upper level facility at district levels. The results with health center levels data were more consistent with the results with the full sample (e.g. all facilities) (Figure 17). For instance, similar to full sample, at sub-district level, the OP utilization rates of HIPCP insurees (IRR = 0.75, 95% CI = [0.68, 0.82], $p < 0.001$), and uninsured children (IRR = 0.73, 95% CI = [0.70, 0.76], $p < 0.001$) were found to lower than the UCS beneficiaries who were assumed to be the standard user of OP

services in study area. On the other hand, at the district level, OP utilization rate (visits/person/year) did not statistically differ by insurance status of children (Figure 17). Therefore, health center level data represented the full sample.

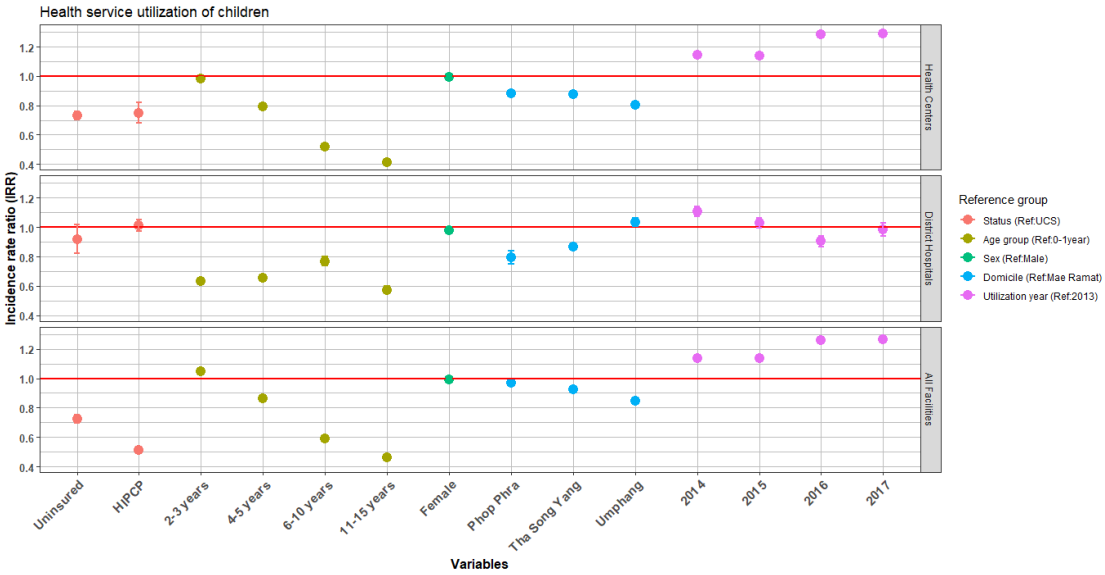


Figure 17 The outpatient service utilization of children in terms of incidence rate ratio (IRR) in health centers, district hospitals, and all facilities

Note: The horizontal lines represent the null effect or no association between outcome and exposure or covariates in which IRR equals one. Vertical bars extending both sides of each point represent 95% confidence intervals

In sum, compared with the UCS group, the HIPCP and the uninsured were less likely to use outpatient services. Subgroup analysis showed that the difference in OP utilisation rates was more pronounced at health center levels, which was less obvious at hospital levels. At health centers or sub-district level, both the HIPCP and the uninsured had fewer OP visits than the UCS. The OP utilization rates of the uninsured and the HIPCP were similar at the health center levels (IRR = 1.030, 95% CI = [0.930, 1.130], p = 0.614). Likewise, at district hospitals, the OP utilization rates of the HIPCP and the uninsured were also similar (IRR = 1.100, 95% CI = [0.990, 1.240], p = 0.089). Similarly, the OP utilization rates did not differ between the UCS

and the uninsured at district hospitals (IRR = 1.090, 95% CI = [0.980, 1.220], p = 0.112).

Inpatient utilization

Participants: Figure 18 shows the selection of individual inpatient and their corresponding admission records over the study period from 2013 to 2017. The researcher identified 9,541 insurance beneficiaries, comprised of 90 (~1%) uninsured, 736 (~8%) stateless, and 8,715 (~91%) UCS children who had at least one inpatient (IP) admission between 2013 and 2017 (Table 18). The highest number of patients were admitted to the Mae Ramat Hospital (~50%) followed by Umphang Hospital (~22%), Tha Song Yang Hospital (~20%), and Phop Phra Hospital (~8%). Around 53% of all patients were males. Regarding age group, the 0-1-year group accounted for 34% of all participants while 2-3 years, 4-5 years, 6-10 years, and 11-15 years groups accounted for 15%, 10%, 18%, and 23%, respectively.

Descriptive statistics of participants by insurance status: The researcher identified a total of 15,677 inpatient admission records between 2013 and 2017. Of these records, 1,223 admissions (~8%) were by the stateless patients while approximately 1% and 91% were the uninsured and the UCS patients, respectively (Table 21). The greatest proportion of IP admission was amongst patients under two (0 -1 year) in all beneficiary types except the uninsured. The proportion of IP admission was highest amongst the uninsured aged 11 and above compared with the stateless and the UCS insurees.

Admission of males outnumbered females in all beneficiary types except the uninsured. However, IP admission did not significantly differ by gender in all beneficiary types. The largest proportion of IP admission amongst the uninsured took place in Tha Song Yang hospital while the largest proportion of admission amongst and the UCS and the stateless patients took place in Mae Ramat hospital. The proportion of IP admission steadily increased over the years amongst all beneficiaries (Table 22).

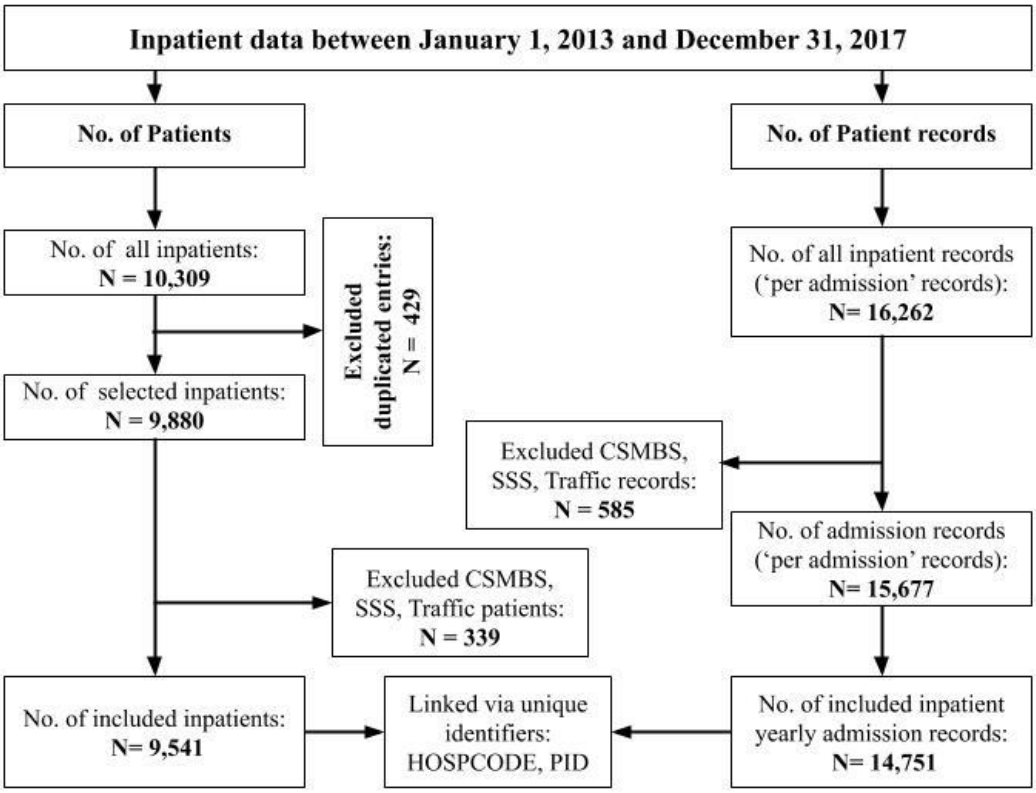


Figure 18 Flowchart of the selection of inpatients and records of their corresponding admission

Note: CSMBS: Civil servant medical benefit scheme, SSS: Social security scheme, HOSPCODE: Hospital code, PID: Personal identification number

Table 21 Number and proportion of individual (inpatients) participants by insurance status, age group, sex, and domicile

Variable	Count (n)	%
Insurance status		
• Uninsured	90	0.94
• HIPCP	736	7.71
• UCS	8,715	91.34
Age group		
• 0-1 year	3,281	34.39
• 2-3 years	1,444	15.13
• 4-5 years	929	9.74
• 6-10 years	1,691	17.72
• 11-15 years	,2196	23.02
Sex		
• Male	5,025	52.67
• Female	4,516	47.33
Domicile of children		

Variable	Count (n)	%
• Mae Ramat	4,815	50.47
• Phop Phra	748	7.84
• Tha Song Yang	1,870	19.6
• Umphang	2,108	22.09
Year of hospitalization		
• 2013	2,540	26.62
• 2014	2,076	21.76
• 2015	1,269	13.3
• 2016	1,721	18.04
• 2017	1,935	20.28

Table 22 Comparing total admissions by personal attributes and insurance status

Variables	Uninsured (n=112)	HIPCP (n=1,223)	UCS (n=14,342)	p-value	test
Age group (%)					
• 0-1 year	12 (10.7)	477 (39.0)	4,967 (34.6)	<0.001	Chi-square
• 2-3 years	23 (20.5)	198 (16.2)	3,001 (20.9)		
• 4-5 years	22 (19.6)	66 (5.4)	1,570 (10.9)		
• 6-10 years	17 (15.2)	141 (11.5)	2,250 (15.7)		
• 11-15 years	38 (33.9)	341 (27.9)	2,554 (17.8)		
Sex (%)					
• Male	61 (54.5)	652 (53.3)	7819 (54.5)	0.718	Chi-square
• Female	51 (45.5)	571 (46.7)	6,523 (45.5)		
Domicile of children (%)					
• Mae Ramat	1 (0.9)	534 (43.7)	8,306 (57.9)	<0.001	Chi-square
• Phop Phra	8 (7.1)	92 (7.5)	779 (5.4)		
• Tha Song Yang	98 (87.5)	113 (9.2)	2,615 (18.2)		
• Umphang	5 (4.5)	484 (39.6)	2,642 (18.4)		
Year of hospital admission (%)					
• 2013	1 (0.9)	234 (19.1)	2,901 (20.2)	<0.001	Chi-square
• 2014	1 (0.9)	280 (22.9)	2,999 (20.9)		
• 2015	11 (9.8)	189 (15.5)	2385 (16.6)		
• 2016	55 (49.1)	233 (19.1)	2988 (20.8)		
• 2017	44 (39.3)	287 (23.5)	3069 (21.4)		

Outcome: To calculate inpatient (IP) utilization rate, the dataset was converted from ‘per admission’ to ‘per person per year admission’ through linking multiple admissions via common identifiers (HOSPCODE, PID). Figure 19 displays the distribution of outcome variable (admissions/person/year) with density plots by insurance status. The mean of the outcome variable was slightly higher than the median (1.61 vs 1.00 admissions/person/year respectively) indicated that data was

slightly skewed to the right. The stateless patients seemed to be accounted for the overall skewness with greater spread (min vs max: 1 vs 18) compared with the UCS and the uninsured (Figure 19). The inpatients' utilization rates by age group, sex, domicile, and year of utilization or hospitalization are shown in Figure 20, Figure 21, Figure 22, and Figure 23, respectively.

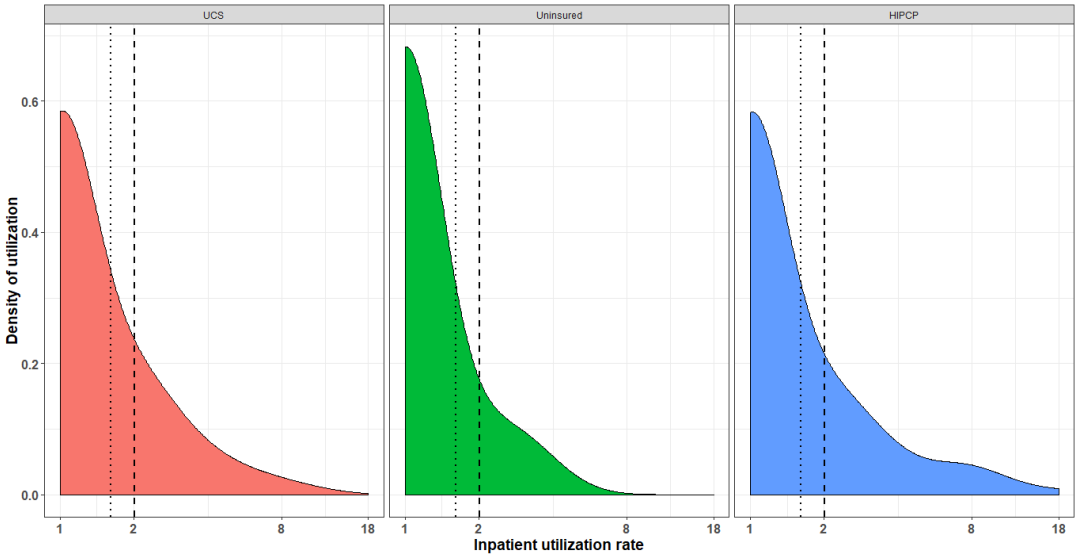


Figure 19 The distribution of inpatient utilization rate (no. of admission/person/year) by insurance status

Note: Dotted and dashed lines show overall mean and variance, respectively in which mean is closer to variance.

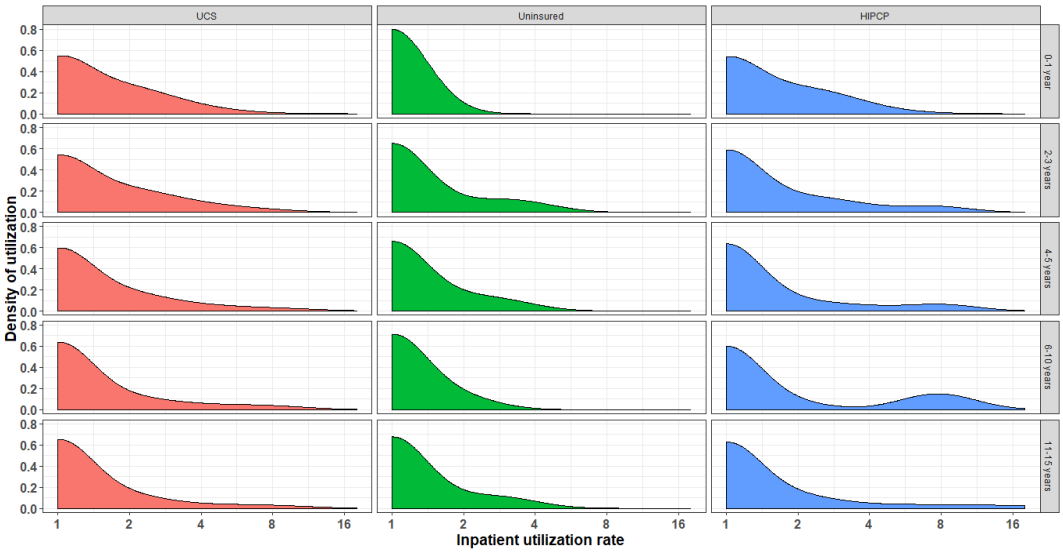


Figure 20 The distribution of inpatient utilization rate (no. of admission/person/year) by insurance status and the age group of children

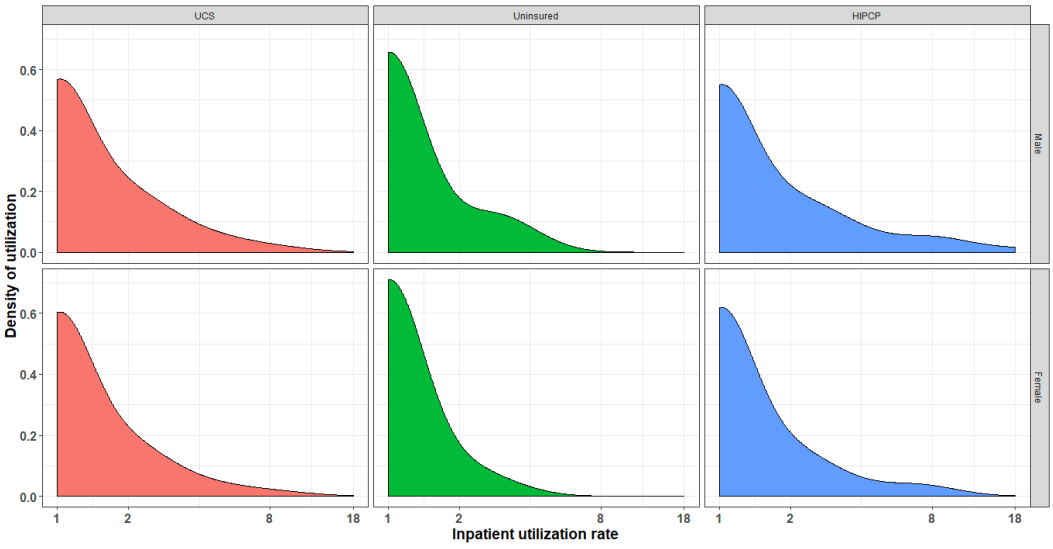


Figure 21 The distribution of inpatient utilization rate (no. of admission/person/year) by insurance status and the sex of children

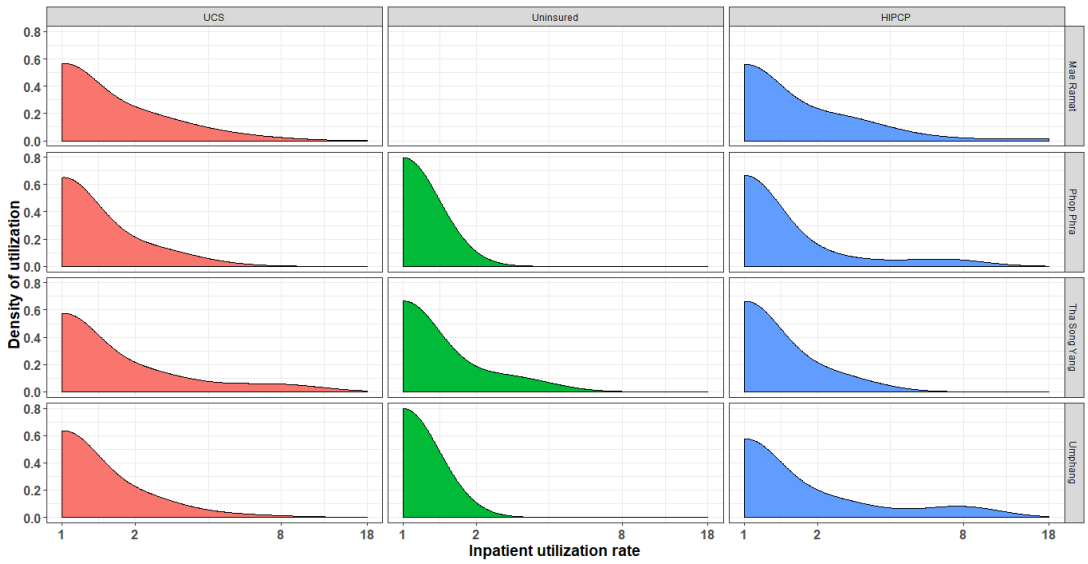


Figure 22 The distribution of inpatient utilization rate (no. of admission/person/year) by insurance status and the domicile of children

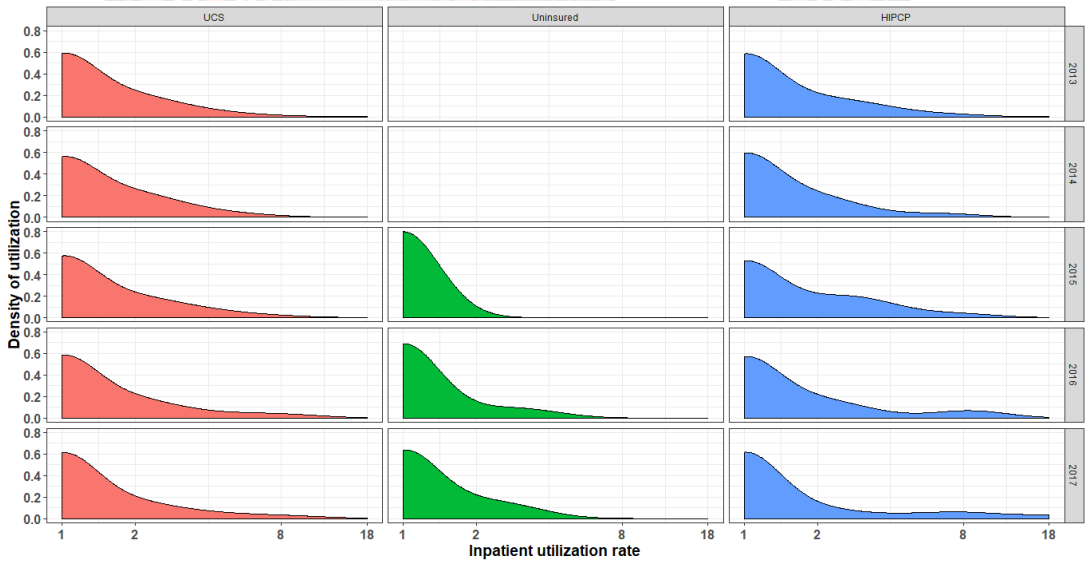


Figure 23 The distribution of inpatient utilization rate (no. of admission/person/year) by insurance status and the year of utilization by children

Table 23 demonstrates the inpatient utilization rate across three insurance groups. Comparing the mean IP utilization rate across insurance status, the stateless patients seemed to experience the greatest number of IP admission followed by the UCS insurees, and the uninsured (1.84 vs 1.59 vs 1.25 admissions/person/year

respectively). The differences across the three groups showed statistical significance. The inpatients' utilization rates by age group, sex, domicile, and year of admissions can be found in the Appendix E.

Table 23 Comparing mean and median numbers of IP utilization rate (admission/ person/year) by insurance status of children

Particulars	Uninsured	HIPCP	UCS	p-value	test
n	**104**	**1,150**	**13,497**		
Mean (SD)	1.25 (0.63)	1.84 (2.17)	1.59 (1.34)	<0.001	ANOVA
Median [IQR]	1.00 [1, 1]	1.00 [1, 2]	1.00 [1, 2]	0.009	Kruskal-Wallis

Note: SD: Standard deviation, IQR: Interquartile range, UCS: Universal coverage scheme

Main results: Multivariate Poisson regression was performed as the variance of the outcome variable was close to its mean (mean vs variance: 1.61 vs 2.00 admissions/person/year respectively). This minimal difference suggested the absence of dispersion and a Poisson regression model was more appropriate over Negative binomial for counted data.

Table 24 displays the results in terms of incidence rate ratio (IRR). The multivariate Poisson model confirmed the findings from univariate analysis, that is, the stateless insurance had a positive effect on IP admissions rate. For instance, compared with the UCS the IP utilization rate (admissions/person/year) among stateless patients was 21% higher. On the other hand, compared with the UCS patients the IP utilization rate was 29% lower among the uninsured.

Children aged between 2-3 years had 6% more admissions than their younger counterparts (0-1 year) while this figure was smaller (4%) for older stateless children (11-15 years). The female children had 9.1% fewer IP admissions compared with their male counterparts.

Unlike Tha Song Yang, being the domicile of children in Phop Phra reduced the IP admissions by 24% followed by Umphang (10%) compared with the domicile in Mae Ramat. Overall IP utilization rate gradually increased by 2% in 2014 to 14% in 2017 compared with 2013 with statistical significance. The researcher also applied quasi-poisson regression and found the identical results as poison model (not shown).

Major reasons for inpatient utilization

Based on top ten most common principal diagnoses the researchers observed the major reasons of IP admissions were treatments for six types of diseases, including gastroenteritis and colitis, pneumonia, hypokalaemia, acute bronchitis, dehydration, and beta thalassaemia (see Appendix G for details). It should be mentioned here that, the child hospital born was found to be common in the stateless and the UCS beneficiaries. The researcher also observed that normal vertex delivery and uncomplicated full-term delivery were common among the stateless and the uninsured.

Table 24 Multivariable analysis of IP utilization rate by Poisson regression

Variable	IRR	[96% CI]	p-value
Status (vs. UCS)			
• Uninsured	0.710***	[0.59, 0.84]	<0.001
• HIPCP	1.210***	[1.15, 1.26]	<0.001
Age group (vs. 0-1 year)			
• Age 2-3	1.060***	[1.02, 1.10]	0.004
• Age 4-5	1.000	[0.95, 1.05]	0.921
• Age 6-10	1.000	[0.96, 1.05]	0.849
• Age 11-15	0.960	[0.92, 1.01]	0.094
Sex (vs. Male)			
• Female	0.910***	[0.89, 0.94]	<0.001
Domicile (vs. Mae Ramat)			
• Phop Phra	0.760***	[0.71, 0.81]	<0.001
• Tha Song Yang	1.080***	[1.04, 1.12]	<0.001
• Umphang	0.900***	[0.87, 0.93]	<0.001
Year of visits (vs. 2013)			
• Year 2014	1.020	[0.98, 1.07]	0.269
• Year 2015	1.040	[1.00, 1.09]	0.054
• Year 2016	1.110***	[1.06, 1.16]	<0.001
• Year 2017	1.140***	[1.08, 1.19]	<0.001
Constant	1.120	[0.93, 1.33]	0.219
Observations		14,751	
Log Likelihood (LL)		-25,929.00	
Akaike Information Criterion (AIC)		51,888.00	
Residual Deviance (df = 14,736)		29,045.00	
Null Deviance (df = 14,750)		29,607.00	

**Note: ***p<0.1; **p<0.05; ***p<0.01, IRR: Incidence Rate Ratio; CI: Confidence Intervals.

The researcher also performed multivariate logistic regression with these two outcomes: a child born in hospital and child itself give birth (not shown in the table). A multivariate logistic regression analysis, after adjusting for age, sex, domicile and hospitalization time (year), revealed that a hospital delivery was associated with the insurance status. For instance, the stateless children insured with the HIPCP a had 2.2 times greater odds of being born in hospital than those insured with the UCS HIPCP (AOR = 2.16, 95% CI = [1.49, 3.20], p <0.001). However, lack of insurance did not show any such association (AOR = 0.42, 95% CI = [0.02, 11.29], p = 0.551). The researcher also found that stateless female children had 2.4 times greater chance of giving birth than the Thai counterparts insured with the UCS (AOR = 2.35, 95% CI = [1.69, 3.27], p <0.001) while uninsured status did not show such relationship (AOR = 1.58, 95% CI = [0.69, 3.51], p = 0.261). A domestic study by Asnong et al. suggests that the main underlying reasons for adolescent pregnancy are the lack of comprehensive adolescent-friendly sexual and reproductive health services and education, and life skills necessary to negotiate sexual and reproductive choices, in particular for unmarried adolescents in refugee and migrant communities along the Thai-Myanmar border [311]. The researcher also observed that hospital lengths of stay (LOS) of the HIPCP were 1.3 times greater than the UCS (IRR = 1.34, 95% CI = [1.27, 1.41], p<0.001) (see Appendix J for detail).

Subgroup analysis

The researcher conducted a subgroup analysis (not shown in table) to examine potential concerns and sources of bias. The researcher repeated the multivariate Poisson regression models using subset of data by excluding newborn admissions (sample without newborn admissions). The results were similar to results with the full sample (sample with newborn admissions) (Figure 24). For instance, without newborn admissions, compared with the UCS, the IP utilization rate was 29% higher among HIPCP insurees (IRR = 1.29, 95% CI = [1.230 1.35], p < 0.001) which was consistent to the results with full sample (IRR = 1.21, 95% CI = [1.15, 1.26], p < 0.001). Similarly, the IP utilization rate of the uninsured was 30% lower compared with the UCS (IRR = 0.70, 95% CI = [0.58, 0.84], p <0.001), which was almost identical to the results with all admissions (IRR = 0.69, 95% CI = [0.57, 0.83], p <0.001).

Therefore, subgroup analysis confirmed the robustness of results. The researcher also found that (not shown in the table) compared with the uninsured, the IP utilization rates of the HIPCP was 14% higher excluding newborn admissions relative to all admissions (e.g. 84% vs 70%: without and with newborn admissions, respectively). On the other hand, compared with the uninsured, the IP utilization rates of the UCS was only 2% higher excluding newborn admissions relative to all admissions (e.g. 43% vs 41%: without and with newborn admissions, respectively). This situation may imply that the HIPCP are more likely to visit hospitals for medical treatment when they are severely ill.

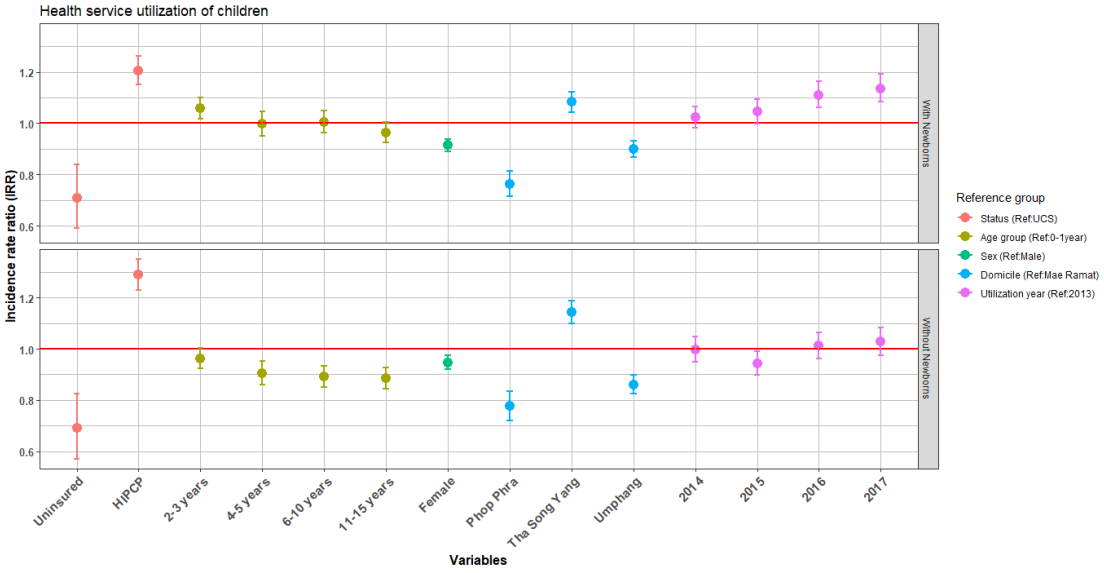


Figure 24 Inpatient service utilization of children in terms of incidence rate ratio (IRR) with and without newborn admissions

Note: Horizontal lines indicate reference group in which incidence rate ratio equals one (IRR=1). The vertical bars extending both sides of point estimate indicate 95% confidence intervals (CIs).

In sum, compared with the UCS group, the HIPCP was more likely to use inpatient services and vice-versa for the uninsured. Subgroup analysis showed consistent results with the full model. For instance, excluding newborn admission, the IP utilization rate of the HIPCP was consistently higher than both the uninsured (IRR = 1.840, 95% CI = [1.530, 2.230], $p < 0.001$) and the UCS (IRR = 1.29, 95% CI =

[1.230 1.35], $p < 0.001$). The HIPCP tends to visit for IP care to treat illness rather than facility-based delivery.

Discussion

The important findings from the above outpatient and inpatient analyses are as follows: (i) Low utilization of outpatient services by stateless and uninsured children as compared to the Thai children insured the UCS, (ii) High utilization of inpatient services by stateless children as compared to the UCS beneficiaries while inpatient services were much lower among the uninsured compared to the UCS beneficiaries, (iii) Age, sex (only inpatient), and domicile of children are independently associated with utilization rates, (iv) The study shows increasing trends of utilizations both outpatient and inpatient services among children. Subgroup analyses confirmed the utilization patterns of both inpatient and outpatient services by insurance status of children. Outpatient services significantly differed at health center levels rather than at hospitals.

Regarding IP care utilization, subgroup analysis also indicated that the HIPCP are more likely to be admitted to a hospital for medical treatment. Additionally, the length of stay (LOS) of the HIPCP is significantly higher than the UCS which may imply that stateless patients might suffer from complicated diseases that required them to stay at the hospital longer than the UCS patients. However, LOS was not adjusted by disease severity which could be a potential confounder for a longer duration of hospital stay. A previous domestic study by Vandepitte et al. suggests that disease severity among paediatric patients is associated with increased hospital resource utilization leading to higher hospital charges and longer hospitalization among children [312]. The results also suggest that the age of children, particularly age below three, was associated with increased utilization of both inpatient and outpatient services. Children in this age group usually deserve special attention to avoid any adverse health conditions in the long-term [313].

Additionally, young children are required to visit health facilities, especially health centers for routine immunization at early childhood which is consistent with the findings of the previous study [15]. The study results also suggest that outpatient

service utilization rate progressively reduced among older children aged four and above while utilization of inpatient services did not significantly differ between these age groups (Figure 25).

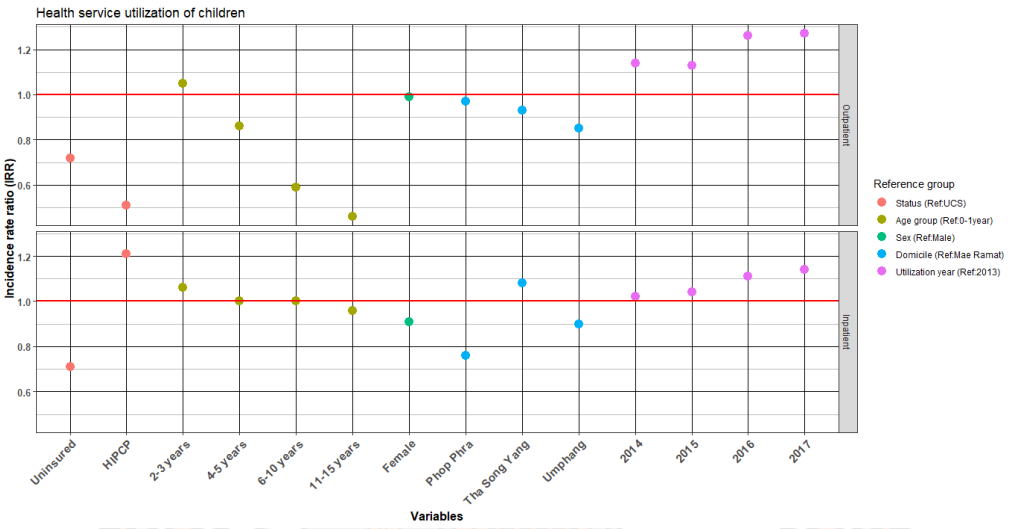


Figure 25 Outpatient and inpatient health service utilization by children in terms of incidence rate ratio (IRR)

Note: The horizontal lines indicate reference group in which incidence rate ratio (IRR) equals one (IRR=1)

Both inpatient and outpatient utilization rates were lower in children living in all study districts as compared to Mae Ramat District except inpatient utilization rate in children living in Tha Song Yang District. Cross-border migrant patients, who are assumed to be uninsured, could be the reason for this as Tha Song Yang is one of the 18 migrant checkpoints along the Thai-Myanmar border [199]. It should be mentioned here that there were no uninsured patients found in Mae Ramat Hospital.

Results also showed that outpatient service utilization rates in children did not differ by sex while the usage of inpatient services was lower in female child patients as compared to their male counterparts. The study also suggested the increasing trends of health services utilization among the children. Both inpatient and outpatient service utilization significantly increased between 2014-2017 as compared to utilization in

2013. All these points are discussed in more detail in the discussion section (Chapter 6).

Objective-3: To compare the presence of cases with diseases, and death in children by insurance status: UCS, HIPCP, and uninsured

Introduction

To help evaluate the disparities in morbidity outcomes by insurance status of children, this study examined the associations between insurance status and health outcomes among children aged between 0-15 years using multivariable logistic regression. The health outcomes are measured by the presence of cases with diseases, and the incidence of death among children during the study period:2013-2017.

Methods

Data sources: The researcher used the same data source as mentioned earlier ("43-files database") from four selected border districts hospitals, namely Mae Ramat, Phop Phra, Tha Song Yang, and Umphang, in Tak Province. The inpatient and death records of children who were registered with the facilities between January 1, 2013 to December 31, 2017, were used for serving the purpose of the objective. Additionally, the researcher used informal interviews with hospital management teams as a means to complement the findings of quantitative analyses (see the methodology section for details).

Participants: Children aged between 0-15 years admitted to four hospitals for inpatient care between 2013 and 2017 were identified from hospital admission databases. Diagnosis of aforementioned 40 diseases was confirmed based on the International Classification of Diseases and Related Health Problems Tenth Revision Thailand Modification (ICD10-TM) codes [106, 314-316]. Death records from hospital databases, which was reportedly integrated with the vital registration system of the Ministry of Interior, were used to identify death cases in children between 2013-2017.

Variables: Same sets of variables were used in the analysis as used in inpatient utilization analysis: outcome variable, exposure variable, and covariates/confounders. The outcome variables were the presence of cases with diseases (e.g. ever diagnosed with selected 40 diseases: yes/no), catastrophic illness (ever had catastrophic admission: yes/no), and incidence of death (yes/no) among children during the study

period in which all registered children were used as denominator. The exposure variable was the three levels of insurance status (UCS, HIPCP, uninsured). The key covariates, namely age group (five groups), sex (male/female), and domicile (districts), and year of admissions were used as confounders. The detailed description of the outcome, exposure, and confounders has been presented in Table 10 of the methodology chapter (Chapter 3).

Table 25 presents a total of 40 types of diseases that have primarily been selected based on the frequently appeared ICD-10TM diagnosis codes appeared in the inpatient data [86, 315]. These comprehensive lists of diseases have been chosen to have a holistic view of disparities, if any, in health outcomes of children by their insurance status (uninsured, HIPCP, UCS). The categorization of these diseases is presented in the Appendix H. These diseases include under these broad categories: (a) certain infectious and parasitic diseases, (b) diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism, (c) endocrine, nutritional and metabolic diseases, (d) diseases of the nervous system, (e) diseases of the eye and adnexa, (f) diseases of the ear and mastoid process, (g) diseases of the respiratory system, (h) diseases of the digestive system, (i) diseases of the skin and subcutaneous tissue, (j) diseases of the genitourinary system, and (k) certain conditions originating in the perinatal period, and congenital malformations. [315, 316]. To assess whether insurance status leads to different health outcomes, the researcher explored the associations between insurance status and each of the aforementioned 40 types of diseases in children using the following methods.

Table 25 The list of name of selected diseases and/or disease categories based on ICD10-TM by broad disease categories

Disease name/category*
(a) Certain infectious and parasitic diseases
1. Intestinal infectious diseases
2. Tuberculosis (TB)
3. Other bacterial infection including septicaemia
4. Rickettsiosis
5. Viral central nervous system (CNS) infection
6. Dengue
7. Viral skin infection
8. Hepatitis A, B, or C
9. Other viral infection

Disease name/category*
10. Mycoses
11. Malaria
12. Helminthiases (including ascariasis, trichuriasis, cysticercosis, hookworm)
13. Pediculosis or acariasis
(b) Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
14. Anaemia
(c) Endocrine, nutritional, and metabolic diseases
15. Malnutrition
16. Metabolic disorders (including hypovolemia, hypokalaemia, hyposmolality and hyponatraemia, acidosis)
(d) Diseases of the nervous system
17. Other CNS diseases
18. Epilepsy
19. Cerebral palsy (including paralytic syndrome, brain disorder)
(e) Diseases of the eye and adnexa
20. Conjunctivitis (including eyelid inflammation)
(f) Diseases of the ear and mastoid process
21. Otitis media
(g) Diseases of the respiratory system
22. Acute upper respiratory infection (AURI)
23. Pneumonia
24. Bronchitis
25. Asthma (including respiratory failure, other pulmonary diseases)
(h) Diseases of the digestive system
26. Disease of the oral cavity (including salivary glands and jaws)
27. Gastritis or dyspepsia
28. Appendicitis or hernia
29. Diseases of intestine including peritoneum
30. Disease of liver or gallbladder
(i) Diseases of the skin and subcutaneous tissue
31. Skin diseases (including cellulitis, urticaria, abscess, dermatitis, lymphadenitis)
(j) Diseases of the genitourinary system
32. Nephritic syndrome
33. Renal tubulo-interstitial diseases (including acute tubulo-interstitial nephritis, other and unspecified hydronephrosis)
34. Renal failure
35. Urinary tract infection (UTI)
36. Other genital organs diseases
(k) Certain conditions originating in the perinatal period
37. Low birth weight
38. Neonatal infections including sepsis
39. Neonatal jaundice
40. Other perinatal conditions (including abnormal foetal growth, small for gestational age adjusted length of gestation)

Note: * See Appendix H for details of these categorizations

Statistical methods: Chi-square test was applied to determine statistical significance between three exposure groups (UCS, HIPCP, uninsured in this case) on

a categorical outcome variable (presence of 40 diseases and occurrence of death in this case) [317]. All associations with a p-value of < 0.05 in the univariate analyses, using Chi-square test, were subsequently entered in the bivariate and multivariate logistic regression model. The multivariate logistic regression model tested the association between insurance status and health outcome taking confounders into account which is crucial in statistical modeling with observational data [318]. The goodness of fit, and model specifications were tested by the likelihood ratio test (LRT). The researcher performed subgroup analysis by repeating the multivariate analyses with and without newborn admissions to examine sources of bias [171, 319].

Results

The results of the objective-3 are presented under these two broad sub-sections: (i) Presence cases with diseases, and (ii) Incidence of death, as follows.

Presence of cases with diseases

Participants: Table 26 presents the total number of child patients by their insurance status, age groups, sex, domicile, year of hospitalization, and patients diagnosed with 40 diseases between 2013 and 2017. A total of 9,444 children were hospitalized between the study period. The majority of the hospitalized children belonged to the UCS 8,626 of 9,444 (~91%), followed by the HIPCP 729 of 9,444 (~8%), and the uninsured 89 of 9,444 (~1%). The youngest group (0-1 year) accounted for the highest proportion of all patients (~36%) followed by these groups: 11-15 years (~20%), 6-10 years (20%), 2-3 years (~17%), and 4-5 years (~10%). The proportions of male patients (~53%) outnumbered females. The largest proportion of admissions of individual children took place in Mae Ramat Hospital (~51%) of Mae Ramat District followed by Umphang Hospital (~22%), Tha Song Yang Hospital (~17%), and Phop Phra Hospitals (~7%) from respective districts. The highest proportions of patients were hospitalized in 2017 (~28%) followed by 2016 (~22%), 2014 (~18%), 2013 (~17%), and 2015 (~15%) (Table 26).

Diseases cases among hospitalized children were identified using recommended ICD10-TM codes. The researcher identified the highest number of patients diagnosed

with intestinal infectious diseases, 2,114 of 9,444 (~22%) and the lowest number of patients diagnosed with tuberculosis, 7 of 9,444 (0.07%). Other more frequently reported diseases were metabolic disorders (22%), pneumonia (19%), bronchitis (~11%) and acute upper respiratory infection (~9%), anaemia (~7%). dengue (~6%), gastritis (~6%), skin disease (6%), urinary tract infection (~5%), neonatal jaundice (~5%), rickettsiosis (~4%), and malnutrition (~4%).

Table 26 Number and proportion of participants by insurance status, age group, sex, domicile, year of admission, and disease outcomes

Variables	Value (N=9,444)
Insurance Status, n (%)	
• UCS	8626 (91.3)
• Uninsured	89 (0.9)
• HIPCP	729 (7.7)
Age group, n (%)	
• 0-1 year	3,367 (35.7)
• 2-3 years	1,602 (17.0)
• 4-5 years	936 (9.9)
• 6-10 years	1,652 (17.5)
• 11-15 years	1,887 (20.0)
Sex = Female (%)	4,461 (47.2)
Domicile (%)	
• Mae Ramat	4,806 (50.9)
• Phop Phra	691 (7.3)
• Tha Song Yang	1,857 (19.7)
• Umphang	2,090 (22.1)
Year of hospitalization (%)	
• 2013	1,575 (16.7)
• 2014	1,677 (17.8)
• 2015	1,404 (14.9)
• 2016	2,117 (22.4)
• 2017	2,671 (28.3)
Diseases outcomes	
• Intestinal infectious diseases, n (%)	2,114 (22.4)
• Tuberculosis, n (%)	7 (0.1)
• Other bacterial infection, n (%)	339 (3.6)
• Rickettsiosis, n (%)	405 (4.3)
• Viral central nervous system (CNS) infection, n (%)	18 (0.2)
• Dengue, n (%)	573 (6.1)
• Viral skin infection, n (%)	107 (1.1)
• Hepatitis, n (%)	70 (0.7)
• Other viral infection, n (%)	69 (0.7)
• Mycoses, n (%)	61 (0.6)
• Malaria, n (%)	163 (1.7)

Variables	Value (N=9,444)
• Helminthiasis, n (%)	253 (2.7)
• Pediculosis acariasis, n (%)	94 (1.0)
• Anaemia, n (%)	644 (6.8)
• Malnutrition, n (%)	386 (4.1)
• Metabolic disorders, n (%)	2,073 (22.0)
• CNS diseases, n (%)	82 (0.9)
• Epilepsy, n (%)	76 (0.8)
• Cerebral palsy, n (%)	55 (0.6)
• Conjunctivitis, n (%)	88 (0.9)
• Otitis media, n (%)	121 (1.3)
• Acute upper respiratory infection (AURI), n (%)	838 (8.9)
• Pneumonia, n (%)	1,818 (19.3)
• Bronchitis, n (%)	1,011 (10.7)
• Asthma, n (%)	233 (2.5)
• Diseases of the oral cavity, n (%)	103 (1.1)
• Gastritis, n (%)	575 (6.1)
• Appendicitis, n (%)	225 (2.4)
• Diseases intestine-peritoneum, n (%)	137 (1.5)
• Diseases liver gallbladder, n (%)	57 (0.6)
• Skin diseases, n (%)	574 (6.1)
• Nephritic syndrome, n (%)	117 (1.2)
• Renal tubule-interstitial diseases, n (%)	32 (0.3)
• Renal failure, n (%)	34 (0.4)
• Urinary tract infection, n (%)	448 (4.7)
• Other genital organs diseases, n (%)	153 (1.6)
• Low birth weight, n (%)	182 (1.9)
• Neonatal infections, n (%)	158 (1.7)
• Neonatal jaundice, n (%)	488 (5.2)
• Other perinatal conditions, n (%)	191 (2.0)
• Catastrophic illness*, n (%)	559 (7.2)
• Child born in hospital, n (%)	1,941 (20.6)
• Child giving birth, n (%)	402 (4.3)

Note: * N = 7,728 excluding missing values

The presence of cases with diseases among hospitalized children were compared according to their insurance affiliations, age groups, gender, domicile, and year of hospitalization as follows.

Diseases by insurance status: Of 40 diseases based on ICD10-TM codes, using univariate analysis, the Chi-square test shows only 10 diseases significantly differ ($p<0.05$) across three insurance groups (uninsured, HIPCP, UCS). These diseases are: intestinal infectious diseases, unspecified viral infectious diseases, malaria, metabolic

disorders, conjunctivitis, acute upper respiratory infections (AURI), pneumonia, bronchitis, renal failure, and urinary tract infection (UTI) (Table 27).

The majority of the patients, experienced intestinal infections, metabolic diseases, and respiratory diseases (AURI, pneumonia, bronchitis), belonged to the UCS. On the other hand, the proportions of malaria and conjunctivitis were found to be higher among the HIPCP patients while the proportions of unspecified viral infections and renal failure were higher among uninsured patients (Figure 26).

Table 27 Comparing presence of cases with diseases by insurance status of children

Diseases	Uninsured (N=89)	HIPCP (N=729)	UCS (N=8,626)	test	p-value
(a) Certain infectious and parasitic diseases					
Intestinal infection, n (%)	15 (16.9)	126 (17.3)	1,973 (22.9)	χ^2	0.001
Tuberculosis, n (%)	0 (0.0)	0 (0.0)	7 (0.1)	χ^2	0.717
Other bacterial infection, n (%)	5 (5.6)	34 (4.7)	300 (3.5)	χ^2	0.150
Rickettsiosis, n (%)	6 (6.7)	34 (4.7)	365 (4.2)	χ^2	0.444
Viral central nervous system (CNS) infection, n (%)	0 (0.0)	1 (0.1)	17 (0.2)	χ^2	0.861
Dengue, n (%)	7 (7.9)	36 (4.9)	530 (6.1)	χ^2	0.329
Viral skin infection, n (%)	2 (2.2)	5 (0.7)	100 (1.2)	χ^2	0.310
Hepatitis, n (%)	1 (1.1)	1 (0.1)	68 (0.8)	χ^2	0.132
Unspecified viral infection, n (%)	2 (2.2)	1 (0.1)	66 (0.8)	χ^2	0.039
Mycoses, n (%)	0 (0.0)	5 (0.7)	56 (0.6)	χ^2	0.741
Malaria, n (%)	0 (0.0)	31 (4.3)	132 (1.5)	χ^2	<0.001
Helminthiases, n (%)	4 (4.5)	13 (1.8)	236 (2.7)	χ^2	0.176
Pediculosis/ascariasis, n (%)	1 (1.1)	1 (0.1)	92 (1.1)	χ^2	0.052
(b) Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism					
Anaemia, n (%)	6 (6.7)	50 (6.9)	588 (6.8)	χ^2	0.999
(c) Endocrine, nutritional and metabolic diseases					
Malnutrition, n (%)	0 (0.0)	24 (3.3)	362 (4.2)	χ^2	0.073
Metabolic disorders, n (%)	16 (18.0)	132 (18.1)	1,925 (22.3)	χ^2	0.020
(d) Diseases of the nervous system					
CNS diseases, n (%)	1 (1.1)	11 (1.5)	70 (0.8)	χ^2	0.145
Epilepsy, n (%)	0 (0.0)	8 (1.1)	68 (0.8)	χ^2	0.465
Cerebral palsy, n (%)	0 (0.0)	7 (1.0)	48 (0.6)	χ^2	0.298
(e) Diseases of the eye and adnexa					
Conjunctivitis, n (%)	0 (0.0)	13 (1.8)	75 (0.9)	χ^2	0.031
(f) Diseases of the ear and mastoid process					
Otitis media, n (%)	0 (0.0)	12 (1.6)	109 (1.3)	χ^2	0.378
(g) Diseases of the respiratory system					

Diseases	Uninsured (N=89)	HIPCP (N=729)	UCS (N=8,626)	test	p-value
Acute upper respiratory infection, n (%)	6 (6.7)	41 (5.6)	791 (9.2)	χ^2	0.004
Pneumonia, n (%)	14 (15.7)	115 (15.8)	1,689 (19.6)	χ^2	0.031
Bronchitis, n (%)	9 (10.1)	58 (8.0)	944 (10.9)	χ^2	0.043
Asthma, n (%)	1 (1.1)	11 (1.5)	221 (2.6)	χ^2	0.152
(h) Diseases of the digestive system					
Diseases of oral cavity, salivary glands and jaws, n (%)	1 (1.1)	6 (0.8)	96 (1.1)	χ^2	0.769
Gastritis and dyspepsia, n (%)	4 (4.5)	38 (5.2)	533 (6.2)	χ^2	0.473
Appendicitis, n (%)	1 (1.1)	18 (2.5)	206 (2.4)	χ^2	0.729
Diseases of intestine-peritoneum, n (%)	0 (0.0)	6 (0.8)	131 (1.5)	χ^2	0.165
Liver/gallbladder diseases, n (%)	2 (2.2)	4 (0.5)	51 (0.6)	χ^2	0.131
(i) Diseases of the skin and subcutaneous tissue					
Skin diseases, n (%)	6 (6.7)	45 (6.2)	523 (6.1)	χ^2	0.959
(j) Diseases of the genitourinary system					
Nephritic syndrome, n (%)	2 (2.2)	5 (0.7)	110 (1.3)	χ^2	0.265
Renal tubule-interstitial diseases, n (%)	1 (1.1)	1 (0.1)	30 (0.3)	χ^2	0.283
Renal failure, n (%)	2 (2.2)	1 (0.1)	31 (0.4)	χ^2	0.007
Urinary tract infection, n (%)	4 (4.5)	21 (2.9)	423 (4.9)	χ^2	0.047
Other genital organs diseases, n (%)	0 (0.0)	10 (1.4)	143 (1.7)	χ^2	0.402
(k) Certain conditions originating in the perinatal period					
Low birth weight, n (%)	0 (0.0)	18 (2.5)	164 (1.9)	χ^2	0.233
Neonatal infections, n (%)	0 (0.0)	16 (2.2)	142 (1.6)	χ^2	0.252
Neonatal jaundice, n (%)	0 (0.0)	45 (6.2)	443 (5.1)	χ^2	0.051
Other perinatal conditions, n (%)	0 (0.0)	17 (2.3)	174 (2.0)	χ^2	0.334
Catastrophic admission					
Catastrophic illness, n (%)	9 (10.7)	36 (5.8)	514 (7.3)	χ^2	0.174
Persons encountering health services in circumstances related to reproduction					
Child born in hospital, n (%)	1 (1.1)	203 (27.8)	1737 (20.1)	χ^2	<0.001
Child gave birth, n (%)	11 (12.4)	80 (11.0)	311 (3.6)	χ^2	<0.001

Note: χ^2: Chi-square

Diseases by age group: The presence of cases with all diseases was compared according to age groups of child patients. Of 40 diseases, the Chi-square test shows all diseases significantly differ ($p<0.05$) across five age groups (0-1, 2-3, 4-5, 6-10, 11-15 years) except these six diseases: tuberculosis, viral central nervous system (CNS) infection, other viral infections, mycoses, other CNS disease, and conjunctivitis (see disease by age group in Appendix I). Figure 27 shows that some

diseases, namely intestinal infectious diseases, respiratory diseases, metabolic disorders are concentrated to younger patients while some other diseases, namely urinary tract infection (UTI), skin diseases, gastritis or dyspepsia, malnutrition, anaemia, rickettsiosis, and other bacterial infections occur across all age groups while malaria and dengue occur relatively older groups of children.

Diseases by sex: The presence of cases with all diseases was compared according to the gender of child patients. The Chi-square test shows that, of 40 diseases, only 10 diseases are significantly differed by gender.

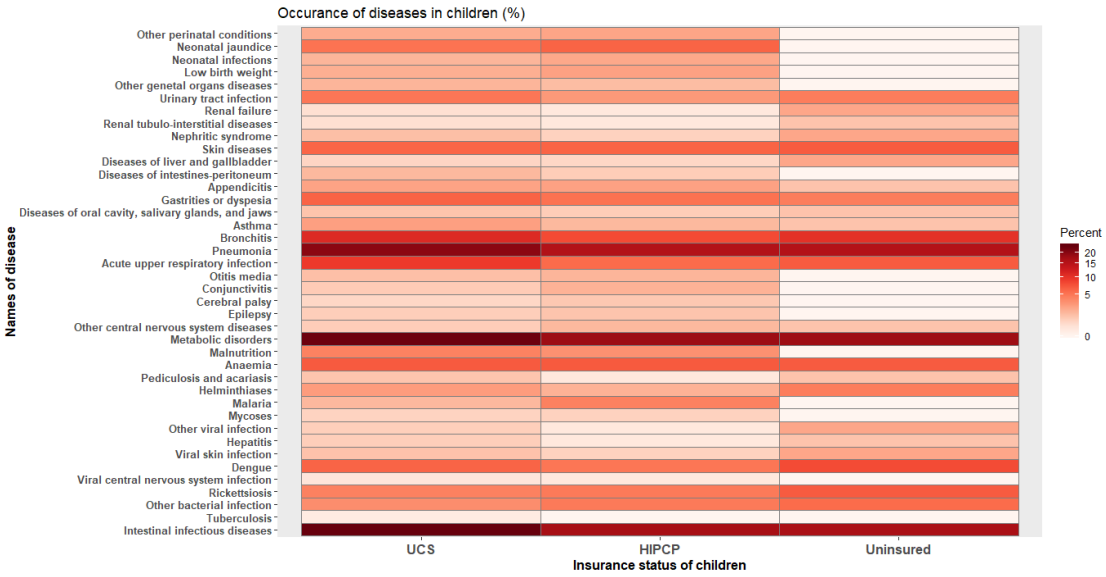


Figure 26 The presence of cases with disease in children by insurance status of hospitalized childre

These diseases are as follows: intestinal infectious diseases, anaemia, bronchitis, appendicitis, skin diseases, nephritic syndrome, renal tubule-interstitial diseases, urinary tract infection (only higher in females), other genital organs diseases, and neonatal jaundice, significantly differ ($p<0.05$) by gender (see disease by gender in Appendix I).

Figure 28 illustrates that the presence of cases with diseases in which male child patients are more likely to present those diseases than in their female counterparts.

Catastrophic illness also found to be higher in male children than in females ($p<0.05$) (see disease by gender in Appendix I).

Diseases by domicile: The presence of cases with all diseases was also compared across domicile of children. Of 40 diseases, the Chi-square test shows all diseases significantly differ ($p<0.05$) by four districts except these eight diseases: tuberculosis, viral CNS infection, viral skin infection, cerebral palsy, diseases oral cavity, salivary and jaws, diseases of intestine, renal failure, and other genital organs diseases. Catastrophic illness also found to be higher in male children than in females ($p<0.05$) (see disease by domicile in Appendix I). Figure 29 illustrates that the incidence of most diseases in children, that differed across districts, are relatively higher either in Mae Ramat or Tha Song Yang Districts than in the other two districts. Some diseases, namely rickettsiosis, malaria, conjunctivitis, otitis media, appendicitis, low birth weight, neonatal jaundice were higher in Umphang District while dengue was higher in Phop Phra District (Figure 29).

Diseases by year of hospitalization: The researcher also explored the trend of the presence of cases with diseases and found that all diseases significantly differed across the years except these eight diseases: tuberculosis, viral CNS infection, viral skin infection, conjunctivitis, otitis media, renal tubulo-interstitial disease, and renal failure. Catastrophic illness among children sharply increased in the last three years (see disease by year of hospitalization in Appendix I).

Figure 30 shows that the presence of diseases in children, that differed over the last five years, presents different trends. For instance, some diseases, namely neonatal jaundice, low birth weight, and perinatal conditions decreased over the years while AURI, asthma, anaemia, dengue, malaria, and UTI fluctuate between 2013-2017.

Conversely, some diseases present a steady increase (e.g. gastritis, epilepsy, other genital organs diseases) while some diseases in children present a sharp increase (e.g. pneumonia, bronchitis, metabolic disorders, intestinal infectious diseases) during the same period.

Figure 31 presents the selection process of child patients diagnosed with ten selected diseases between 2013-2017: renal failure, viral infectious diseases, conjunctivitis, malaria, urinary tract infection (UTI), acute upper respiratory infection

(AURI), bronchitis, pneumonia, metabolic disorders, and intestinal infectious diseases, for bivariate and multivariate logistic regression analyses.

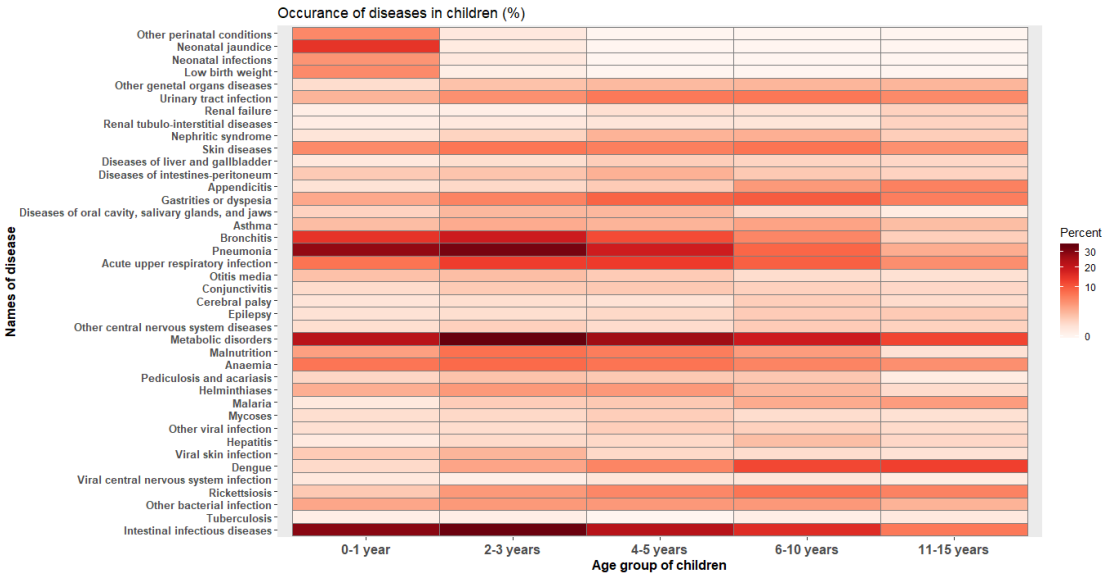


Figure 27 The presence of cases with disease in children by age groups

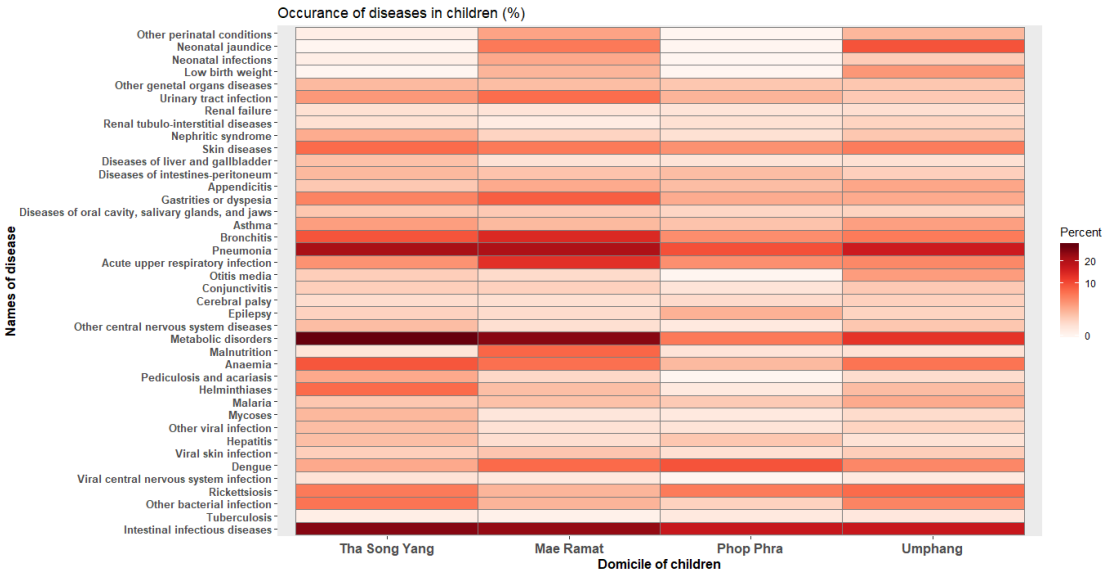


Figure 28 The presence of cases with disease in children by gender

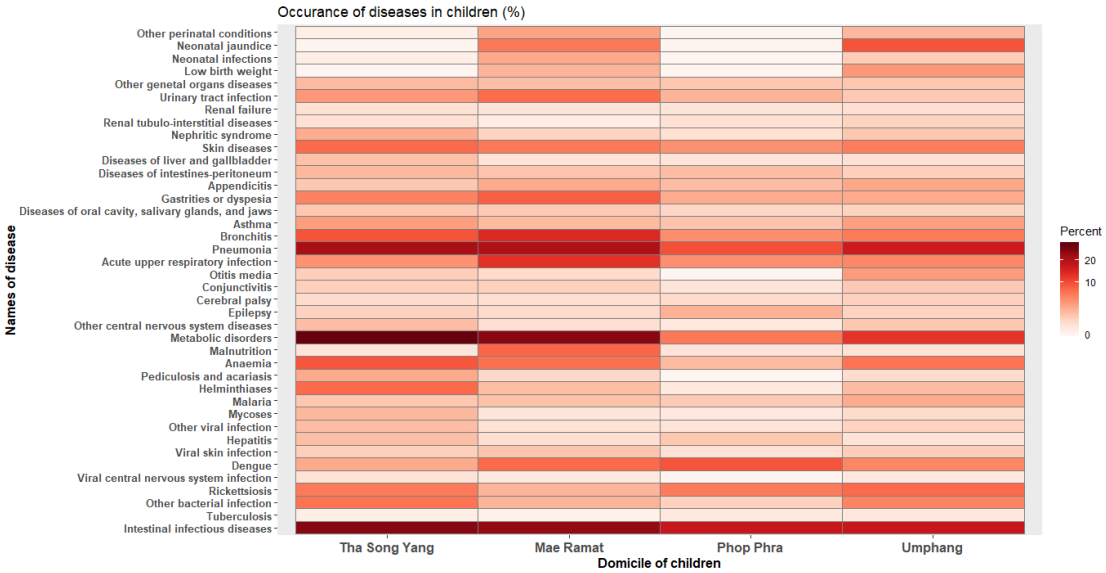


Figure 29 The presence of cases with disease in children by domicile

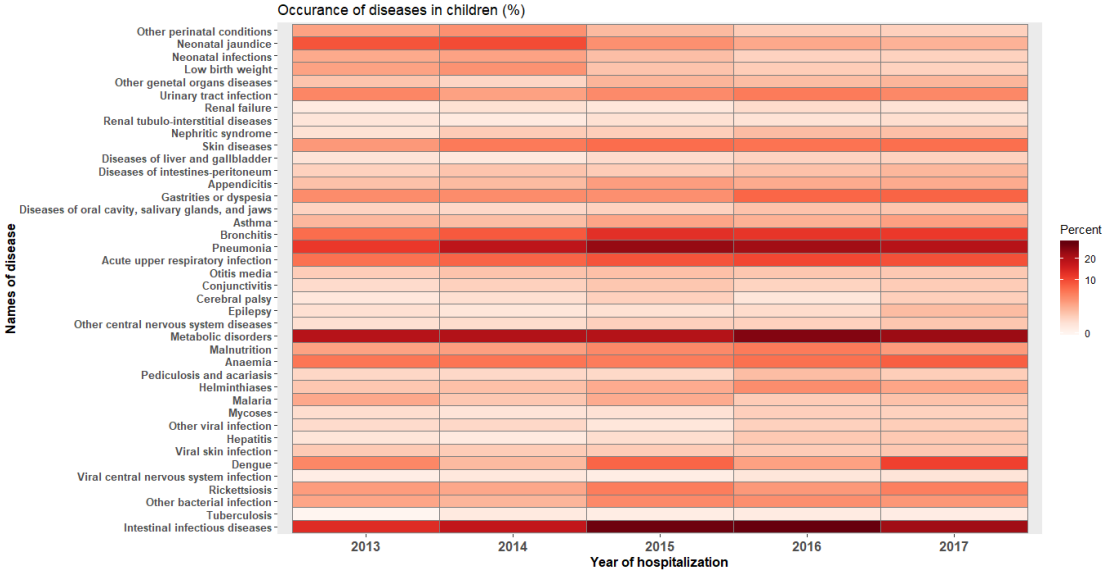


Figure 30 The presence of cases with disease in children by year of hospitalization

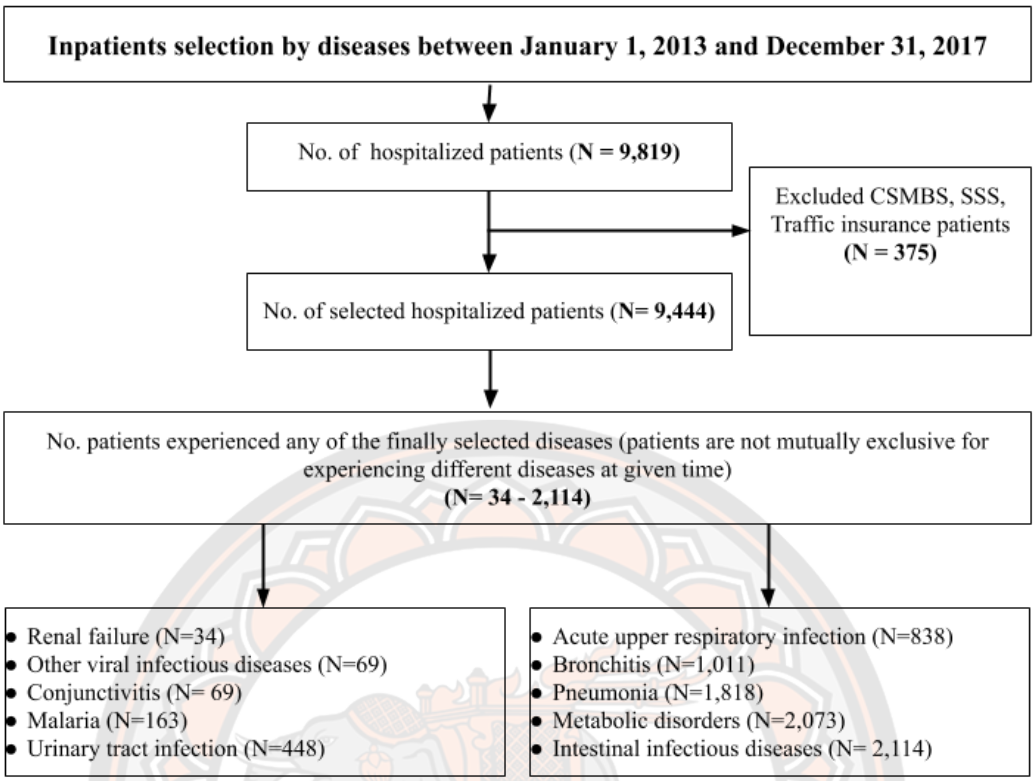


Figure 31 Flowchart of the selection of participants from inpatients health records during the study period

Note: CSMBS: Civil servant medical benefit scheme, SSS: Social security scheme

Bivariate logistic regression analysis: Figure 32 displays the regression results of bivariate logistic regression model in terms of crude or unadjusted odds ratio (OR). Bivariate or simple logistic regression analysis showed that, among child patients hospitalized, insurance status was associated with risk of these 10 diseases: intestinal infectious diseases, unspecified viral infectious diseases, malaria, metabolic disorders, conjunctivitis, acute upper respiratory infections (AURI), pneumonia, bronchitis, renal failure, and urinary tract infection (UTI).

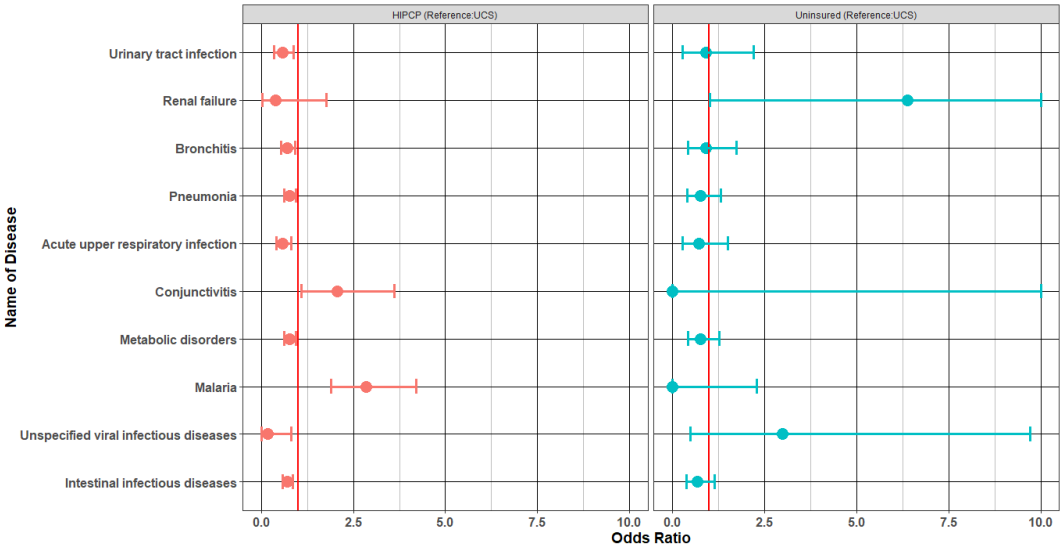


Figure 32 Illustration of association between the presence of cases with selected diseases and insurance status of children by bivariate logistic regression

Note: The vertical lines indicate no association, in which OR=1, and 95% confidence intervals, respectively

Among 9,444 child patients hospitalized, the HIPCP was associated with a significantly lower odds of these seven diseases as compared to the UCS: intestinal infectious diseases (OR = 0.70, CI= [0.58, 0.86], p = 001), unspecified viral infectious diseases (OR = 0.18, CI = [0.01, 0.81], p = 0.087), metabolic disorders (OR = .77, CI= [0.63, 0.93], p = 0.009), acute upper respiratory infection (OR = 0.59, CI = [0.42, 0.81], p = .001), pneumonia (OR = 0.77, CI= [0.62, 0.94], p = 0.013), bronchitis (OR = 0.70, CI= [0.53, 0.92], p = 0.013), and urinary tract infection (OR = 0.58, CI= [0.36, 0.87], p = 0.015). Conversely, the HIPCP was associated with a significantly higher odds of these two diseases as compared to the UCS: malaria (OR =2.86, CI= [1.89, 4.20], p<0.001), and conjunctivitis (OR=2.07 [1.09, 3.62], p = 0.016). Similarly, the uninsured status of child patients was associated with a significantly higher odds of renal failure as compared to the UCS (OR = 6.37, CI= [1.02, 21.51], p = 0.012).

Multivariate logistic regression analysis: Table 28-31 display the results of multivariate logistic regression in terms of adjusted odds ratio (AOR). Unlike the bivariate model, in the multivariate analysis, the insurance status of hospitalized child

patients was found to be significantly associated with only five diseases: intestinal infectious diseases, malaria, conjunctivitis, acute upper respiratory infections (AURI), and renal failure. For instance, among child patients hospitalized, the HIPCP was associated with a 19%, lower odds of intestinal infectious but weak association (AOR= 0.81, 95% CI= [0.66, 1.00]; p = 0.054) and 30% lower odds of acute upper respiratory infections (AOR = 0.70, 95% CI = [0.49, 0.96], p<0.033) as compared to the UCS. On the other hand, children insured with the HIPCP had 2.6 times (AOR = 2.61, 95% CI = [1.69, 3.91]; p<0.001) and 2.1 times (AOR = 2.11, 95% CI = [1.10, 3.76]; p = 0.016) greater odds of malaria and conjunctivitis, respectively than those insured with the UCS. Similarly, the uninsured child patients had 4.5 time (AOR = 4.53,95% CI = [0.67, 18.46], p = 0.060) greater odds of renal failure than that of the UCS beneficiaries but weak association.

Unlike insurance status, multivariate analysis showed that age groups, domicile, and year of hospitalization of children were found to be significantly associated with all ten diseases to some extent. For instance, those aged 2-3 years, had 1.2 times, 1.1 times, 7 times, 1.7 times, 2.1 times, 1.8 times, 1.2 times, 1.3 times, and 2 times, greater odds of intestinal infectious diseases, unspecified viral infectious diseases, malaria, metabolic disorders, conjunctivitis, AURI, pneumonia, bronchitis, UTI, respectively than those aged 0-1 year. Similarly, those children aged 4-5 years had 8.6 times, 1.2 times, 2.2 times, 1.8 times, 10.2 times, and 2.7 times greater odds of unspecified viral infectious diseases, malaria, conjunctivitis, AURI, renal failure, and UTI, respectively than those aged 0-1 year. Likewise, those aged 6-10 years had 1.9 times, 20.1 times, 8 times, and 2.9 times greater odds of unspecified viral infectious diseases, malaria, renal failure, and UTI, respectively than those aged 0-1 year. The oldest group aged 11-15 years also had 1.6 times, 27 times, 21.5 times, and 2.2 times greater odds of unspecified viral infectious diseases, malaria, renal failure, and UTI, respectively than their youngest counterparts aged 0-1 year. None of the diseases were significantly statistically differed by sex of child patients except UTI. Female had 1.72 times greater odds of UTI than their male counterparts.

Conversely, those children aged 4-5 years had 0.63 times, 0.53 times, and 0.67 times, smaller odds of intestinal infectious diseases, pneumonia, and bronchitis, respectively than those aged 0-1 year. Likewise, those aged 6-10 years had 0.39 times,

0.63 times, 0.21 times, and 0.29 times smaller odds of intestinal infectious diseases, metabolic disorders, pneumonia, and bronchitis, respectively than those aged 0-1 year. The oldest group aged 11-15 years also had 0.15 times, 0.48 times, 0.58 times, 0.06 times, and 0.05 times smaller odds of intestinal infectious diseases, metabolic disorders, AURI, pneumonia, and bronchitis, respectively than their youngest counterparts aged 0-1 year (Figure 33).

Domicile of children, where child patients were assumed to be lived in, were associated with diseases. For instance, children living in Tha Song Yang District had 4.9 times greater odds of unspecified viral infectious diseases than children living in Mae Ramat District. Similarly, children living in Umphang District had 2.4 times, and 1.6 times greater odds of unspecified viral infectious diseases, and malaria, respectively than children living in Mae Ramat District.

Conversely, children living in Phop Phra, Tha Song Yang, and Umphang districts had greater odds of some diseases as compared to those living in Mae Ramat District. For instance, children living in Phop Phra District had 0.60 times, 0.17 times, 0.24 times, 0.35 times, 0.22 times, and 0.24 times smaller odds of intestinal infectious diseases, metabolic disorders, AURI, pneumonia, bronchitis, and UTI, respectively than children living in Mae Ramat District. Similarly, children living in Tha Song Yang District had 0.72 times, 0.19 times, 0.72 times, 0.39 times, and 0.42 times smaller odds of intestinal infectious diseases, AURI, pneumonia, bronchitis, and UTI, respectively than those children living in Mae Ramat District. Likewise, children from Umphang District had 0.71 times, 0.40 times, 0.40 times, 0.79 times, 0.42 times, and 0.18 times smaller odds of intestinal infectious diseases, metabolic disorders, AURI, pneumonia, bronchitis, and UTI, respectively than children from Mae Ramat District (Figure 33).

Table 28 Results of multiple logistic regression with the binary dependent variables: intestinal infectious diseases and unspecified viral infectious diseases

Variables	Intestinal infectious diseases		Unspecified viral infectious diseases	
	AOR [95% CI]	p	AOR [95% CI]	p
Insurance (vs UCS)				
• Uninsured	0.68 [0.37,1.19]	0.194	1.39 [0.22, 4.74]	0.656
• HIPCP	0.81 [0.66,1. 00]	0.054	0.19 [0.01, 0.87]	0.102
Age group (vs 0-1 year)				
• 2-3 years	1.16 [1.02, 1.33]	0.023	1.14 [0.50, 2.43]	0.748
• 4-5 years	0.63 [0.53,0.75]	<0.001	2.27 [1.02, 4.80]	0.036
• 6-10 years	0.39 [0.33,0.45]	<0.001	1.92 [0.97, 3.80]	0.059
• 11-15 years	0.15 [0.12,0.18]	<0.001	1.56 [0.73, 3.24]	0.238
Sex (vs Male)				
• Female	0.96 [0.87,1.06]	0.441	0.63 [0.38, 1.03]	0.068
Domicile (vs Mae Ramat)				
• Phop Phra	0.60 [0.47,0.75]	<0.001	0.68 [0.10, 2.55]	0.619
• Tha Song Yang	0.72 [0.63,0.83]	<0.001	4.90 [2.52, 10.05]	<0.001
• Umphang	0.71 [0.62,0.82]	<0.001	2.41 [1.22, 4.76]	0.011
Year of hospitalization (vs 2013)				
• Year2014	1.28 [1.05,1.55]	0.014	1.28 [0.53, 3.21]	0.582
• Year2015	3.01 [2.48,3.66]	<0.001	0.25 [0.05, 0.88]	0.045
• Year2016	3.33 [2.77,4.02]	<0.001	0.85 [0.34, 2.19]	0.724
• Year2017	2.89 [2.40,3.49]	<0.001	1.17 [0.49, 2.92]	0.733

Table 29 Results of multiple logistic regression with the binary dependent variables: malaria, metabolic disorders and conjunctivitis

Variables	Malaria		Metabolic disorders		Conjunctivitis	
	AOR [95% CI]	p	AOR [95% CI]	p	AOR [95% CI]	p
Insurance (vs UCS)						
• Uninsured	0.00 [0.00, 0.00]	0.973	0.63 [0.35, 1.07]	0.104	0.00 [0.00, 8.23]	0.975
• HIPCP	2.61 [1.69, 3.91]	<0.001	1.00 [0.81, 1.22]	0.977	2.11 [1.10, 3.76]	0.016
• 2-3 years	6.98 [2.94,19.24]	<0.001	1.73 [1.51, 1.98]	<0.001	2.06 [1.12, 3.78]	0.019
• 4-5 years	8.55 [3.35,24.49]	<0.001	1.18 [0.99, 1.39]	0.063	2.17 [1.05, 4.30]	0.029
• 6-10 years	20.12 [9.27,52.73]	<0.001	0.74 [0.63, 0.86]	<0.001	1.55 [0.80, 2.94]	0.184
• 11-15 years	26.99 [12.63,70.10]	<0.001	0.48 [0.40, 0.56]	<0.001	1.18 [0.59, 2.31]	0.627
Sex (vs Male)						
• Female	0.95 [0.69, 1.31]	0.766	1.06 [0.96, 1.17]	0.273	0.69 [0.44, 1.06]	0.099
• Phop Phra	0.76 [0.32, 1.58]	0.488	0.17 [0.12, 0.23]	<0.001	0.26 [0.04, 0.88]	0.069
• Tha Song Yang	1.15 [0.68, 1.87]	0.591	1.05 [0.92, 1.20]	0.493	0.98 [0.54, 1.74]	0.958
• Umphang	1.57 [1.09, 2.25]	0.015	0.45 [0.38, 0.52]	<0.001	1.42 [0.84, 2.34]	0.180
• Year2014	0.57 [0.33, 0.95]	0.037	1.03 [0.86, 1.23]	0.758	1.67 [0.74, 4.00]	0.228
• Year2015	0.78 [0.49, 1.25]	0.302	0.96 [0.80, 1.16]	0.682	2.43 [1.10, 5.74]	0.033
• Year2016	0.35 [0.20, 0.60]	<0.001	1.41 [1.18, 1.67]	<0.001	1.71 [0.75, 4.14]	0.211
• Year2017	0.40 [0.24, 0.65]	<0.001	1.56 [1.31, 1.85]	<0.001	2.58 [1.22, 5.97]	0.018

Table 30 Results of multiple logistic regression with the binary dependent variables: acute upper respiratory infection (AURI) and pneumonia

Variables	AURI		Pneumonia	
	AOR [95% CI]	p	AOR [95% CI]	p
Insurance (vs UCS)				
• Uninsured	1.72 [0.65, 3.74]	0.217	0.84 [0.44,1.51]	0.577
• HIPCP	0.70 [0.49, 0.96]	0.033	0.88 [0.70,1.09]	0.245
Age group (vs 0-1 year)				
• 2-3 years	1.83 [1.50, 2.23]	<0.001	1.15 [1.01,1.31]	0.040
• 4-5 years	1.77 [1.40, 2.23]	<0.001	0.53 [0.44,0.63]	<0.001
• 6-10 years	1.15 [0.93, 1.43]	0.194	0.21 [0.18,0.26]	<0.001
• 11-15 years	0.58 [0.45, 0.74]	<0.001	0.06 [0.05,0.09]	<0.001
Sex (vs Male)				
• Female	1.07 [0.93, 1.24]	0.350	1.02 [0.92,1.14]	0.704
Domicile (vs Mae Ramat)				
• Phop Phra	0.24 [0.16, 0.34]	<0.001	0.35 [0.26,0.46]	<0.001
• Tha Song Yang	0.19 [0.15, 0.25]	<0.001	0.72 [0.62,0.84]	<0.001
• Umphang	0.40 [0.32, 0.49]	<0.001	0.79 [0.69,0.92]	0.002
Year of hospitalization (vs 2013)				
• Year2014	1.22 [0.93, 1.60]	0.149	1.52 [1.24,1.86]	<0.001
• Year2015	1.72 [1.31, 2.26]	<0.001	2.93 [2.39,3.61]	<0.001
• Year2016	2.61 [2.03, 3.37]	<0.001	2.91 [2.38,3.56]	<0.001
• Year2017	2.49 [1.95, 3.21]	<0.001	3.37 [2.76, 4.12]	<0.001

Table 31 Results of multiple logistic regression with the binary dependent variables: bronchitis, renal failure, and urinary tract infection (UTI)

Variables	Bronchitis		Renal failure		UTI	
	AOR [95% CI]	p	AOR [95%CI]	p	AOR [95%CI]	p
Insurance (vs UCS)						
• Uninsured	1.41 [0.64, 2.78]	0.360	4.53 [0.67,18.46]	0.060	1.23 [0.37, 3.07]	0.693
• HIPCP	0.86 [0.64, 1.15]	0.323	0.29 [0.02,1.38]	0.227	0.74 [0.46, 1.14]	0.198
Age group (vs 0-1 year)						
• 2-3 years	1.29 [1.10, 1.52]	0.002	1.12 [0.05,11.69]	0.929	1.95 [1.42, 2.68]	<0.001
• 4-5 years	0.67 [0.53, 0.84]	0.001	10.22 [2.17,72.00]	0.006	2.71 [1.93, 3.79]	<0.001
• 6-10 years	0.29 [0.23, 0.37]	<0.001	8.02 [1.91,54.37]	0.010	2.89 [2.16, 3.87]	<0.001
• 11-15 years	0.05 [0.03, 0.08]	<0.001	21.45 [6.03,136.75]	<0.001	2.16 [1.60, 2.94]	<0.001
Sex (vs Male)						
• Female	0.94 [0.82, 1.08]	0.390	0.57 [0.28,1.15]	0.125	1.72 [1.41, 2.09]	<0.001
Domicile (vs Mae Ramat)						
• Phop Phra	0.22 [0.15, 0.32]	<0.001	0.69 [0.10,2.71]	0.639	0.24 [0.13, 0.39]	<0.001
• Tha Song Yang	0.39 [0.32, 0.48]	<0.001	1.17 [0.42,3.09]	0.751	0.42 [0.31, 0.55]	<0.001
• Umphang	0.42 [0.34, 0.51]	<0.001	1.95 [0.83,4.40]	0.114	0.18 [0.11, 0.26]	<0.001
Year of hospitalization (vs 2013)						
• Year2014	1.17 [0.90, 1.53]	0.231	4.57 [1.09,30.91]	0.060	0.67 [0.47, 0.96]	0.032
• Year2015	2.42 [1.87, 3.14]	<0.001	1.45 [0.24,11.11]	0.687	0.92 [0.65, 1.30]	0.627
• Year2016	2.69 [2.11, 3.46]	<0.001	4.15 [1.05,27.57]	0.072	1.38 [1.01, 1.88]	0.043
• Year2017	3.43 [2.69, 4.39]	<0.001	2.43 [0.59,16.43]	0.268	1.04 [0.76, 1.42]	0.811

Regarding the presence of diseases in children between 2014-2017, the hospitalization years of children were associated with diseases in children as compared to those hospitalized in 2013. The presence of some diseases increased between 2013-2017. For instance, children hospitalized in 2014 had 1.3 times, and 1.5 times greater odds of intestinal infectious diseases, and pneumonia, respectively than those hospitalized in 2013 (Figure 33).

Likewise, those hospitalized in 2015 had 3 times, 2.4 times, 1.7 times, 2.9 times, and 2.4 times greater odds of intestinal infectious diseases, conjunctivitis, AURI, pneumonia, and bronchitis, respectively than those hospitalized in 2013. Those hospitalized in 2016 had 3.3 times, 1.4 times, 2.6 times, 2.9 times, 2.7 times, and 1.4 times greater odds of intestinal infectious diseases, metabolic disorders, AURI, pneumonia, bronchitis, and UTI, respectively than those hospitalized in 2013. Finally, those hospitalized in 2017 had 2.9 times, 1.6 times, 2.6 times, 2.5 times, 3.4 times, and 3.4 times greater odds of intestinal infectious diseases, metabolic disorders, conjunctivitis, pneumonia, AURI, and bronchitis, respectively than those hospitalized in 2013.

Conversely, some diseases decreased between 2013-2017. For instance, children hospitalized in 2014, 2016, and 2017 had 0.57 times, 0.35 times, and 0.40 times smaller odds of malaria respectively than children hospitalized in 2013. Similarly, those hospitalized in 2014 had a 0.67 times smaller chance of UTI than those who were hospitalized in 2013. Similarly, those hospitalized in 2015 had a 0.25 times smaller chance of unspecified viral infectious diseases that those who hospitalized in 2013 (Figure 33)

Subgroup analysis

The researcher conducted a subgroup analysis to examine potential sources of bias. In a subgroup analysis (not shown), both bivariate and multivariate logistic regression analyses were repeated using subsample (N=7,098) by excluding newborn admissions as they might affect the analysis (Figure 34). However, the results were nearly identical to the analysis with full sample (e.g. including newborn admissions, N=9,444) except AURI.

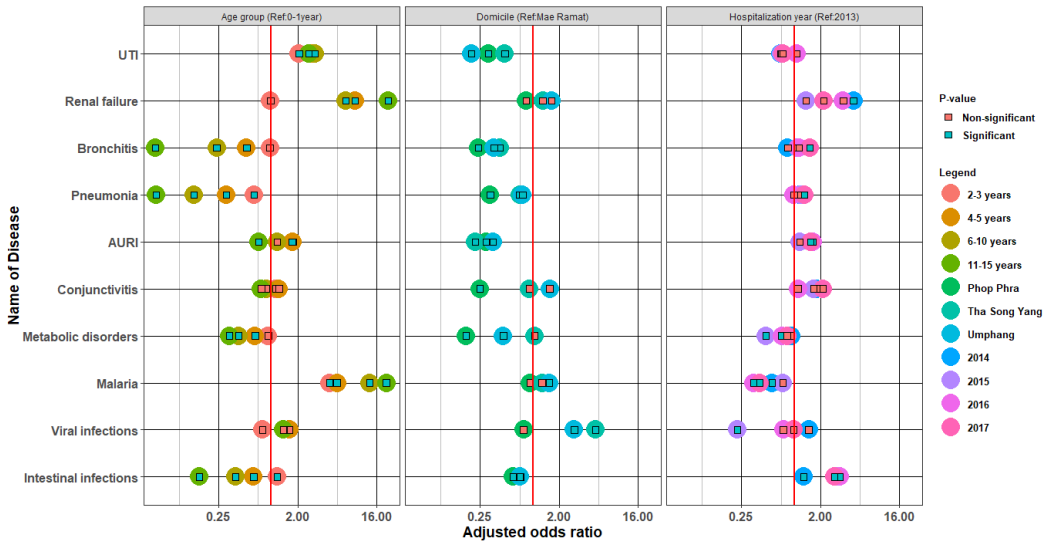


Figure 33 Association between diseases and the age, domicile, and hospitalization year of children in terms of AOR

Note: AOR: Adjusted odds ratio; Vertical lines represent reference groups in which AOR =1

Figure 34. presents the unadjusted odds ratio (OR) and adjusted odds ratio (AOR) from bivariate and multivariate logistic regression models, respectively. It shows that, without newborn admissions, AURI is not significantly associated with the HIPCP as compared to the UCS (AOR = 0.72, 95% CI = [0.47, 1.05], p = 0.106). On the other hand, after sub-group analysis malaria and conjunctivitis were consistently associated with the HIPCP (Figure 34). For instance, 7,098 child patients hospitalized, the HIPCP had 2.6 times greater odds of malaria (AOR = 2.55, 95% CI = [1.60, 3.94], p<0.001), and 2.4 times greater odds of conjunctivitis (AOR = 2.11, 95% CI = [1.18, 4.18], p = 0.016) than the UCS.

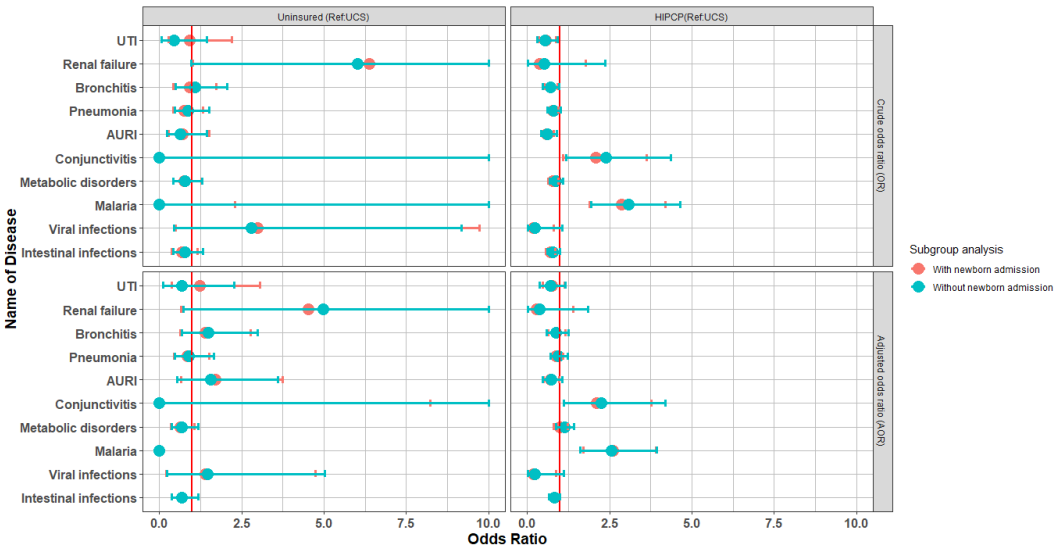


Figure 34 Association between diseases and insurance status of children with and without newborns admissions

Note: The vertical lines indicate no association, in which OR=1, Subgroup analysis shows nearly identical results

In sum, of 40 diseases, only these 10 diseases are associated with the insurance status of children. Bivariate logistic model showed that intestinal infectious diseases, unspecified viral infectious diseases, malaria, metabolic disorders, conjunctivitis, acute upper respiratory infections (AURI), pneumonia, bronchitis, and urinary tract infection were associated with the HIPCP, while renal failure was associated with the uninsured status of the children. However, multivariate analysis showed only three diseases were associated with the insurance while a subgroup analysis revealed that only malaria and conjunctivitis were associated with the HIPCP.

Incidence of death

Participants: Figure 35 depicts the selection of participants and death cases from the facility-based database between 2013-2017. Table 32 demonstrates that there are 164,435 children who had been registered with selected health facilities between 2013 and 2017. Of these, 824 deaths were found during the same period. Regarding age distribution, the majority of all registered children were aged between 6-10 years (~33 %) followed by age group 11-15 years (~31 %), 4-5 years (~13 %), and 2-3 years (~12 %), and 0-1 year (~11 %).

Approximately 51% of all registered children were males. The highest proportion of all registered children was drawn from health facilities in Tha Song Yang District (31%) followed by Phop Phra (~31%), Mae Ramat (~23%), and Umphang (~15%) districts. Of the 824 deaths, the proportion was the highest among children aged between 6-10 years (~28%) followed by 11-15 years (~26%), 4-5 years (~17%), 0-1 year (~15%), and 2-3 years (~14%) (Table 32).

Descriptive statistics of participants by insurance status: Table 33 compares the personal attributes of all registered children by their insurance affiliations: the uninsured, the HIPCP, and the UCS. It shows that the majority of the children belonged to the UCS group 152,199 of 164,435 (~93%), followed by the uninsured 7,238 of 164,435 (~4%), and the stateless 4,998 of 164,435 (~3%). However, the proportion of deaths was the highest in the uninsured group (1.2 %) followed by the UCS (0.5%) and stateless children (0.3%).

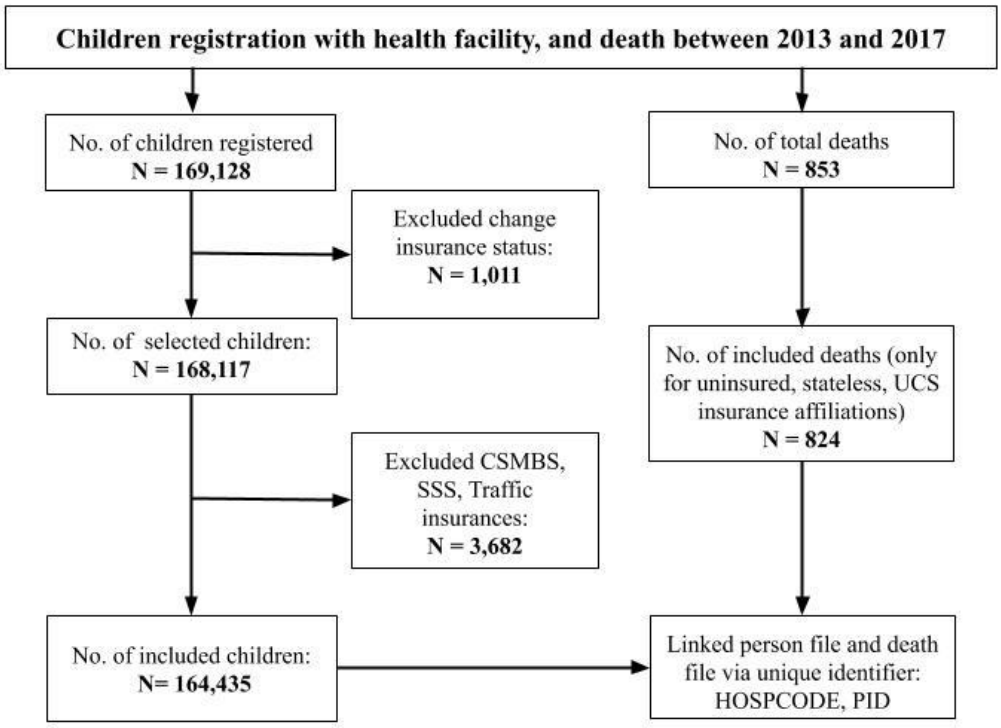


Figure 35 Flowchart of the selection of participants including death cases from facility based database between 2013-2017

The greatest proportion of children aged between six and above in all insurance types. The proportion of males outnumbered the females in all insurance types. The largest proportion of registration took place in health facilities in Phop Phra District for the uninsured and the stateless children while the UCS children were mostly registered with health facilities in Tha Song Yang District.

Distribution of outcome: The distribution of death outcomes by insurance status, age group, sex, and domicile of children are presented in Figure 36, Figure 37, Figure 38, and Figure 39, respectively. As mentioned earlier the proportion of death in uninsured children was more than double that in the UCS, and fourfold compared to the HIPCP (Figure 36). The proportions of death were higher in children aged five and below (Figure 37) and male children (Figure 38). Umphang District has higher death than the rest of three districts (Figure 39).

Table 32 The number and proportion of participants by insurance status, age group, sex, and domicile

	All registered children		Death cases	
Variable	**Count (n)**	**%**	**Count (n)**	**%**
Insurance status				
• Uninsured	7,238	4.4	84	10.19
• HIPCP	4,998	3.04	16	1.94
• UCS	152,199	92.56	724	87.86
Age group				
• 0-1 year	18,721	11.39	122	14.81
• 2-3 years	20,244	12.31	116	14.08
• 4-5 years	20,585	12.52	143	17.35
• 6-10 years	53,535	32.56	228	27.67
• 11-15 years	51,350	31.23	215	26.09
Sex				
• Male	84,088	51.14	453	54.98
• Female	80,344	48.86	371	45.02
Domicile of children				
• Mae Ramat	37,768	22.97	139	16.87
• Phop Phra	50,696	30.83	250	30.34
• Tha Song Yang	51,526	31.34	264	32.04
• Umphang	24,445	14.87	171	20.75

Table 33 Comparing registered participants by their personal attributes and insurance status

Variable	Uninsured (N=7,238)	HIPCP (N=4,998)	UCS (N=152,199)	test	p-value
Death (%)					
• 0 (No)	7,154 (98.8)	4,982 (99.7)	151,475 (99.5)	χ^2	<0.001
• 1 (Yes)	84 (1.2)	16 (0.3)	724 (0.5)		
Age group (%)					
• 0-1 year	532 (7.4)	542 (10.8)	17,647 (11.6)	χ^2	<0.001
• 2-3 years	575 (7.9)	730 (14.6)	18,939 (12.4)		
• 4-5 years	815 (11.3)	541 (10.8)	19,229 (12.6)		
• 6-10 years	2,444 (33.8)	1,364 (27.3)	49,727 (32.7)		
• 11-15 years	2,872 (39.7)	1,821 (36.4)	46,657 (30.7)		
Sex (%)					
• Male	3,721 (51.4)	2,510 (50.2)	77,857 (51.2)	χ^2	0.384
• Female	3,517 (48.6)	2,488 (49.8)	74,342 (48.8)		
Domicile of children (%)					
• Mae Ramat	680 (9.4)	1,038 (20.8)	36,050 (23.7)	χ^2	<0.001
• Phop Phra	3,063 (42.3)	1,561 (31.2)	46,072 (30.3)		
• Tha Song Yang	3,008 (41.6)	872 (17.4)	47,646 (31.3)		
• Umphang	487 (6.7)	1,527 (30.6)	22,431 (14.7)		

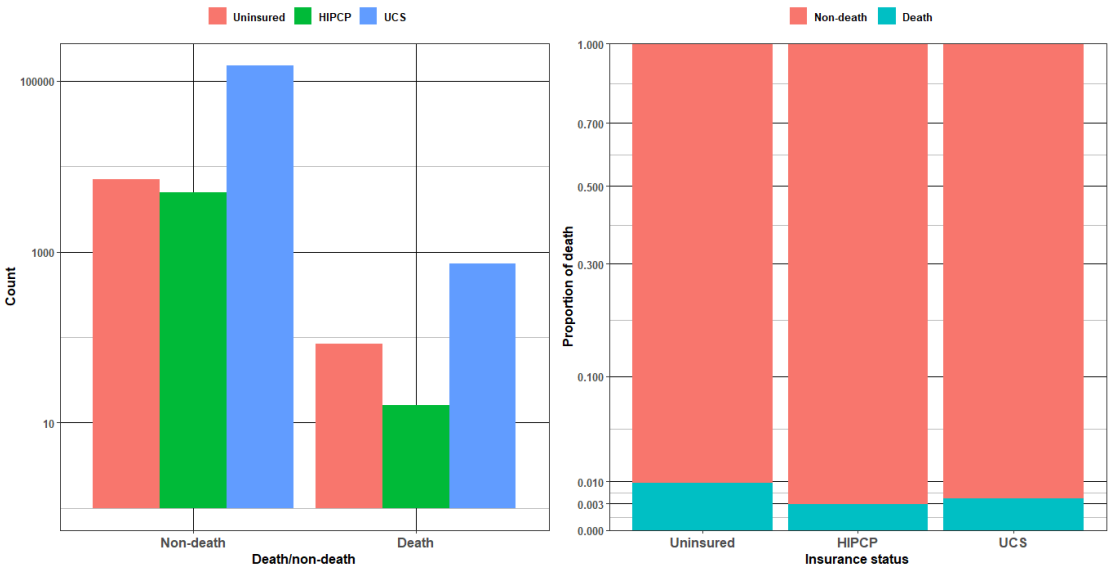


Figure 36 Incidence of death by insurance status of children

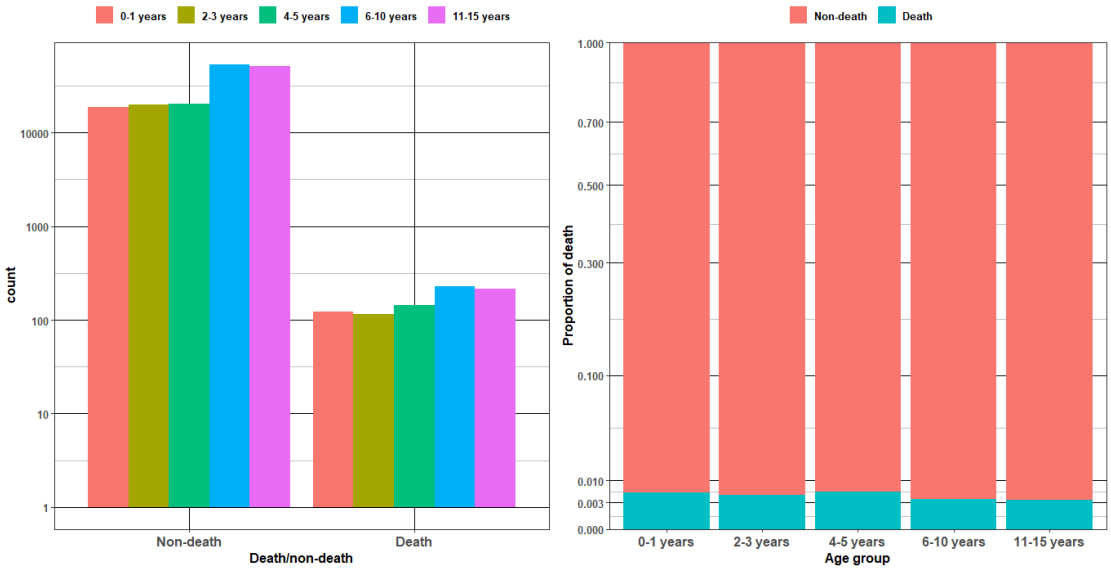


Figure 37 Incidence of death in children by age groups

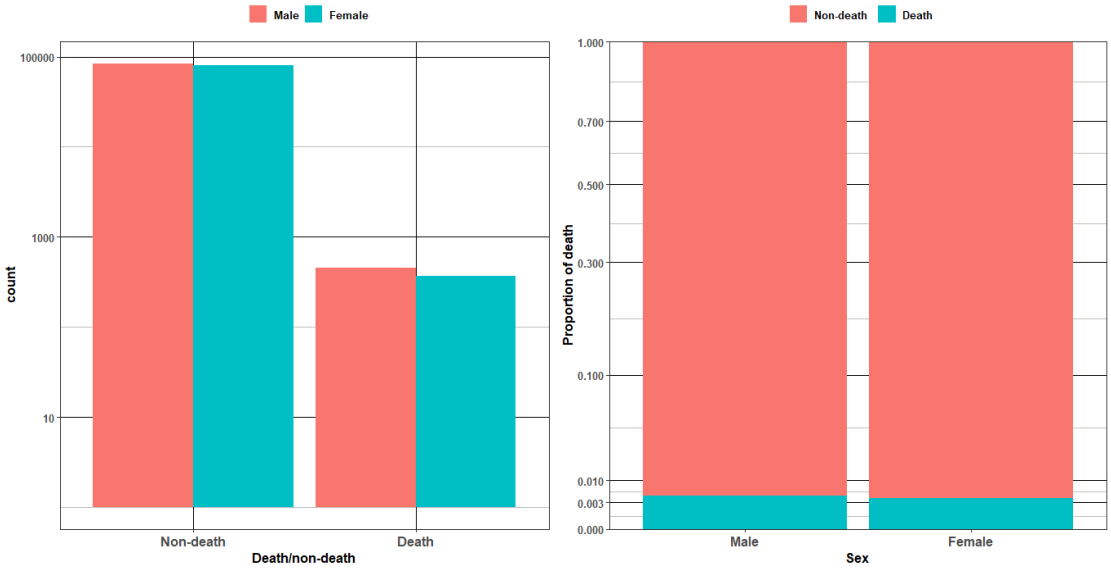


Figure 38 Incidence of death in children by sex

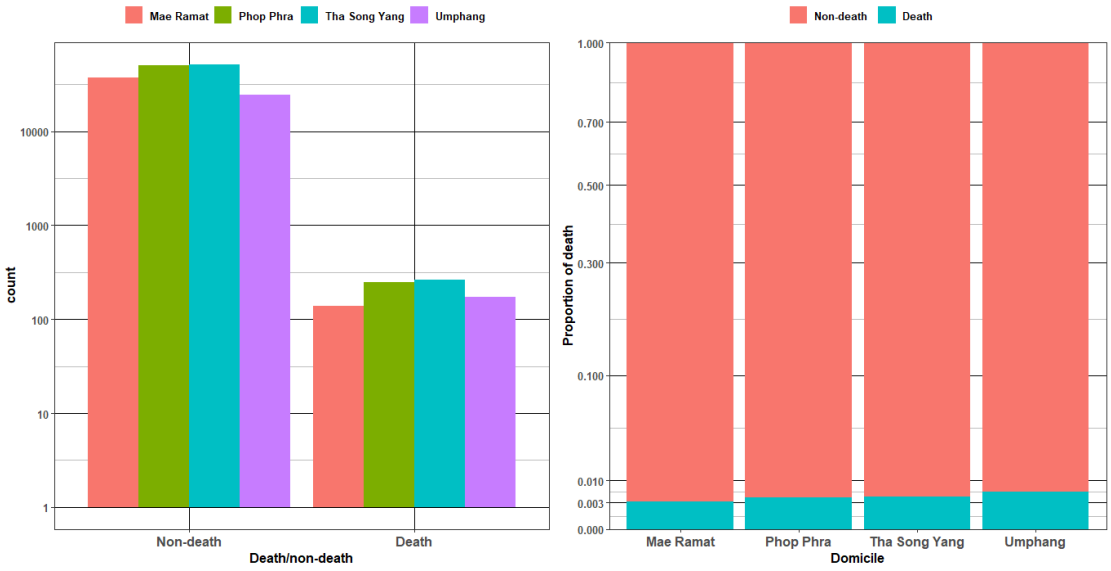


Figure 39 Incidence of death in children by domicile

Table 34 displays bivariate and multivariate logistic regression results in terms of crude odds ratio (OR) and adjusted odds ratio (AOR), respectively. Both models showed that death was associated with insurance status of children. For instance, uninsured children had 2.6 times greater odds of death than those insured with the UCS (AOR 2.6, 95% CI = [2.05, 3.25], p <0.001). Conversely, the children insured with the HIPCP had 0.63 times smaller odds of death than those insured with the UCS but without statistical significance (AOR = 0.63, 95%CI = [0.37,1.00], p = 0.066) (Table 29). Alternatively, self-pay or uninsured had 4.1 times greater odds of death (AOR = 4.14, 95% CI = [2.48, 7.36], p<0.001) than those insured with the HIPCP. On the other hand, UCS children had 1.6 times greater odds of death but non-significant (AOR = 1.60, 95% CI = [1.01, 2.74], p = 0.066) than the HIPCP (not shown in Table 34).

Age groups, sex, and domicile of children were also independently associated with deaths in children. For instance, those children aged 6-10 years, and 11-15 years had 0.64 times (AOR = 0.64, 95% CI = [0.51, 0.80], p<0.001), and 0.62 times (AOR = 0.62, 95% CI = [0.50, 0.78], p<0.001) smaller odds of death, respectively than those aged 0-1 year. Female children had 0.86 time (AOR = 0.86, 95% CI = [0.75, 0.99], p = 0.034) smaller odds of death than their male counterparts. The children living in Phop Phra District, Tha Song Yang District, and Umphang District had 1.26 times

(AOR = 1.26, 95% CI = [1.03, 1.56], p = 0.034), 1.31 times (AOR = 1.31, 95% CI = [1.06, 1.61], p = 0.011), and 1.92 times (AOR = 1.92, 95% CI = [1.54, 2.41], p<0.001) greater odds, respectively than those living in Mae Ramat District (Table 34).

Table 34 Regression results of bivariate and multivariate logistic regression models in terms of odds ratio (OR) and adjusted odds ratio (AOR), respectively

Variable	Bivariate logistic regression				Multivariate logistic regression			
	OR	95% CI		p	AOR	95% CI		p
Insurance (Reference: UCS)								
• Uninsured	2.460	1.940	3.060	<0.001	2.600	2.050	3.250	<0.001
• HIPCP	0.672	0.392	1.060	0.116	0.627	0.365	0.995	0.066
Age group (Reference: 0-1 year)								
• 2-3 years	0.879	0.680	1.134	0.320	0.881	0.682	1.137	0.330
• 4-5 years	1.066	0.837	1.360	0.603	1.048	0.823	1.337	0.704
• 6-10 years	0.652	0.524	0.815	<0.001	0.635	0.511	0.795	<0.001
• 11-15 years	0.641	0.514	0.803	<0.001	0.619	0.496	0.776	<0.001
Sex (Reference: Male)								
• Female	0.856	0.746	0.983	0.027	0.861	0.750	0.988	0.034
Domicile (Reference: Mae Ramat)								
• Phop Phra	1.342	1.092	1.655	0.006	1.260	1.025	1.557	0.030
• Tha Song Yang	1.394	1.137	1.717	0.002	1.307	1.065	1.611	0.011
• Umphang	1.907	1.525	2.389	<0.001	1.924	1.537	2.411	<0.001

Discussion

Among 9,444 child patients hospitalized, a bivariate analysis showed that stateless children insured with the HIPCP were associated with a significantly lower odds of intestinal infectious diseases, unspecified viral infectious diseases, metabolic disorders, acute upper respiratory infection (AURI), pneumonia, and urinary tract infection (UTI). Conversely, the HIPCP had significantly higher odds of conjunctivitis, and malaria than the UCS. Similarly, the uninsured status of child patients was associated with significantly higher odds of renal failure than in the UCS beneficiaries.

Unlike the bivariate model, a multivariate analysis showed that the insurance status of hospitalized child patients was found to be significantly associated with only three diseases. The HIPCP was associated with increased odds of acute upper

respiratory infections (AURI), malaria, and conjunctivitis when compared with the UCS. While multivariate logistic regression revealed malaria, conjunctivitis, and AURI were associated with insurance status of children, subgroup analysis showed that only malaria and conjunctivitis were significantly associated with the HIPCP as compared to the UCS.

Regarding incidence of death, both bivariate and multivariate models showed that uninsured children had greater odds of death than those insured with the UCS. On the other hand, both bivariate and multivariate logistic regression models showed that the incidence of death in the HIPCP was similar to the incidence of death in the UCS children (Figure 40). This finding is consistent with previous studies that demonstrated the lack of insurance was associated with greater odds of death among children in the US [320-322]. This phenomenon may be explained as follows.

First, as mentioned earlier, the uninsured group belongs to low-skilled and/undocumented migrants in the country meaning they have very low socioeconomic status in the country. The study also demonstrates that the uninsured are less likely to use both OP and IP care compared to the UCS. A domestic study by Suphanchaimat suggests that migrant patients visit for IP care when they experience catastrophic illness regardless of their insurance status [15]. This situation might put the uninsured at risk of experiencing adverse health outcomes leading to death. Nevertheless, all-cause deaths are common in the low socioeconomic group living in the country due to lack of access to healthcare [323].

Second, inadequate services for the uninsured in emergency visits may lead to death. A study Rosen et al. argued that insurance status may be a reliable predictor of mortality. Despite the general perception that the uninsured tend to be given the same level of intensive care services as insured patients, uninsured patients have exhibited higher odds of in-hospital mortality after both blunt and penetrating injuries as compared to insured patients with the same type of injury [320].

Third, a limited or no insurance is strongly associated with preventable advanced-stage cancer and death. A study by Rosenberg et al. suggests that the risk of cancer death is highest among patients with lower stage or presumably more curable cancer than those with advanced-stage cancer [324].

The age, sex, domicile, and/or hospitalization year of children were independently associated with diseases and death. The older children had lower odds of diseases compared to their younger counterparts except for malaria, renal failure, and death are less likely to die particularly when they exceed five.

The presence of cases with diseases did not differ by the sex of children except UTI which was higher in female children. Conversely, females were less likely to die as compared with their male counterparts.

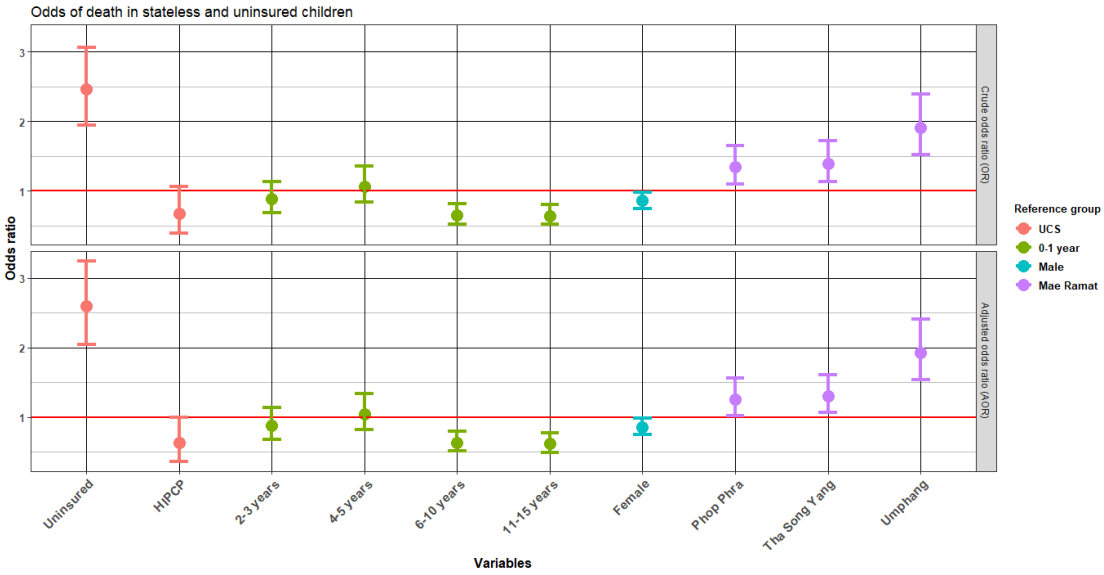


Figure 40 Association between death and insurance status, and covariates in terms of the odds ratio

Children living in Tha Song Yang, and Umphang districts were more likely to be experienced with unspecified viral infectious diseases as compared to those living in Mae Ramat District. The study also found that, children living in Umphang District were more likely to present malaria. This is consistent with a domestic study by Tananchai et al. that reported malaria is highly endemic in Umphang [325]. This finding may be explained as follows. Umphang is the most inaccessible and remote area in the country. While early detection and treatment (EDT) is essential to reduce malaria transmission [326], it may be difficult to access populations living in remote and hard to reach areas like Umphang. Additionally, Umphang is a dense forest area and the malaria vectors in this area are forest mosquitoes (e.g. A. minimus, A. dirus,

and A. maculatus) feeding early in the evening and outdoors [327]. People, especially young adult males, are exposed to mosquito bites while working in the forested areas like Umphang [325, 326]. Besides, evidence suggests that the population living in rural remote areas along the Thai-Myanmar border have very little naturally acquired immunity against malaria [328], and people they often suffer from highly drug-resistant malaria such as P. falciparum and P. vivax [329]. It has been suggested that the use of substandard drugs, self-treatment and monotherapies may be contributing factors for drug resistant malaria followed by decreasing efficacy of recommended drugs [327].

Children living in Phop Phra, Tha Song Yang, and Umphang districts had greater odds of death than those living in Mae Ramat District. This phenomenon may be explained as follows. These are the three remote districts along the Thai-Myanmar border where proportions of non-Thai population including stateless, undocumented and low-skilled migrants are relatively higher in these interior districts. Majority of the non-Thai patients are uninsured who are more likely to be untreated due to lack of access to health services. The most common diseases in Umphang are malaria, dengue fever, tuberculosis, and diarrhoea. Although hospitals provide free care, these epidemic diseases (malaria, TB) in the border area frequently cause deaths among patients. Additionally, lack of funding and unpaid debt in rural remote hospitals, situated along the Thai-Myanmar border area, resulted in a shortage of medicine, hospital staff, and hospital beds which may lead to poorer health outcomes followed by death (Informal discussion).

Regarding trends of diseases, intestinal infectious diseases, conjunctivitis, AURI, pneumonia (except 2016), bronchitis (except 2014), and renal failure consistently showed greater odds between 2014-2017 than that in 2013. On the other hand, unspecified viral infectious disease (except 2014), malaria, metabolic disorders (but increasing), and UTI showed lower odds than that in 2013. All these points are also discussed in more detail in the discussion and conclusion chapter (Chapter 6).

CHAPTER VI

DISCUSSION AND CONCLUSION

Introduction

This chapter is the final part of this thesis, which is divided into several sections. These sections have been presented following the order of results presented in the previous two chapters (Chapter 4 and Chapter 5). As such, this discussion section is categorized into three parts by three broad objectives of this study are as follows: (i) to summarize health policy for the stateless populations in ASEAN countries, (ii) to compare healthcare service utilization by three levels of insurance status: uninsured, HIPCP, and UCS, and (iii) to compare health outcomes by three levels of exposure: uninsured, HIPCP and UCS. Each of these sections has been further split into sub-sections.

Overview of key findings of the study

The discussion begins with an overview of key findings of the study as presented in Table 35.

Table 35 Overview of key findings of the study

Objective	Key findings
Objective-1	Conducting a scoping review, the study found that none of the 10 ASEAN countries have explicit health policy for stateless populations living in respective countries except Thailand. In 2010, the Thai Cabinet launched a health insurance policy for stateless populations in the country which is known as "Health Insurance for People with Citizenship Problems" (HIPCP). Additionally, Thailand is the only country that has ratified core and all three optional protocols to the Convention on the Rights of the Child (CRC).
Objective-2	HIPCP patients had 49% lower outpatient use rate than UCS patients. Conversely, HIPCP had 21% higher inpatient use rate than UCS patients.
Objective-3	HIPCP children had 2.6 times and 2.1 times greater incidence of malaria and conjunctivitis, respectively than UCS children. On the other hand, uninsured children had 2.5 times greater odds of death than UCS children.

Health policy for the stateless populations in ASEAN countries (Objective-1)

Key results: The researcher conducted scoping review study to summarize the state healthcare policies for stateless populations living in ASEAN countries. The researcher found that none of the ASEAN countries have explicit healthcare policies for stateless persons and undocumented migrants except Thailand. The Thai Ministry of Public Health (MOPH) instigated the Health Insurance for People with Citizenship Problem (HIPCP) in 2010 for stateless populations in the country.

Most of the ASEAN countries, such as Brunei, Lao PDR, Indonesia, the Philippines, Singapore, and Vietnam were found with a few stateless people in the country which may indicate an effective implementation of the nationality law and naturalization of the stateless people. This is comparable to the situation in developed countries where illegal immigrants have undertaken the nationality verification and become fully legalized to be insured by the main insurance scheme similar to the citizens of the host country [330].

The ratification of international human rights instruments relating to the "right to health" does not necessarily ensure the provision of health policies for all people in the country including stateless people. All countries except Brunei, Malaysia, Singapore have ratified the core instrument (e.g. ICESCR) recognising health for all by stipulating "the States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health". Thailand is the only country that has ratified core and all three optional protocols to the Convention on the Rights of the Child (CRC). However, none of the ASEAN countries have fully implemented the international human rights instruments as reflected by the Concluding Observations of the treaty bodies.

The researcher did not observe any association between pro-poor health financing and provision of healthcare for stateless people in some ASEAN countries. Lao PDR, Vietnam, Cambodia, Indonesia, who have government-subsidized social health insurance programmes for the poor in the country, but none of these countries have health policies for stateless people. This phenomenon is consistent with a previous study that found no association between the financing system (tax-funded and social health insurance) and the provision of healthcare to undocumented migrants in European Union countries [331].

The researcher also found no association between well-established health systems and provision of health policies for stateless people in the country. Intuitively it might be expected that a strong, well-established health infrastructure would provide, vulnerable population such as stateless and undocumented people, complete entitlements into healthcare. In practice, Brunei, Malaysia, Singapore does not have explicit health policies for stateless people in the country.

The volume of stateless people living across the countries is not necessarily a predictor of having health policies for them. The number of stateless persons is the highest in Myanmar followed by Thailand, Cambodia, and Vietnam. However, none of these countries have explicit healthcare policies for stateless people except Thailand. Even Myanmar's nationality law is against the stateless Rohingya minorities in the country. In contrast, the Philippines has strived to accommodate stateless people into their national health insurance program (e.g. PhilHealth) though the Philippines has fewer stateless people in the country. This phenomenon is analogous to EU countries where the level of rights to access healthcare is inconsistent with number of undocumented migrants in the country [331].

The researcher has also observed that access to healthcare may differ by the types of stateless persons living across different countries. In Thailand, de facto (or "in practice") stateless people (i.e. hill-tribes and ethnic minorities) are covered by the HIPCP or Stateless Insurance, while de jure (or "in law") stateless (i.e. stateless migrants, stateless refugees) are covered by the Refugee Medical Insurance (REMEDI) initiated by UNHCR in Malaysia. These phenomena of providing healthcare services are comparable to in EU countries where irregular migrant workers in the informal sector were provided broader health service coverage while rejected asylum seekers received restricted or less than minimum access to services [331].

Although Brunei, Malaysia, Singapore, and Thailand are reportedly called the migrant recipient countries, none of them are signatories of the ICMW 1990. On the other hand, Indonesia and the Philippines ratified the ICMW though they are reportedly migrant sending countries The ICMW 1990 recognises the right to emergency medical care regardless of the legal status of migrants (Article 28) and the equal treatment not less favourable than that which applies to nationals (Article 25).

Being non-signatories, these counties are not morally obliged to provide even emergency care to undocumented migrant workers. However, the Thai government allows undocumented migrant workers to enrol in their government-run annual premium based health insurance programme since 2004 [19]. On the other hand, the female Foreign Domestic Workers (FDWs) are repatriated to their country of origin if they get pregnant while working in Singapore as being pregnant is illegal in the country [332]. Therefore, to some extent, the right to health among undocumented migrants are in limbo in the migrant recipient countries and they are often victims of the national restrictive policies like Singapore [333]. This similar policy on FDWs is also applicable to Malaysia and Brunei [334].

The researcher found some commonality in two neighbouring countries, such as Malaysia and Thailand, in respect of statutory education policy for stateless children which is closely linked to mental and physical health of children. Thailand and Malaysia promulgated primary education for stateless children in 2005 and 2018, respectively. Currently, in both countries, stateless children are allowed to enrol into government schools to receive six to nine years of primary education like native children. However, primary education is not free in Malaysia. This finding is analogous to EU member countries which have laws on education that require all children to attend schooling for at least eight years including undocumented children living in the country [335].

Healthcare service utilization by insurance status of children (Objective-2)

Primary results

The key findings of the study objective-2 are discussed as follows: (i) The HIPCP had lower outpatient utilization rate than the UCS, (ii) The HIPCP had higher inpatient use rate than the UCS, (iii) Explanations of findings on the impact of the HIPCP on utilization.

The HIPCP had lower outpatient use rate than the UCS: The study revealed that stateless children insured with the HIPCP and uninsured children had a lower use of outpatient care than the Thai children insured with the UCS. These findings are consistent with the most recent domestic by Suphanchaimat, which reported that the

OP utilization was much lower among the HICS beneficiaries and the uninsured than the UCS beneficiaries [15]. These findings are also consistent with another domestic study by Srithamrongsawat et al. that suggested that the HICS beneficiaries were less likely to use OP services (measured by crude utilization rate) than their Thai counterparts insured with the UCS in provincial hospitals [179].

The study also suggests that the UCS are 1.4 times more likely to visit OP care than the uninsured which is consistent with a study by Kibusi et al. in Tanzania which reported that women covered by health insurance were 2 times more likely to have proper timing of the first antenatal visit and receive skilled birth assistance at delivery [336]. However, in LMIC context, the authors suggested that health insurance alone may not bring about the desirable changes in healthcare utilization while it is important to improve other health system pillars, including poor human resource for health, medical supplies, information technology, and stewardship [336].

The study suggests that the stateless beneficiaries were more likely to visit district hospitals for OP services particularly Mae Ramat and Umphang hospitals while uninsured and the UCS children were more likely to visit health centers in general. This may reflect the strategic pro-poor utilization of health services due to geographical proximity, where travel time and costs were minimal. It was reported that OP utilization increased at district health systems in which beneficiaries can effectively use services with low travel cost [337]. This phenomenon is consistent with the study by Wang et al. in China [338], which reported that the individuals who were insured by the Urban and Rural Resident Basic Medical Insurance (URRBMI) were more likely to seek outpatient care in the high-level health facilities (e.g. hospitals) assuming a better quality of healthcare.

A study by Nguyen in Vietnam found a larger effect of health insurance on utilization among children living in urban areas than those living in rural areas. The author argued that this phenomenon was possibly due to the availability of high-quality health care services in urban areas than in rural areas [155]. On the other hand, a domestic study by Limwattananon et al. suggests that the increase in OP utilization rate is greatest among the poor and rural residents in the country [339]. It should be mentioned here that primary care services in Thailand are usually delivered by paramedics in health centres or general practitioners (GPs) in outpatient departments

(OPDs) of district or provincial hospitals. The GPs diagnose and prescribe medicines (if needed) and patients are directed to receive medicines from dispensaries or pharmacies accordingly [337].

The study also found that the HIPCP beneficiaries sought an even fewer number of OP visits than that of the uninsured. This finding contradicts the perception that the HIPCP would encourage its beneficiaries for increased utilization of health services without financial barriers. There are some plausible explanations for this phenomenon. The Provincial Public Health Office (PPHO) allows all children, regardless of their legal status in the country, to be immunized free of charge [15]. Uninsured children might take the benefit of this local initiative who reside along border provinces such as Tak Province. Additionally, undocumented and/or uninsured migrants are sometimes exempted from healthcare charges at the discretion of local health providers without compromising the quality of healthcare services. Also, the Thai Ministry of Public Health (MOPH) has established migrant-friendly services to improve access to healthcare for all migrants regardless of insurance coverage. These migrant-friendly services include the use of migrant volunteer community health workers (MVHWs), mobile clinics for migrant communities, bilingual signposts and notice boards (e.g. in Thai and Burmese) at health facilities, and outreach services in the workplace of low-skilled migrants [340].

Further, there are some projects for migrant communities living in the Thai-Myanmar border districts including Mae Sot, Mae Ramat, and Phop Phra for protecting the health of undocumented or illegal migrants in the country [341]. These local policy initiatives/interventions might improve children's health service utilization regardless of their insurance status. Unlike stateless children, uninsured children might maximize these disease prevention and health promotion services along the border area that might increase health services utilization among the uninsured as compared to the HIPCP beneficiaries. Nevertheless, these are just some impressions from the existing literature, and it was difficult to assess the validity of these explanations in-depth since the study lacked data of stateless children who did not show up at selected health facilities.

The HIPCP had higher inpatient (IP) use rate than the UCS: The study suggests that the HIPCP has a significant positive effect on inpatient utilization among stateless

children as compared to the Thai children insured with the UCS. This finding contradicts with the most recent domestic study by Suphanchaimat which reported that the effect of the HICS on inpatient utilization was much lower than that in the UCS beneficiaries [15]. Besides, a domestic study by Suphanchaimat et al. did not find any significant effect of the HIPCP on inpatient utilization of stateless patients compared to the UCS beneficiaries [5]. On the other hand, the study found that uninsured children were less likely to utilize inpatient care as compared to the UCS beneficiaries which are consistent with previous domestic studies [15, 149, 151, 152]. Unlike finding of this study, a domestic study by Hasuwannakit found that the HIPCP policy failed to significantly increase the hospital utilization rate among stateless beneficiaries [3]. This situation may be explained as follows. First, the author conducted the study right after six months of launching the HIPCP in 2010 which was probably too short to observe the policy effect especially due to lack of greater awareness about the policy among its intended beneficiaries. Second, initially, the HIPCP enrolees were not allowed to access to care beyond their registered domicile or real living/working place, except for emergency cases or referrals [3, 15]. However, evidence from Ranong Province showed that, this gate-keeping system was difficult to apply in the field considering the highly mobile behaviour of stateless people and migrants. Later, the PPHO abrogated the regulations and permitted stateless beneficiaries to access care beyond their registered domicile. A similar policy might be adapted in Tak Province that may increase IP care among its beneficiaries.

Explanations of findings on the impact of the HIPCP on utilization: The plausible explanations of findings, of the impact of health insurance policy on healthcare service utilizations, are discussed, based on existing literature, as follows. The key finding of this study showed that the utilisation rates of the HIPCP and the uninsured were much lower than for the UCS, particularly for OP care at health centers. Previous studies suggest that IP diseases are normally more severe than OP diseases and both stateless and migrant patients tended to present for IP care only when they were severely ill [5, 15, 179]. One of these studies reported that having a history of catastrophic illness a had much greater effect than the insurance status for IP admission [15]. The present study finds that the HIPCP utilisation rate is 1.2 times

greater than the UCS in IP services, and hospital lengths of stay (LOS) are 1.3 times greater that the UCS patients. This study also shows that the HIPCP children may be more likely to experience infectious diseases (e.g. malaria, conjunctivitis) than their Thai counterparts. This situation may reflect the relatively poor health of stateless children than the UCS children.

On the other hand, assuming the UCS as the standard user of health services, the HIPCP beneficiaries might overly use IP services as their IP utilization rate was significantly higher than the standard level. There are concerns that the HIPCP policy might encourage moral hazard among its beneficiaries [342]. Nevertheless, this study did not have data to assess whether admissions of stateless patients were clinically necessary or whether the insured had a lower medical threshold for admission relative to non-users.

Although, in principle, there is no user fee at the point of service, there might be non-financial contributing factors (e.g. accessibility, acceptability) hindering stateless people from using OP services, especially in remote areas of Umphang District. A domestic study by Yingtaweesak et al. showed that the accessibility to health care services at primary health care posts in rural and remote areas of Tha Song Yang District in Tak Province was not good. They reported that the indirect cost of health care utilization was substantially high for Karen people in Tha Song Yang District. It takes more than 30 minutes, and more than two hours to travel from home to the nearest primary healthcare post, and home to the nearest hospital respectively. In both cases travel time is even more in the rainy season than in the dry season [343].

Secondary results

In addition to the above findings of study objective-2, health service utilizations are associated with age, domicile and year of visit which are discussed as follows: (i) older children had lower OP use rate, (iii) both OP and IP service utilisation rates are higher in Mae Ramat District, (iii) both OP and IP use rates increased between 2013-2017.

Older children had lower OP use rate: The study suggests that, unlike inpatient services, the utilization of outpatient services is consistently lower among children aged four and above as compared to those aged 0-1 year. Both OP and IP utilization rates are consistently higher among children aged 2-3 years as compared to

those aged 0-1 year, which is consistent to a study by Nguyen and Wang in Vietnam that reported a higher predicted utilization levels among younger age children [154].

Both OP and IP service utilisation rates are higher in Mae Ramat District: The study has revealed that, both OP and IP utilization rates were consistently lower in Phop Phra and Umphang districts as compared to Mae Ramat District. Phop Phra and Umphang are rural remote areas which are relatively inaccessible, especially in the rainy season which may be the possible causes of lower utilizations. Additionally, parents do not bring their kids to the hospital for vaccination following pre-schedule as they keep busy with farming activities for their livelihoods. In addition, the full immunization rate (who received five doses of vaccine) has been reduced from about 81% in 2014 to 75% in 2016 in the border area. This lower immunization might increase the chance of preventable infectious diseases among the residents including migrants and stateless people (Informal discussion).

The most common diseases in Umphang are malaria, dengue fever, tuberculosis, and diarrhoea. Umphang District Hospital has to provide healthcare services to all patients while the majority of the non-Thai patients are uninsured. However, under the leadership of the hospital director, both Thai and non-Thai patients receive free health services because the non-Thai patients have no health insurance and they are too poor to pay medical bills. So, the hospital helps them not only for humanitarian reasons but also for disease prevention as the director mentioned during the discussion. He also emphasized the control of epidemic disease in the border area as disease has no borders. If underprivileged populations such as hill-tribes and aliens are sick and left untreated it is likely that the disease would be contaminated by other people including Thais. He also argued that Thailand gets economic benefit from migrant labour especially from Myanmar, so it is the government's responsibility to ensure social rights of migrants and their children for longer-term benefit (Informal discussion).

Both OP and IP use rates increased between 2013-2017: This study also revealed that both OP and IP utilization rates among children consistently increased between 2014-2017 as compared to utilization in 2013. This finding is consistent with an earlier domestic study by Hasuwannakit, which reported the OP utilization rate of stateless patients increased by 38% between 2010 and 2011 in a public hospital in northern Thailand [3]. The finding of this study is also consistent with another

domestic study by Suphanchaimat et al. which reported the average inpatient utilization rate of stateless patients, at Kraburi Hospital in Ranong Province, increased from 1.2% in 2009 to 1.4% in 2012 [5].

These above findings are also consistent with a study by Nguyen and Wang in Vietnam that reported that public insurance increased the probability of an inpatient visit by 6.8% and an outpatient visit by 21.7% among child beneficiaries in secondary public hospitals between 2006-2010. The study also reported that the average number of inpatient and outpatient visits increased by 1.13, and 0.77, respectively [154]. Another study by Nguyen in Vietnam reported a positive effect of both student and free health insurance programs on the number of health care visits between 2006-2012 [155], which is consistent with the present study.

Health disparities in children by insurance affiliations (Objective-3)

Primary results

The key findings of the study objective-3 are discussed as follows: (i) The HIPCP had greater odds of both malaria and conjunctivitis than the UCS, (ii) The uninsured had greater odds of death than the insured, (iii) Explanations of findings on associations between insurance and malaria cases.

The HIPCP had greater odds of both malaria and conjunctivitis than the UCS: Unlike bivariate logistic regression model, after adjusting for potential covariates, showed that the insurance status of hospitalized child patients was significantly associated with only three diseases in children: malaria, conjunctivitis, and AURI. However, after subgroup analysis, without newborn admissions, suggests that only malaria and conjunctivitis are associated with the HIPCP, which are briefly discussed below.

Malaria: The study revealed that malaria was found to be significantly higher among stateless insured as compared to the Thai children. This finding is consistent with a domestic study by Sriwichai et al. in Tha Song Yang District of Tak Province which reported that migrants were four times more likely to have malaria as compared with Thai patients. Most of the migrants were from Kayin State of Myanmar [199].

However, Thailand has made significant progress towards eliminating malaria by 2024 by reducing malaria cases from 67% in 2012 to 39% in 2017 [344]. The incidence of malaria infection has drastically reduced in Tak Province as the Malaria Elimination Taskforce programme has been very active along the Thai-Myanmar border, and there has also been an increased number of malaria posts across the border that helped early detection of malaria using so-called '1-3-7 approach' in which village malaria workers report cases within 24 hours of detection; within three days, cases are investigated, and the risk of local transmission is evaluated; a follow-up response is conducted within seven days [345]. The Shoklo Malaria Research Unit (SMRU) has been helping rapid tests for malaria since 2016. Thus, multiple initiatives reduced malaria incidence in the border area [102].

A previous study showed that the highest malaria cases were found in Tha Song Yang and Umphang districts between 2016-2017 which are the extreme north and south of the province along the Thai-Myanmar border [346]. This is consistent with the results of this study. The study showed that children living in Umphang District were associated with 1.6 times higher odds of malaria than those living in Mae Ramat. A previous study showed that such variation is linked to high altitude or elevation (>650m), annual temperature (>270C) and precipitation (271.9mm) which are suitable for mosquitoes leading malaria [347] and these indicators correspond to the four districts of this study. Older children had greater odds of malaria which is consistent with domestic study by Thway et al. in Tha Song Yang District that indicated more cases of malaria among individuals aged 15 and above years [346, 348].

Conjunctivitis: The study found that the HIPCP had greater odds of conjunctivitis than the UCS. Conjunctivitis is very common in Thailand. It is an inflammation of the conjunctiva usually due to virus, but sometimes bacteria or parasite or due to an allergic reaction. This disease can spread widely and especially during the rainy season in Thailand. However, it did not differ by age, sex, domicile and this disease was found to be stable in children between 2013-2017. This finding is consistent with a previous study in Thailand [349]. An earlier study done in Italy reported that conjunctivitis ratio was significantly higher in residents in areas with more air pollution [350]. Another study reported that younger children aged below six

were more frequently diagnosed with conjunctivitis in Miami, USA [351], which is consistent with this study.

Multiple studies suggest significant association between health insurance and health status meaning insurance benefited the target population to improve health in different countries. For instance, social health insurance improves the health index of its beneficiaries in Cambodia [146], reduces malnutrition in China [165], reduced incidence of low birth weight in Colombia [166], reduces adult mortality in India [144], reduces child mortality [167] and neonatal mortality [168] in Mexico. Previous studies also suggest a positive effect of insurance in Nigeria [169], in the Philippines [170], and in the US [171]. Conversely, some studies suggest non-significant association between insurance and health outcomes. For instance, Duffy et al. [174] found a non-significant difference in health status (e.g. dental caries) among for children aged 2-19 years by their insurance affiliations: public insurance, uninsured, private insurance, in the US. Coker et al. reported that insured status of children was not associated with persistent symptoms to have a diagnosis of asthma as compared to uninsured children with similar symptoms in the US [171]. Celhay et al. found the healthcare insurance scheme (e.g. SMSXXI) was not associated with early neonatal mortality in Mexico [168].

The uninsured had greater odds of death than the insured: The study showed that uninsured children had a higher proportion of death (1.2%, compared to UCS at 0.5% and HIPCP at 0.3%; $p < 0.001$). A multivariate analysis indicated that uninsured children were associated with increased odds of death as compared to the UCS. The uninsured had even greater odds of death than the HIPCP. This finding concurs with previous studies in international contexts. For instance, studies conducted in Costa Rica, and Ghana, both reported a lower risk of death in children was associated with the national health insurance [176, 352]. Similarly, the community-based health insurance reduced the risk of death in children by 45% in Burkina Faso [353]. Insured patients had lower crude mortality rates than uninsured patients in the US [354, 355].

The present study found that age, sex, and domicile of children were independently associated with death, which is consistent with the previous study by Schoenfeld et al. in the US which reported, apart from insurance status, the increased

age, male gender, race/ethnicity, and blood pressure at presentation were significant predictors of mortality [356]. The study also found that female children had a lower chance of death than their male counterparts which is consistent with studies done in China [357] and Thailand [358]. A domestic study by Aungkulanon et al. reported that geographical disparity in mortality in children aged between 0-14 years old has increased between 2001-2014 in Thailand, while under-five mortality was high among ethnic minority groups along the Thai-Myanmar border [110]. Rutherford et al. reported that the child mortality was associated with distance of health providers in low-income countries [359], which is analogous to the finding of this study. This study discovered that children living in Umphang District, the most inaccessible and remote area, had the highest chance of death. It should be mentioned here that Umphang is the largest and least accessible mountainous terrain district in the country. The majority of the population living in this district are Karen, Thai, Shan, and other ethnic hill-tribes [360]. Chronic non-communicable diseases have been the major causes of death in Phop Phra District. Top reasons of death between 2014-2016 in Phop Phra District were: high blood pressure (hypertension), blood infection, pneumonia, cancer, stroke, COPD, taking herbicides, and cirrhosis (Informal discussion).

Explanations of findings on insurance and malaria

The HIPCP had greater odds of malaria than the UCS: The present study finds that the HIPCP children are more likely to experience malaria than the UCS children. In other words, stateless children are more likely to present malaria than the Thai children. The plausible explanations of this finding are as follows.

First, low accessibility and socioeconomic condition of stateless people: the majority of stateless people reside in deep rural villages who are unable to easily travel to healthcare centres, especially in the rainy season [39]. For instance, Umphang District is the most inaccessible and remote area in the country. While early diagnosis and treatment (EDT) to the mobile and migrant population appears to have been successful in reducing malaria transmission [326], it is difficult to access populations living in remote and dangerous areas [361]. Since many stateless people

live in conditions of extreme poverty they may not have adequate housing or protective mosquito nets to cover all family members, may not have the knowledge necessary to help prevent malaria infections that may put them at greater risk of malaria [362].

Second, experiencing drug resistant malaria parasite: unlike novel malaria infections by Plasmodium falciparum parasite, the hill-tribes are susceptible to be infected by Plasmodium vivax parasite which is the result of relapse or re-emergence of parasites in the blood from dormant parasite stages in the liver [199, 329, 362]. The 'hill tribe', especially Karen and Hmong, are at high-risk of malaria and malaria treatment-seeking behaviour of hill-tribes is culturally different from other ethnic Thais. For instance, the majority of stateless people (79%) sought delayed seeking treatment for malaria, self-treatment due to asymptomatic malaria by P. vivax [207, 361]. A recent review study shows that about 85% of all malaria cases are due to P. vivax and rest are due to P. falciparum [325]. Evidence suggests that the population living in this rural remote area has very little naturally acquired immunity against malaria [328]. It has been suggested that they may use substandard drugs, self-treatment and monotherapies contributing to developing drug resistance against malaria parasites[363]. Shan and Mon ethnic groups are mostly located in Tha Song Yang and Umphang districts, respectively which are historically the hotspot of malaria, especially drug registrant malaria [346, 362, 364].

Third, occupation of hill-tribes may contribute to malaria: the majority of the hill-tribes are basically engaged in agriculture (maize and rubber plantations) and their occupation partially responsible for experiencing malaria especially in the rainy seasons as well as when they exposed to forest mosquitoes (Anopheles dirus, Anopheles baimaii) during work in forest area. Evidence shows that A. dirus has shown a preference to feed immediately after dusk until midnight while A. baimaii has demonstrated peak biting periods just after midnight until dawn, suggesting people, especially young adult males are at risk of mosquito biting especially while working in the forested areas [199, 325, 327]. The outdoor biting activity of forest mosquitoes greatly limits the protective utility of long-lasting insecticide-treated nets and indoor residual spraying, especially during the early evening and morning hours when humans are outside and unprotected [365].

Health insurance status and presence of malaria: The researcher found no malaria cases for the uninsured (as mentioned in Table 24) and multivariate showed no association between uninsured status and malaria as compared to the UCS. This situation (absence of malaria case) may be explained as follows. Absence of malaria cases in the hospital database does not mean uninsured migrants do not experience malaria. According to routine malaria surveillance of the Bureau of Vector Borne Diseases (BVBD) in Thailand, migrant population, especially highly mobile short-term or recent migrants bear a disproportionately high proportion of the malaria burden infected with Plasmodium falciparum parasite [366, 367]. Cross-border low-skilled migrants without HICS are less likely to use the formal Thai healthcare system for malaria treatment. Instead, they are highly likely to use the services provided by malaria clinics, NGOs as malaria treatment is free under the malaria elimination project implemented along the Thai-Myanmar border area [207, 362]. Additionally, as migrants are commonly infected my P. falciparum which shows malaria symptoms within few hours of onset due to higher parasite loads. As such migrant patients are more likely to seek treatment immediately from malaria clinics [199, 250, 362]. Some uninsured migrants from Cambodia seek malaria treatment from their home country [368]. These might be the possible reasons for the absence of any malaria case among uninsured migrants in the hospital database.

Secondary results

The presence of cases with diseases are independently associated with demographic factors of children: The age, sex, domicile, and hospitalization year of children were independently associated with diseases as follows.

Intestinal infectious diseases: The finding showed that intestinal infectious diseases were found to be higher in children aged below three years as compared to children aged four years and above. This finding is consistent with a study conducted in Japan which reported that the proportion of intestinal infectious diseases was higher in children aged below two years as compared to children aged two and above. They reported the highest number of rotavirus gastroenteritis hospitalizations contributed for occurrence of these diseases [369]. Another study reported that children aged six and above was negatively associated with prevalence of these diseases as compared to

younger children which are also consistent with the findings of this study [370]. The present study also showed that being female was significantly negatively associated with intestinal infectious diseases as compared to their male counterparts. However, this finding contradicts with a previous study conducted in the UAE which reported that female had 2.4 times greater odds of intestinal infectious diseases than that in males [370]. The study showed that children being either from Phop Phra, Tha Song Yang or Umphang districts had a lower risk of intestinal infectious diseases as compared to those from Mae Ramat District. The study also showed a steady increase of intestinal infectious diseases between 2013-2017 which is consistent with a study conducted in China [371]. They reported that the summer season was associated with the highest incidence rates for these diseases. They also reported that the occurrence of intestinal infectious diseases is related to climatic factors, including the duration of sunshine, temperature and humidity and the quality of food and drinking water. The high temperature and humidity in summer are conducive to bacterial reproduction while food and water are easily contaminated. At the same time, the human immune system is relatively weak due to higher bodily exertion in summer. This phenomenon may be linked to a higher incidence of intestinal infectious diseases in Mae Ramat District as its climatic factors are relatively more dry and humid that other three districts [372, 373].

Unspecified viral infections: The study demonstrated that uninsured children were associated with greater risk of unspecified viral infectious diseases as compared to the Thai children and vice-versa for the stateless children. Older children had greater odds of unspecified viral infectious diseases than their younger counterparts. Similarly, children living in Tha Song Yang and Umphang districts had greater odds of unspecified viral infections diseases than those living in Mae Ramat District. The study also revealed that unspecified viral infectious disease was stable between 2013-2017.

Metabolic disorders: The study revealed that Thai children (22%) were found to be more frequently diagnosed with metabolic disorders followed by stateless (18%) and uninsured children (18%). Older children were associated with smaller odds of metabolic disorders. Male and female children were equally likely to have metabolic disorders. Children living in Tha Song Yang were more frequently diagnosed with

metabolic disorders (29%) which was the highest followed by children living in Mae Ramat (25%), Umphang (13%), and Phop Phra (6%). The study showed an increasing trend of metabolic disorder cases between 2015-2017.

AURI: The study found that younger children aged below five had higher incidence of AURI which is consistent with a study conducted in the US [374]. The study also found that the AURI did not significantly differ between male and female patients, which is consistent with a study done in China [367]. The study showed that the AURI admissions were disproportionately higher in Mae Ramat District compared to the other three districts. A previous study found that air pollution was strongly correlated with respiratory disease in children aged between 2-18 years leading to hospital admissions [367]. The study also showed that AURI has increased between 2013-2017 which is consistent with the informal discussion with local health providers in Tak (Informal discussion).

Pneumonia: The study has suggested that the age was independently associated with pneumonia. This discovery is consistent with the earlier domestic studies by Turner et al. which reported a 2.4 times greater odds of pneumonia in young children in the refugee population in the Maela Refugee Camp in Tha Song Yang District in Tak Province [103, 104]. Fry et al. reported that children aged below one year and aged between 1-4 years had 13 times and 8 times greater odds of pneumonia, respectively in rural provinces [375-378]. The study revealed that the presence of cases of pneumonia soared in 2015 and declined afterwards among uninsured children while there has been a steady rise of pneumonia among the stateless and the UCS beneficiaries between 2013 and 2016. Unlike the uninsured, in 2017, the pneumonia was found to be with decreased odds among the stateless and the UCS groups after steady increase until 2016. This finding was consistent with the informal discussion conducted with Phop Phra and Umphang hospital management teams (Informal discussion).

Bronchitis: While bronchitis can affect people of all ages, it mostly happens in children under-5 [379, 380]. The study found that younger children aged under-5 were more likely to experience bronchitis which is consistent with a previous study conducted in the UK which reported 1.8 times greater odds of childhood wheezy bronchitis [381]. Females were less likely to experience bronchitis which is consistent

with a previous study done in the US which reported that male had 1.5 times greater odds of chronic bronchitis [382]. Children with higher prevalence of bronchitis resided in areas with higher ambient air pollutants has also been reported [383, 384], which may indirectly be linked to the findings of this study as children living in Mae Ramat and Tha Song Yang districts, which are reportedly lower elevation areas with higher concentration of air pollutant, were more likely to be diagnosed with bronchitis compared to other two districts [372, 373]. The study showed an increasing trend of bronchitis among children which may cause major childhood morbidity and high socioeconomic costs as a previous study suggested [385].

Renal failure: Kidney failure, is a medical condition in which the kidneys are functioning at less than 15% of normal. It is also known as end-stage kidney disease [386] The study demonstrated that (in the bivariate analysis but weak association) lack of insurance was associated with 6 times greater odds of renal failure than the UCS patients. This phenomenon might be explained as follows which is mainly related to the insurance coverage of the HICS beneficiaries. As mentioned earlier, in 2004, the Thai MOPH launched the HICS for low-skilled and undocumented migrants in the country. Although, the benefit package of the HICS includes some high-cost treatments such as chemotherapy and antiretroviral therapy for HIV/AIDS, it does not cover renal replacement therapy (RRT) for chronic renal failure [138]. Even the Thai government included RRT into the UCS benefit package in 2008 though it was not cost effective [387, 388]. However, a recent study shows that only 50% of Thai patients requiring RRT receive it [389], while the UCS chronic kidney disease patients had the highest rate of complications, and had the greatest odds of in-hospital death than the CSMBS [390]. It is highly likely that uninsured migrants could not afford the cost of kidney disease and keep themselves untreated that leads to last stage kidney disease or renal failure. Unlike the HICS, the HIPCP benefit package included RRT for chronic renal failure.

The lack of early treatment and screening among the uninsured may result in renal failure as most of the uninsured visit the facilities quite late, especially at the most severe stage of kidney disease. A domestic study by Suphanchaimat argued that advanced stage of disease among uninsured migrants might consume more healthcare resources than insuring all migrants and promoting access to treatment at the earliest

opportunity [15]. Renal failure is reportedly the ultimate outcome of poor non-communicable disease (NCD) control in Thailand. Evidence suggests that an NCD medication interruption is much higher in high among Syrian refugees in northern Jordan who need regular medication mainly due to unaffordability [391]. Additionally, while effective and cost-effective treatments are available for preventing and slowing the progression of chronic kidney disease (CKD), there are a number of common barriers, including lack of health workforce capacity, absence of mechanisms for disease surveillance, lack of a coordinated CKD care strategy, poor integration of CKD care with other NCD control initiatives, and low awareness of the significance of CKD among refugees and asylum-seekers [392].

The study also revealed, older children aged 11 and above were associated with greater odds of renal failure as compared with their younger counterparts (0-1 year). The renal failure fluctuated between 2013-2017 and children living in Umphang District showed greater odds of renal failure than those living in Mae Ramat District. The proportion of stateless children was disproportionately higher in Umphang (~40%) compared to Thai children (~18%) and uninsured children (~5%). Thus, stateless children may be more likely to experience renal failure in Umphang. It should be noted here that to avoid the potential under-provisions of inpatient services, some high-cost interventions were unbundled from closed-end payment to on an agreed fee schedule. For instance, unlike the benefit package of Civil Servant Medical Benefit Scheme (CSMBS) and Social Security Scheme (SSS), renal replacement therapy (RRT) was not included in the UCS benefit package until 2006 due to its high cost. However, despite cost ineffective, the Thai government included RRT into the UCS benefit package, to prevent catastrophic spending and ensure equity across the above three schemes financed by public resources [337, 387]. Therefore, in principle, the HIPCP and the UCS are covered for the renal failure to be avoided catastrophic expenditure.

UTI: The study revealed that children aged between 6-10 experienced a higher incidence of UTI. A study done in Slovakia showed that urinary tract infections affect mostly females which is consistent with the findings of this study. Females generally present with greater number and activity of immune cells and inflammatory responses than males. The immune system generally responds to UTI infection by the innate

immune defence, inflammatory mediators, cytokines and antimicrobial peptides [393]. This study also showed that UTI fluctuated between 2013-2017 in which it reached a peak in 2016 and Mae Ramat Hospital was found to be the highest with UTI admissions between the same period.

Limitations of the study

The present study has some important limitations which are discussed under two categories: results limitations, and methodological limitations as follows.

Results limitations: Regarding scoping review (objective-1) (i) discrepancy in the definition and registration process of stateless people across countries are different that may affect our analysis. For instance, some countries counted stateless people as undocumented migrants or people of concern. So, if we say Thailand is the only country that has established stateless health policy, it might not explicitly be comparable to other countries as they may have covered stateless people already, but they may not call them stateless. Similarly, in some countries categorise their refugees and asylum-seekers as stateless people while Thailand does not, (ii) what appears in this review needs not to reflect the actual practice. This is because most of the time the access to care of vulnerable population is always shaped by many factors, such as perspectives and openness of providers (which could be positive or negative), not just the policy document. (iii) although the study identified existing health policies allowing stateless people access to healthcare, it did not focus on the implementation of the policy or other social determinants of health that stateless people might encounter. As such, the practical implications of the health policy cannot be known from this study. Therefore, the results should be used with caution.

Regarding quantitative analysis (objective-2 and 3), several studies were done in Thailand which measured the impact of health insurance schemes, including the universal coverage scheme (UCS) [109, 149-152], the health insurance card scheme (HICS) [15], and the health insurance for people with citizenship problem (HIPCP) [5], on health service utilization. These studies employed a difference-in-difference (DID) design to see the impact on desired outcomes mainly relying on the household survey data [149-151], and administrative data [5, 152] while other studies employed

multivariate fixed effect and/or random effect models using administrative data [15, 151]. The researcher of this study could not find any study estimating the impact of stateless insurance on utilization and health outcomes of stateless children using multivariate analysis design with administrative data like this study. Additionally, the demographic structure of participants in the previous studies included the overall population of all age groups where the present study was limited to paediatric population aged between 0-15 years.

Regarding quantitative findings, the differences in utilizations and disease outcomes associated with the HIPCP were significant even after controlling for confounders. However, it is unclear whether these differences might be due to variations in other sociodemographic and health characteristics of the population [358]. Additionally, the decision to use health care services does depend not only on children but also heavily on their parents and caregivers. For instance, for a given insurance, more educated parents are more likely to use health care services for their children than less educated parents [155]. These factors were beyond the scope of this study. Therefore, the results of this study required a cautious interpretation.

Methodological limitations: Unlike systematic review and meta-analysis, scoping reviews have inherent limitations with focusing on breadth rather than depth of information in a particular topic [394].

The study also has several limitations using administrative data. First, the most critical disadvantage of using routinely collected health data is a lack of information on study patients who failed to show up at a health facility. This issue can be addressed only by collecting primary data at the household level on the health-seeking behaviour of the study population. Second, facility-based health data do not routinely collect a number of determinants that might influence access to care, such as length of stay in the country, language barriers, and household socioeconomic status. Third, facility-based health data do not track individual patients across the facilities via a unique identifier but within the facility that may weaken robustness of the estimates. Fourth, the data had quite a short time trend with a limited number of stateless and uninsured children compared with the UCS children which might affect the robustness of the impact estimates [5]. Fifth, the study results cannot be generalized for all stateless children in the country as the study population was drawn from only

four districts in Tak Province. Additionally, results may not be generalized for all non-Thai children as the stateless children is just one group among many non-Thai populations in the country, such as legal and undocumented/illegal migrant children, international students, children of diplomats, and refugees who are distinct from each other based on its own characteristics [5]. Sixth, the cross-sectional nature of the study design, with time-series cross sectional data, may lead to selective survival bias and hinder drawing causal relationships between exposure and the outcomes of interest such as death in this case [395]. Finally, the researcher conducted some informal discussions with the hospital management team. This study lacks empirical qualitative work. For instance, unlike previous studies [15, 133], frontline health workers (nurses, administrative staff, migrant health workers), health policy makers, local health providers/implementers, and service users were not interviewed to explain/supplement the findings of quantitative analyses. Moreover, a previous study suggests that the legal status of stateless people and migrants is quite unstable in the country, which might affect the accuracy of the quantitative analysis [133]. In other words, the researcher used a single-method approach rather than multi-method approach, which might limit the researcher to answer some research questions which cannot be answered by a single-method approach, to provide better and stronger inference coupled with the divergent views of providers [396].

Nevertheless, one of the key strengths was the use of the most recent routinely collected facility-based health records of all health facilities, including health centers and district hospitals in four districts. This allowed the researcher to use information about natural comparators (in this case stateless children vs. Thai children, uninsured children) in the multivariate model coupled with covariates that came with raw data. This enabled the researcher to assess the real-world impact of the HIPCP policy. This phenomenon resembled the Natural Experiment which is a recommended method for impact evaluation where a randomized controlled trial (RCT) is not feasible [397] as cited in [5].

Conclusions of the study

While statelessness has been a long-standing and complex issue, the information on healthcare policies for stateless people across the 10 ASEAN countries is largely

unknown in the literature. Additionally, there have been a few studies conducted on the impact of the HIPCP on health service utilization and health outcomes since its inception in 2010, especially on the paediatric population as this group of children has not been assessed in previous studies. To researcher's knowledge, this is the first study that provides empirical evidence on the impact of the HIPCP on health service utilization followed by the association between the HIPCP and the diseases among stateless children aged between 0-15 years. In addition, this study has used more recent data from the Health Data Center (HDC) in Thailand which is popularly known as the "43-files database".

Following an introduction in Chapter 1, Chapter 2 presents a thorough review of existing literature on the health issues of stateless populations. It led to identifying knowledge gaps in the literature and set objectives of this thesis. For instance, previous studies focused on the process evaluation of the stateless health insurance, and impact of stateless health insurance on inpatient utilization. However, there is a paucity of evidence on the effect of the HIPCP policy on morbidity outcomes in stateless children. Such information on the magnitude and severity of health problems could be useful for policy decision-makers to make appropriate policy initiatives for reducing disparities between stateless children and Thai children in the country. Additionally, the study addresses contemporary issues while the Thai government also has pledged to end statelessness by 2024.

Based on the literature review (Chapter 2), knowledge gaps were derived. Subsequently, the objectives of this thesis were set to be investigated. To this end, a rigorous methodology of this study has been presented in Chapter 3, including review of existing methods of quantitative analysis with observational data, and how to address the pitfalls of such data in healthcare settings.

Results are presented in the following chapters (Chapter 4 and Chapter 5) according to the objectives of this study. For instance, this study consists of these three objectives as follows. The first objective summarizes the health policies for the stateless populations in the 10 ASEAN countries (presented in Chapter 4). A scoping review was conducted to achieve the purpose of objective-1. The results suggest that none of the ten ASEAN countries have explicit health policies except Thailand while statelessness is a common problem, to some extent, in all these countries. It is

necessary to undertake appropriate health policy measures to address health issues of stateless people in the country. Based on lessons learned, the researcher recommends health policies for the stateless population as follows.

First, countries with a recognised prevalence of stateless population could reform their nationality and/or naturalization laws to reduce stateless population in the country. For instance, Vietnam, Lao PDR, Indonesia, and the Philippines have drastically reduced the number of stateless populations by reforming and implementing their nationality laws.

Second, although proper implementation of the reformed nationality laws and/or naturalization potentially eliminates statelessness in a given country, the whole process might take considerable time due to unprecedented obstacles and administrative barriers (e.g. stateless populations are stalled in Thailand). Given this scenario, countries with high prevalence of stateless populations could undertake interim decentralised healthcare policies for stateless populations like Thailand. As mentioned earlier the Thai MOPH introduced the HIPCP in 2010 for stateless population (which is managed by local providers) while the Thai government is committed to ending statelessness by 2024.

Third, having a policy may not ensure “right to health” of the vulnerable populations unless the effect of policy on the health of the target population is investigated empirically. As such empirical studies are warranted to generate new information on barriers and challenges of implementation of the national health policies leading to improving health status of stateless and undocumented populations in the country through ensuring the right to health.

The second objective assessed the impact of the HIPCP on healthcare service utilization by comparing the outcome (OP and IP use rates) among the uninsured, the HIPCP, and the UCS (presented in Chapter 5). Multivariate analysis was performed, using health facility-based data to serve the purpose of objective-2. The study revealed that compared with the UCS group, the HIPCP and the uninsured had significantly fewer OP visits. OP visit rates were similar between the HIPCP and the uninsured groups. Conversely, IP utilization rates and LOS were significantly higher among the HIPCP beneficiaries when compared with the UCS insurees. Lack of insurance was significantly associated with significantly lower utilization of both OP

and IP services as compared to the UCS. Subgroup analysis confirmed the robustness of the findings with the full model.

The third objective investigated whether diseases, and death were associated with the insurance status of children. A multivariate logistic regression analysis was performed using health facility-based data to achieve this objective. The study findings suggested that most diseases were common in all beneficiaries as out of 40 diseases only 10 diseases were found to be associated with insurance status using bivariate logistic model while multivariate analysis showed only three diseases were associated with the HIPCP. Figure 41 summarizes the study findings of quantitative analysis.

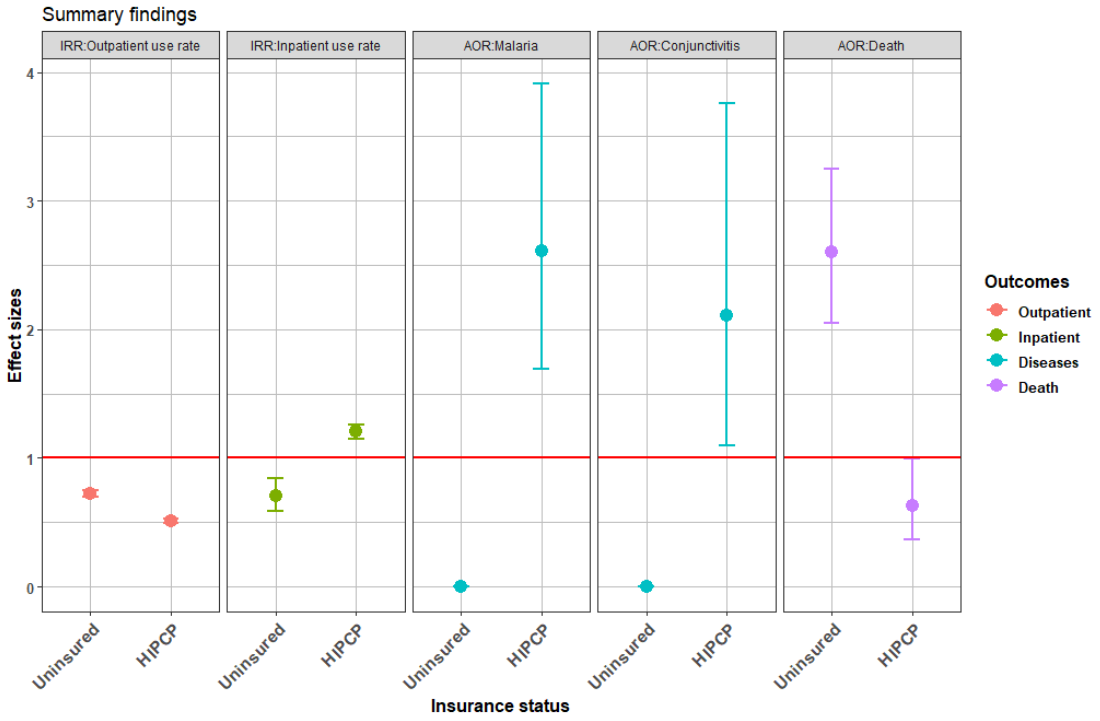


Figure 41 Summary results of quantitative analysis in terms of incidence rate ratio (IRR) and adjusted odds ratio (AOR)

Note: Horizontal red line indicates reference group (UCS) in which IRR or AOR equals one (IRR or AOR =1). UCS: Universal Coverage Scheme, HIPCP: Health Insurance for People with Citizenship Problems

However, subgroup analysis revealed that the HIPCP had greater odds of malaria and conjunctivitis than the UCS. Additionally, a lack of insurance was

associated with increased odds of death as compared to either the UCS or the HIPCP. The study also indicated that death was similar between the UCS and the HIPCP groups.

Policy recommendations

Following the key findings of the study, this sub-section presents key policy recommendations by study objectives. To this end, from a social determinants perspective, the recommendations are divided into two approaches: upstream and downstream policy interventions. The upstream-policy recommendations focus mainly on long-term political commitments of central government or policy makers in different relevant sectors, while the downstream-policy recommendations are more local government or local implementers in health sector. These frontline health workers of government (e.g. the MOPH in this case) routinely interacted with the service users (e.g. stateless patients in this case) in implementing the HIPCP policy. They have long lived experience and at times they use their discretionary power to implement a policy with necessary adaption of the original policy [15, 398]. These policy interventions may leverage reducing persisting health disparities among vulnerable populations (e.g. stateless and/or undocumented people) in the long-run. However, to adopt these practical recommendations in real-world, much more work needs to be done including empirical qualitative studies on feasibility, allocative efficiency and equity of these policy measures. Figure 42 illustrates links between findings in each objective of the thesis leading to policy recommendations, which potentially reduce health disparities among vulnerable populations.

Objective-1: Urging health policies for stateless populations in ASEAN countries

Key findings: Nine of the 10 ASEAN countries do not have explicit health insurance policies for stateless and undocumented populations living in respective countries. Only three countries (Indonesia, the Philippines, Thailand) have health policies for undocumented migrants in the country. All countries have universal birth registration policies except Singapore. All countries have ratified at least four of the

18 international human rights instruments including optional protocols to the conventions. The Philippines is the only country in ASEAN who has ratified the 1954 Convention relating to the status of stateless persons.

Upstream: ASEAN member states may adopt either of these three alternatives, which are not mutually exclusive:

(a) Commitment of ASEAN Member States to protect health of stateless people in respective state territory: The ASEAN Human Rights Declaration (AHRD) promotes "health for all" that mirrors the tenet of universal health coverage (UHC) [8, 194]. However, stateless populations are excluded from the UHC systems across ASEAN countries except Thailand while over 40% of the world's stateless persons currently reside in ASEAN Member States [248]. There might be several benefits, if ASEAN Members States commit to protect health of stateless people, as follows:

(i) Currently, ASEAN health cooperation is limited to disaster preparedness for natural disasters (e.g. typhoons, floods, drought, earthquakes, and volcanic eruption), and infectious disease outbreaks (e.g. SARS, COVID-19) [399, 400]. However, once committed, it will primarily address the health needs of stateless populations living in ASEAN countries (Chapter 4), as right to health and social justice are already enshrined in number of ASEAN legal instruments under these three community pillars: the APSC (ASEAN Political-Security Community), AEC (ASEAN Economic Community) and ASCC (ASEAN Socio-Cultural Community).

(ii) This will be in line with the ASCC Blueprint 2025, which will open a world of opportunities for an inclusive, sustainable, resilient, and dynamic ASEAN Community. For instance, an inclusive community that promotes high quality of life, equitable access to opportunities for all and promotes and protects human rights of women, children, youths, the elderly/older persons, persons with disabilities, migrant workers, and vulnerable and marginalised groups [400].

(iii) The ASEAN Members States can set a unique example for the rest of the world that the UHC could go beyond the health protection of nationals through inclusion of non-nationals (e.g. stateless populations) in the UHC systems [192, 401]. The proposed policy agenda (health protection of stateless people) should be

discussed in the ASEAN Health Minister's Meeting (AHMM), at which all regional health leaders meet every two years [399]. This policy agenda should also be discussed in the ASEAN Intergovernmental Commission on Human Rights (AICHR) forum at which all Governments Representatives meet bi-annually. Because the AICHR an overarching institution with overall responsibility for the promotion and protection of human rights in ASEAN [400].

(b) Domestication of the UN international human rights treaties: Upon ratification of UN treaties (discussed in Chapter 4), a state party should domesticate (if needed) the international human rights instruments pertinent to right to health for all people. Regarding ratification status, the Philippines is seemed to be the pioneer who ratified the highest number of international human rights laws, including optional protocols (15) followed by Cambodia (12), Thailand (12), Indonesia (10), Vietnam (9), Lao PDR (8), Malaysia (5), Myanmar (5), Singapore (5), and Brunei (4). Six of the nine core human rights treaties are related to right to health [269] and only three ASEAN countries: Cambodia, Indonesia, and the Philippines, have ratified all core international human rights instruments recognizing the "right to health" including the 1966 International Convention on the Elimination of All Forms of Racial Discrimination (ICERD 1966), the 1966 International Covenant on Economic, Social and Cultural Rights (ICESCR 1966), the 1979 Convention on the Elimination of All Forms of Discrimination against Women (CEDAW 1979), the 1989 Convention on the Rights of the Child (CRC 1989), the 1990 International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (ICMW 1990), and the 2006 Convention on the Rights of Persons with Disabilities (CRPD 2006) [230, 269]. Therefore, the ASEAN members should ensure the enjoyment of the highest attainable standard of health without any discrimination leading to shrinking disparities in health outcomes between stateless populations and the citizens living in respective countries.

(c) Implementation of the UN global action plan to end statelessness by 2024: The UNHCR's has been promoting 10 actions to end statelessness since 2014, which are:(i) resolve existing major situations of statelessness, (ii) ensure that no child is born stateless, (iii) remove gender discrimination from nationality laws, (iv) prevent denial, loss or deprivation of nationality on discriminatory grounds, (v) prevent

statelessness in cases of State succession, (vi) grant protection status to stateless migrants and facilitate their naturalization, (vii) ensure birth registration for the prevention of statelessness, (viii) issue nationality documentation to those with entitlement to it, (ix) accede to the UN Statelessness Conventions, (x) improve quantitative and qualitative data on stateless populations [402]. These actions are based on the standards contained in the international treaties. For instance, actions 1st and 6th are based to the 1954 convention relating to the status of stateless persons (Article 32): "the Contracting States shall as far as possible facilitate the assimilation and naturalization of stateless persons. They shall in particular make every effort to expedite naturalization proceedings and to reduce as far as possible the charges and costs of such proceedings". Similarly, actions 2nd, and 4-5th are based on the 1961 convention on the reduction of statelessness [402]. More importantly, most of these actions (e.g. i to viii) are based on the ASEAN Human Rights Declaration (Article 18): "Every person has the right to a nationality as prescribed by law. No person shall be arbitrarily deprived of such nationality nor denied the right to change that nationality" [403]. It turns out that ASEAN member states are committed to end statelessness. However, AHRD itself has been criticized by ASEAN civil society and international human rights organizations [404, 405]. Nevertheless, there are some good practice such as amendment of nationality law, acquisition of nationality through naturalization, and birth registration [231, 406].

Objective-2: Improving access to healthcare services among stateless people in Thailand

Key findings: Despite having health policy for stateless people in the country, the study found health disparities in terms of healthcare service utilization among stateless beneficiaries compared with the UCS beneficiaries (this group is assumed to be the standard user of healthcare services). It turns out that having a health insurance does not necessarily increase utilization and create more pressure on the Thai healthcare systems in terms of number of visits (Chapter 5). To address this, following downstream policy recommendations are suggested.

Downstream: (a) Fee waiver for undocumented and uninsured patients: The finding of this study shows that the uninsured are more likely to suffer high cost chronic disease (e.g. renal failure) compared with the UCS beneficiaries. Financial barriers could be a potential burden for them access to care. Additionally, high cost treatment such as renal failure or end stage kidney disease is not included in the benefit package of the HICS that may have adverse impact on HICS enrolees let alone uninsured. Previous studies show that the HIPCP patients and uninsured visit a facility at a more advanced stage of disease [5]. Such a situation might consume more healthcare resources than insuring all undocumented people regardless of their legal status in the country, and promoting access to treatment as soon as possible [15].

Regarding the insurance design for non-Thais, the HICS was launched to cover low-skilled or cross-border migrant workers in the informal sector and their dependants in Thailand. Upon registration with the MOI, potential beneficiaries are permitted to buy the insurance card, which must be renewed every year. It turns out that HICS beneficiaries generally pay excise tax like Thai citizens. On the other hand, both the HIPCP and UCS are financed by general tax. However, unlike HIPCP, the benefit package of HICS does not include high-cost treatments such as renal replacement therapy for chronic renal failure. Therefore, it is reasonable to include renal replacement therapy (RRT) in HICS. In the same time, this would promote equity across these three schemes: UCS, HICS, and HIPCP. So, this thesis suggests for a fee waiver for uninsured at least for high cost diseases (e.g. chronic kidney disease).

(b) Expansion of Legal Aid Clinic to support stateless and undocumented people: Lack of a birth registration document of a stateless person, stating Thai nationality, is the main problem in Thailand. Although some ethnic minority groups (collectively known as hill-tribe) have been in residing Thailand for decades, a lack of birth registration or having a 13-digit national identification number is a great challenge for them to acquire Thai nationality. Additionally, despite amendment of Thai Nationality Act, most stateless and undocumented people are not aware about the process of acquiring Thai nationality through civil registration. To address this, a Legal Aid Clinic unit was installed in each of five district hospitals in Tak Province: (i) Mae Sot Legal Clinic in Mae Sot Hospital, (ii) Phop Phra Legal Clinic in Phop

Phra Hospital, (iii) Mae Ramat Legal Clinic in Mae Ramat Hospital, (iv) Tha Song Yang Legal Clinic in Tha Song Yang Hospital, and (v) Umphang Legal Clinic in Umphang Hospital. The legal clinic provides information and legal aid relating to acquisition of nationality, including by naturalization, counselling on nationality related questions including acquisition process of nationality, legal support on ad hoc basis, and capacity building for stateless communities at local level (UNHCR, 2018).

Additionally, hospital's legal clinic issues 'delivery certificate' for newborns which is a critical document for civil registration with the MOI. The Legal Clinic is strategically installed in district hospitals so that babies born in those hospitals get birth registration opportunity right away. According to Thai law "every child shall be registered immediately after birth and shall have a name." So, Phop Phra hospital issues a 'delivery certificate' in prescribed form which called Tor Ror 3 for non-Thais, and Tor Ror 1/1 for Thais. This delivery certificate issued by public hospitals and clinics is considered an official document, which serves two purposes: first, as a record for the parents or guardians, and second, for the institution of birth (public hospitals and clinics.

Therefore, the Department of Provincial Administration (DOPA) considers a delivery certificate serves solely as "evidence for confirming the birth of a child, but not declaring or registering the birth." Therefore, it is clear that the delivery certificate outlined in Tor Ror 3 is not birth registration per se, but rather fundamental evidence to prove the birth and location of the birth. The delivery certificate, however, can be used to initiate the next step in the birth registration process leading to nationality (Informal discussion). Therefore, this thesis suggests the expansion of a legal aid clinic unit in each of nine districts of Tak Province to expedite to end of statelessness in the country.

(c) Using bilingual staff for interaction between clinician-patient: A previous domestic study shows that migrant-friendly services improve access to healthcare for all migrants regardless of insurance coverage. These migrant-friendly services include the use of migrant volunteer community health workers, mobile clinics for migrant communities, bilingual signposts and notice boards (e.g. in Thai and Burmese) at health facilities. For instance, the researcher came to know that from informal discussion with management team that most of the cross-border migrants

from Myanmar in Thailand frequently visit the Mae Tao Clinic (MTC), which a community based private clinic in Mae Sot District of Tak Province. This is not necessarily due to subsidised quality health services but most of the health staff at MTC speak both Thai and Burmese which is comfortable for patients who speak any of those languages. The MTC also has smooth referral system that facilitates a non-Thai patient to seek care at a provincial hospital (Informal discussion). Similar idea can be adopted through engaging stateless persons as community health worker. They may also act as cultural mediators in the community/village level, where stateless are mostly concentrated, to provide health promotion and disease prevention services leading to reduce high cost and preventable infectious diseases like malaria and conjunctivitis. Thus, using a bilingual staff may improve patient-centred quality healthcare service followed by standard/adequate utilization of healthcare service among stateless populations in the country.

Objective-3: Improving health outcomes among stateless populations in Thailand

Key findings: The present study shows that the HIPCP are more likely to have infectious diseases (e.g. malaria, conjunctivitis) while lack of insurance were associated with increased risk of death compared with the UCS beneficiaries (Chapter 5). As such, following policy recommendations are suggested to local implementers.

Downstream: (a) Increase effort on disease prevention activities among stateless populations: A domestic study by Yingtaweesak et al. showed that the accessibility to health care services at primary health care posts in rural and remote areas of Tha Song Yang District in Tak Province was not good. They reported that the indirect cost of health care utilization was substantially high for Karen people in Tha Song Yang District. It takes more than 30 minutes, and more than two hours to travel from home to the nearest primary healthcare post, and home to the nearest hospital respectively. In both cases travel time is even more in the rainy season than in the dry season [407]. It is highly likely that the stateless children, living in rural remote area, would have missed routine immunization and early detection of infectious diseases (e.g. malaria), especially in remote areas of Umphang District. This situation may put stateless people at risk of having vaccine preventable infectious diseases while

vaccination is cost effective in terms of quality adjusted life-years gained [408] or disability-adjusted life year (DALY) averted in Thailand [409]. So, the MOPH should emphasize on vaccine preventable infectious disease through raising awareness at community level where stateless and undocumented people are concentrated in rural and remote area (e.g. Umphang, Phop Phra). Implementation of this policy may reduce high cost inpatient care among stateless people.

(b) Recruitment of stateless persons in official post at health facilities: While the number of health-professional posts is based on the size of the registered population in a given area, a large number of stateless people are not registered. As a result, despite greater concentration of stateless people in a given area, it difficult for a hospital to hire health staff to provide services for stateless people. In other words, those hospitals often suffer from understaffing. To address this, currently, some hospitals hire stateless people or non-Thai ethnic group members to serve as interpreters and cultural mediators in local communities. However, this initiative is against government regulation (e.g. civil servant posts must hold Thai nationality) as well as unsustainable [4]. Thus, this thesis suggest that the Thai Civil Service may allow health facilities recruiting stateless people for official posts to serve stateless people. Given the ethnic diversity among stateless people, the recruited staff may also act as a bilingual interpreter during interaction between clinician and stateless patients.

(c) Prioritizing the services to those who are really in need: The predisposing factors, such as heredity, age, gender, environment, and lifestyle, can have a larger impact on health than medical care itself [410]. As such, it is important to prioritize the services to those who really in need leading to improving health and reducing disparities among vulnerable populations such as stateless. The present study revealed that biological factors (age and sex of children) and geographical factors (domicile of children) were associated with health outcomes (presence of cases with diseases and death) (Chapter 5 and 6). Infectious diseases (e.g. malaria, respiratory, and renal diseases) are higher among younger children especially children aged 2-5 years while children living in Umphang District are at greater risk of malaria as well as death compared to children living in Mae Ramat District. (Table 36).

Table 36 Significant social determinants (predisposing factors) of health outcomes (increased risks compiled from multivariate analyses)

Predisposing factors	Malaria	Conjunc-tivitis	AURI	Pneum-onia	Bron-chitis	Renal failure	UTI	Death
Individual determinants								
Age group (2-3 years)	⇑	⇑	⇑	⇑	⇑		⇑	
Age group (4-5 years)	⇑	⇑	⇑			⇑	⇑	
Age group (6-10 years)	⇑					⇑	⇑	
Age group (11-15 years)	⇑					⇑	⇑	
Sex (Female)							⇑	
Geographic determinants								
Living in Phop Phra								⇑
Living in Tha Song Yang								⇑
Living in Umphang	⇑							⇑

Note: Upward arrows indicate significant increased risk compared to reference group

The researcher was informed that parents do not bring their kids to the health center for routine vaccination as they keep busy with farming activities for their livelihoods. As a result, full immunization rate (who received five doses of vaccine) has been reduced in the border area (Informal discussion). This lower immunization might increase the chance of preventable infectious diseases among the residents including migrants and stateless people. So, local providers should increase effort on disease prevention activities at community levels. If underprivileged populations such as hill-tribes and aliens are sick and left untreated it is likely that the disease would be transmitted to Thais. From philanthropic point of view, the local providers should take spontaneous precautionary measures to ensure border health security through protecting health of vulnerable people such as stateless and undocumented people.

Additionally, the local providers could screen the patients empathetically (‘whole person’ point of view) rather than merely look at diagnosis report to identify root causes of diseases. Local providers should advocate for the vulnerable patients linking them to the appropriate government or non-government programmes available

in respective communities (e.g. health literacy, livelihood training, early childhood development etc.).

Finally, telemedicine technology can be adapted to increase access to care among vulnerable people living rural and remote area [411]. Note that both Phop Phra and Umphang are rural and remote areas which are relatively inaccessible, especially in the rainy season. Stateless health workers can be trained and equipped with mobile device (cell phone or tablet with high speed internet connection). As telemedicine technology has been growing, it can be used to overcome health disparities through delivering higher-quality health care to patients in remote locations [412].

All aforementioned policy measures at downstream level (e.g. local implementers) may improve access to care among stateless population leading to improve service utilization and health outcomes in the short-term and reduce health disparities in the long-run (Figure 42).

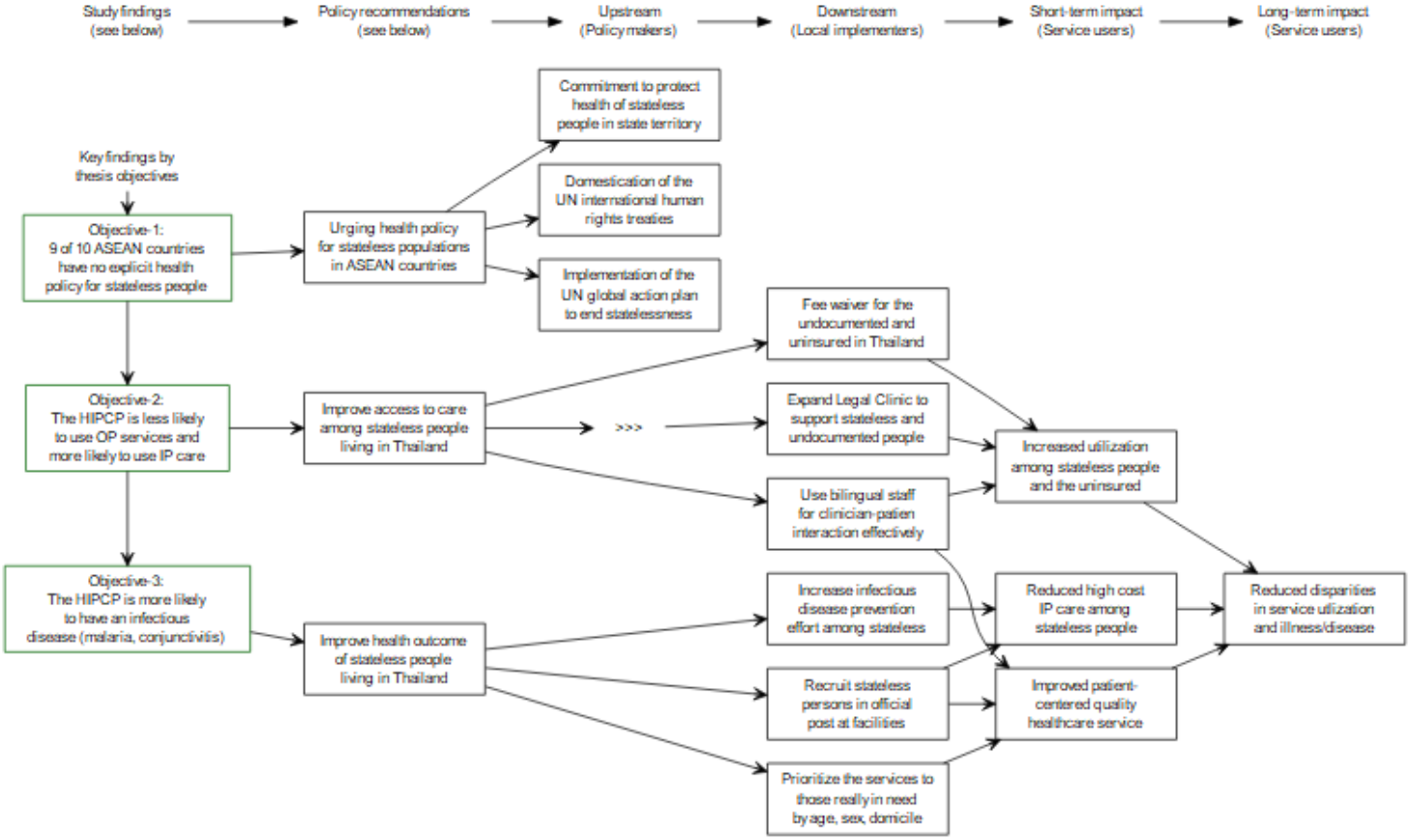


Figure 42 Illustration of links between findings in each objective of the thesis leading to policy recommendations

Recommendations for future research priorities

- Although, this study has explained some results based on the existing literature, it was difficult to assess the validity of these explanations in depth since the study lacked data of stateless children who did not show up at selected health facilities. Future studies are required to corroborate the findings of this study using household level primary data.
- Further studies are required for deeper understanding of the causal effect of the HIPCP to overcome the limitations of this observational study. For instance, future primary research should incorporate more confounding factors, that would maximize the homogeneity between the groups, (e.g. socioeconomic indicators: age, ethnicity, parental education, occupation of parents, income of parents of children), healthcare use factors (e.g. essential immunization, access to healthcare), and health-seeking behaviour (e.g. formal care, informal care, self-treatment) of the target population when they have fallen sick, to overcome the limitations of this study.
- Although the differences in utilizations and disease outcomes associated with the HIPCP were significant even after controlling for potential confounders, it is unclear whether these differences might be due to variations in other socio-demographic and health characteristics of the population, which need further investigation.
- Empirical qualitative study should interview the frontline heath workers/implementers such as community health workers, directors at sub-district health promotion hospitals and district hospital, and provincial hospital.
- Ecological study is needed to explore the impact of having legal aid clinic on the improvement of health status stateless people and reduction of statelessness.
- Research on the effectiveness of potential of new infrastructure management system of the HIPCP: Currently, the Health Insurance Group (HIG) of the MOPH is responsible for managing the HIPCP scheme. The HIG's main duties are collecting patient information from provincial health offices on a regular basis and providing documents for policy makers on request. However,

the HIG is not used to deal with a large volumes of routine data which as was not originally designed for managing the HIPCP scheme. In addition, as the policy governing body mandated by the MOPH, the HIG has limited technical and human-resource capacities (e.g. only 7-10 staff to manage over 1.5 million beneficiaries) [15].

It is clear that the HIG encounters a number of constraints in managing the HIPCP due to its bureaucratic structure and limited managerial capacity. To make the stewardship of the HIPCP more effective, the NHSO may be proposed as the HIPCP's governing body. The capacity and feasibility of the NHSO to manage the HIPCP are as follows: (a) Unlike HIG, the NHSO has established strong institutional capacity in terms of funding, technology, and skilled human resources. (b) The UCS beneficiary data are linked with the MOI data via the 13-digit ID. This means stateless registration for residence permit/profile registration (e.g. Tor Ror 38kor) and issuance of 13-digit occur simultaneously, and a stateless person will be automatically insured. It will expedite nationality verification process leading to access to stateless insurance. (c) Unlike the HIG, the NHSO has its own information unit for collecting and analysing UCS service data from health facilities and uses it to adjust its annual budget. (d) Additionally, the analysed service data is regularly returned to local health facilities to help them reflect on their performance. (e) The benefit packages, purchasing mechanisms, and source of financing (general tax-based) of the UCS and the HIPCP are quite similar. So, there will be no additional task to be worked out once taken over responsibilities. One potential challenge would be a demand for strong political commitment to overcome political tensions between the MOPH and the NHSO. An extensive bureaucratic reform is required which is quite uncertain [4, 15].

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APPENDICES

ABBREVIATIONS

ACSC	=	Ambulatory Case Sensitive Condition
ANC	=	Antenatal Care
AOR	=	Adjusted Odds Ratio
ART	=	Antiretroviral Therapy
ASEAN	=	Association of Southeast Asian Nations
AURI	=	Acute Upper Respiratory Infection
BHA	=	Bureau of Health Administration
BOI	=	Board of Investment
BORA	=	Bureau of Registration Administration
BPS	=	Bureau of Policy and Strategy
CBHI	=	Community Based Health Insurance
CAT	=	Convention against Torture and Other Cruel, Inhumane or Degrading Treatment or Punishment
CEDAW	=	Convention on the Elimination of All Forms of Discrimination against Women
CERD	=	International Convention on the Elimination of All Forms of Racial Discrimination
CI	=	Confidence Interval
CNS	=	Central Nervous System
CRC	=	Convention on the Rights of the Child
CSMBS	=	Civil Servant Medical Benefit Scheme
DID	=	Difference-in-Difference
DM	=	Diabetes Mellitus
DOE	=	Department of Employment
DOPA	=	Department of Provincial Administration
DRG	=	Diagnostic Related Groups
EPI	=	Extended Programme on Immunisation
ESRD	=	End-stage Renal Disease
GDP	=	Gross Domestic Product
GGHE	=	General Government Health Expenditure
GLM	=	Generalised Linear Model
GNI	=	Gross National Income
HIPCP	=	Health Insurance for People with Citizenship Problems
HIC	=	High Income Country
HICS	=	Health Insurance Card Scheme
HIG	=	Health Insurance Group
HISO	=	Health Information System Development Office

HN	=	Hospital Number
HOSPCODE	=	Hospital Identification Code
HPSR	=	Health Policy and System Research
HR	=	Hazard Ratio
HSRI	=	Health System Research Institute
ICCPR	=	International Covenant on Civil and Political Rights
ICD10 TM	=	International Classification of Diseases version 10 Thailand Modification
ID	=	Identification Number
ICESCR	=	International Covenant on Economic, Social, and Cultural Rights
ILO	=	International Labour Organization
IOM	=	International Organization for Migration
IP	=	Inpatient
IQR	=	Interquartile Range
IRR	=	Incidence Rate Ratio
IV	=	Instrumental Variable
LICS	=	Low Income Card Scheme
LR	=	Likelihood Ratio
LRT	=	Likelihood Ratio Test
MeSH	=	Medical Subject Headings
MICT	=	Ministry of Information and Communication Technology
MOE	=	Ministry of Education
MOF	=	Ministry of Finance
MOFA	=	Ministry of Foreign Affairs
MOI	=	Ministry of Interior
MOL	=	Ministry of Labour
MOPH	=	Ministry of Public Health
MTC	=	Mae Tao Clinic
NCD	=	Non-Communicable Diseases
NCPO	=	National Council for Peace and Order
NESDP	=	National Economic and Social Development Plan
NGO	=	Non-government organisation
NHSO	=	National Health Security Office
NSC	=	National Security Council
NSO	=	National Statistical Office
NU	=	Naresuan University
NV	=	Nationality Verification
NB	=	Negative Binomial
OECD	=	Organization for Economic Co-operation and Development

OFWA	=	Office of Foreign Workers Administration
OHCHR	=	Office of the High Commissioner for Human Rights (United Nations)
OLS	=	Ordinary Least Square
OOP	=	Out-of-pocket Payment
OP	=	Outpatient
OPS	=	Office of the Permanent Secretary
OR	=	Odds Ratio
OSS	=	One Stop Service
PBC	=	Performance-based Contracting
PCMO	=	Provincial Chief Medical Officer
PDRC	=	People's Democratic Reform Committee
PID	=	Personal Identification Number
PPHO	=	Provincial Public Health Office
PNC	=	Postnatal Care
RCT	=	Randomised Controlled Trial
SD	=	Standard Deviation
SE	=	Standard Error
SEA	=	South East Asia
SHI	=	Social Health Insurance
SSO	=	Social Security Office
SSS	=	Social Security Scheme
STD	=	Sexually Transmitted Disease
TAVI	=	Traffic Accident Victim Insurance (Traffic Insurance)
TB	=	Tuberculosis
TIP	=	Trafficking in Persons
TMC	=	Thai Medical Council
UCS	=	Universal Coverage Scheme
UDHR	=	Universal Declaration of Human Rights
UHC	=	Universal Health Coverage
UNGA	=	United Nations General Assembly
UNICEF	=	United Nations International Children’s Emergency Fund
UNHCR	=	United Nations High Commissioner for Refugees
UNDESA	=	United Nations Department of Economic and Social Affairs
UTI	=	Urinary Tract Infection
VHCS	=	Voluntary Health Card Scheme
WHO	=	World Health Organization

Currency equivalents

US Dollar (USD) 1.00 = 29.76 Thai Baht (THB) (As of 1 January 2020)

APPENDIX A Name of facilities by district and corresponding codes used in this study

District	##	Code - Name of service	Level of facility
Mae Ramat	1	07320 - Ban San Pa Rai Sub District Health Promotion Hospital	Sub-district HC
	2	07321 - Ban Wang Pha Sub District Health Promotion Hospital, Mae Charao Sub-district	Sub-district HC
	3	07322 - Chaloem Phra Kiat Health Center 60 Phansa Nawaminthawee, Tak Province (SRT)	Sub-district HC
	4	07323 - Ban Huai Bong Sub District Health Promotion Hospital	Sub-district HC
	5	07324 - Ban Khane Chue Sub District Health Promotion Hospital, Khane Chue Sub-district	Sub-district HC
	6	07325 - Ban Mae Ramat Sub District Health Promotion Hospital, Khane Chue Sub-district	Sub-district HC
	7	07326 - Ban Kham Wan Sub District Health Promotion Hospital, Mae Aw Sub-district	Sub-district HC
	8	07327 - Ban Samae Sub-district, Sam Muen Sub District Health Promotion Hospital	Sub-district HC
	9	10564 - Ban Huay Sin Community Health Services	Village HC
	10	10566 - Ban Huai Pong Community Health Service	Village HC
	11	10568 - Ban Phae Hae Community Health Service	Village HC
	12	10569 - Ban Khun Huai Mae Tho Community Health Services	Village HC
	13	11240 - Mae Ramat Hospital	District Hospital
	14	14042 - Ban Nong Luang Sub District Health Promotion Hospital, Sam Muen Sub-district	Sub-district HC
	15	14043 - Ban Thung Makham Pom Health Promoting Hospital, Phra That Sub-district	Sub-district HC
	16	14127 - Ban Huai Krathing Community Health Service	Village HC
Tha Song Yang	1	07328 - Tha Song Yang Sub District Health Promotion Hospital	Sub-district HC
	2	07329 - Mae Song Sub District Health Promotion Hospital	Sub-district HC
	3	07330 - Ban Mae Rameng Sub District Health Promotion Hospital, Mae Song Sub-district	Sub-district HC
	4	07331 - Mae La Sub District Health Promotion Hospital	Sub-district HC
	5	07332 - Mae Wa Luang Sub District Health Promotion Hospital	Sub-district HC
	6	10571 - Ban Mae Wei Health Promotion Hospital	Sub-district HC
	7	10574 - Ban Mae Song Noi Community Health Service	Village HC

District	##	Code - Name of service	Level of facility
	8	10578 - Ban Tapo Pu Grand Community Health Service	Village HC
	9	10580 - Ban Tikkee Community Health Service	Village HC
	10	10581 - Ban Mae Nil Community Health Services	Village HC
	11	10583 - Ban Klaidee Kae Community Health Service	Village HC
	12	10586 - Ban Mae Ok Pha Ra Sub District Health Promotion Hospital, Mae La Sub-district	Sub-district HC
	13	10587 - Ban Ka Ma Phado Health Promotion Hospital	Sub-district HC
	14	10588 - Ban Thi Chuea Loi Community Health Service	Village HC
	15	10589 - Ban Sok Khae Raka Community Health Service	Village HC
	16	11241 - Tha Song Yang Hospital	District Hospital
	17	14044 - Ban Huai Nok Kok Sub District Health Promotion Hospital, Mae La Sub-district	Sub-district HC
Phop Phra	1	07354 - Ban Soo Sub District Health Promotion Hospital, Chong Khaep Sub-district	Sub-district HC
	2	07355 - Chong Khaep Sub District Health Promotion Hospital	Sub-district HC
	3	07356 - Ban Rom Klao 4 Health Promoting Hospital, Khiri Rat Sub-district	Sub-district HC
	4	07357 - Ban Chibaba Sub District Health Promotion Hospital Khiri Rat Sub-district	Sub-district HC
	5	07358 - Ban Rom Klao 1 Health Promoting Hospital, Khiri Rat Sub-district	Sub-district HC
	6	07359 - Ban Wale Sub District Health Promotion Hospital, Wale Sub-district	Sub-district HC
	7	07360 - Ban Ruam Thai Phatthana Subdistrict Health Promotion Hospital, 16 Wale Subdistrict	Sub-district HC
	8	07361 - Ban Ruam Thai Phatthana Sub-district Health Promotion Hospital No.1, Ruam Thai Phatthana Sub-district	Sub-district HC
	9	07362 - Ban Ruam Thai Phatthana Subdistrict Health Promotion Hospital 6, Ruam Thai Phatthana Sub-district	Sub-district HC
	10	10597 - Ban Pa Kha Mai Community Health Service	Village HC
	11	10598 - Ban Pa Kha Kao Community Health Service Center	Sub-district HC
	12	10599 - Ban Ya Pho Sub District Health Promotion Hospital, Wale Sub-district	Sub-district HC
	13	11242 - Phop Phra Hospital	District Hospital
	14	14045 - Ban Rom Klao Sahamit Tambon Health Promotion Hospital Khiri Rat Sub-district	Sub-district HC

District	##	Code - Name of service	Level of facility
	15	14128 - Ban Mai Sam Yot Doi Community Health Service Center	Village HC
	16	14129 - Ban Sap Anan 18 Community Health Service	Village HC
Umphang	1	11238 - Ban Tak Hospital	Sub-district HC
	2	11239 - Sam Ngao Hospital	Sub-district HC
	3	11240 - Mae Ramat Hospital	Sub-district HC
	4	11241 - Tha Song Yang Hospital	Sub-district HC
	5	11242 - Phop Phra Hospital	Sub-district HC
	6	11243 - Umphang Hospital	District Hospital
	7	27443 - Wang Chao Hospital	Sub-district HC

APPENDIX B Detail codes of insurance type, label, and exposure variable

Code	Code label	Status	Exposure
0100	Universal health insurance	UCS	2
2401	Officials of the Subdistrict Administration Organization	CSMBS	Dropped
2801	Political officials, subdistrict administrative organizations	CSMB	Dropped
4200	Social Security Fund	SSS	Dropped
5100	Private health insurance	Private	Dropped
6100	Car victims fund	Traffic	Dropped
7100	Employees / Officials or workers under the Constitution	CSMBS	Dropped
8200	Rights that the hospital provides help	Uninsured	0
8300	Individuals with payment status problems themselves	Stateless	1
8301	Persons with citizenship status problems and exercising rights under the project of the Ministry of Public Health	Stateless	1
8302	People with citizenship status problems full payment	Stateless	1
8308	People with citizenship status problems use other rights	Stateless	1
8400	Individuals with alien rights pay themselves	Uninsured	0
8401	The alien population entering the city is legal and right to buy health insurance with the Ministry of Public Health	Uninsured	0
8405	The alien population entering the city is not legal but can buy health insurance with the Ministry of Public Health	Uninsured	0
8406	The alien population entering the city is not legal and can pay some medical expenses themselves	Uninsured	0
9100	Own out-of-pocket payment	Uninsured	0

Source: Provincial Public Health Office (PPHO)

APPENDIX C Explanation of first digit of 13-digit national identification number given by the Ministry of Interior in Thailand

1st digit	Citizen	Description	Insurance
1	Thai	The person who was born before January 1st, 1984 and has Thai nationality.	UCS
2	Thai	The person who was born after January 1st, 1984 and has Thai nationality.	UCS
0	Non-Thai	The group with rights and citizenship problems that has been surveyed and registered with the Ministry of Interior (MOI). This group includes (i) students in educational institutions that receive government benefits from education and their type of registration is Thor. Ror. 38 Kor.; (ii) a group of rootless children who are orphaned or abandoned that have been left in Thailand while their families live outside of the country; (iii) a group of people who have benefited the country and their registration type is Thor. Ror 38.	Stateless
3	Non-Thai	Thai people and foreigners with alien identification cards and have Thor Ror 14 type house registration during 1st January – 31st May 1984. They entered the city legally and have permanent residence rights (Immigration Act BE 2552).	Uninsured
4	Non-Thai	Thai people and foreigners with alien certificates who had no identification number in the initial period (1st January – 31st May 1984). They entered the city legally and have permanent residence rights (Immigration Act BE 2552). They have permanent residency with Thor.Ror.14.	Uninsured
5	Non-Thai	The aliens who entered the city legally and have permanent residence rights and added their name to register before 22nd March 1992. Their registration type is Thor. Ror.14. Their naturalization process is being done.	Uninsured
6	Non-Thai	The foreigners entering the city legally and living in a temporary manner in Thailand. They are under the Immigration Act BE 2522 (1979) (M. 12, 13, 34,35)	Uninsured
		The foreigners entering the country illegally and holding the type of registration, Tor. Ror 13. They are under the Immigration BE 2522 (1979) (M.17)	Uninsured
7	Non-Thai	The alien child who entered the city legally and living in a temporary manner in Thailand. They are under the Immigration Act BE 2522 (1979) (M. 12, 13, 34,35). Or, they are illegal immigrant children born in Thailand and holding the type of registration, Tor. Ror 13. They are under the Immigration BE 2522 (1979) (M.17)	Uninsured
8	Non-Thai	The aliens entered the city legally and have the right to live permanently, added their names in the register after 22nd March 1992. They hold Thor Ror. 14 registration ID.	Uninsured

Note: Most Thai citizens reportedly have No. 3 on the first digit of 13-digit national identification number

Source: Author compiled from the meaning of the 13-digit identification number (http://stat.bora.dopa.go.th/fop/pid13.htm) and Thailand e-Government (https://www.egov.go.th/th/content/817/78/)

APPENDIX D Distribution of outpatient utilization rate (visits/person/year) by covariates (age group, sex, facility level, domicile, and year of op visits)

AGE GROUP

Visits/ person/ year	0-1 year (n=33011)	2-3 years (n=34298)	4-5 years (n=38138)	6-10 years (n=59594)	11-15 years (n=52956)	p-value	test
Mean (SD)	4.34 (3.73)	4.85 (4.32)	4.03 (3.52)	2.76 (2.32)	2.21 (1.96)	<0.001	ANOVA
Median [IQR]	3.00 [2, 6]	3.00 [1, 7]	3.00 [1, 6]	2.00 [1, 4]	2.00 [1, 3]	<0.001	Kruskal-Wallis

AGE GROUP: STATUS

Age_group	Status	Mean (Visits/ person/year)	df	F-statistic	P-value
0-1 year	Uninsured	2.857	14	1693.435	<0.001
0-1 year	Stateless	2.355			
0-1 year	UCS	4.391			
2-3 years	Uninsured	3.326			
2-3 years	Stateless	1.490			
2-3 years	UCS	4.893			
4-5 years	Uninsured	2.538			
4-5 years	Stateless	1.581			
4-5 years	UCS	4.061			
6-10 years	Uninsured	2.132			
6-10 years	Stateless	2.113			
6-10 years	UCS	2.766			
11-15 years	Uninsured	1.779			
11-15 years	Stateless	1.626			
11-15 years	UCS	2.221			

SEX

Visits/person/year	Male (n=110304)	Female (107693)	p-value	test
Mean (SD)	3.45 (3.33)	3.37 (3.18)	<0.001	ANOVA
Median [IQR]	2.00 [1, 4]	2.00 [1, 4]	0.005	Kruskal-Wallis

SEX: STATUS

Sex	Status	Mean (Visits/ person/year)	df	F-statistic	P-value
Male	Uninsured	2.276	5	149.448	<0.001
Male	Stateless	1.864			
Male	UCS	3.482			
Female	Uninsured	2.331			
Female	Stateless	1.920			

Sex	Status	Mean (Visits/ person/year)	df	F-statistic	P-value
Female	UCS	3.397			

FACILITY LEVEL

Visits/ person/ year	District Hospitals (n= 19392)	Health Center (n=198605)	p-value	test
Mean (SD)	1.73 (1.13)	3.58 (3.35)	<0.001	ANOVA
Median [IQR]	1.00 [1, 2]	2.00 [2, 5]	<0.001	Kruskal-Wallis

FACILITY LEVEL: STATUS

Facility level	Status	Mean (Visits/ person/year)	df	F-statistic	P-value
District Hospital	Uninsured	1.372	5	1230.88	<0.001
District Hospital	Stateless	1.766			
District Hospital	UCS	1.732			
Health Center	Uninsured	2.415			
Health Center	Stateless	2.550			
Health Center	UCS	3.592			

DOMICILE

Visits/ person/ year	Mae Ramat (n= 57311)	Tha Song Yang (56283)	Phop Phra (n=73673)	Umphang (n=30730)	p-value	test
Mean (SD)	3.56 (3.31)	3.59 (3.41)	3.31 (3.22)	3.06 (2.88)	<0.001	ANOVA
Median [IQR]	2.00 [1, 5]	2.00 [1, 5]	2.00 [1, 4]	2.00 [1, 4]	<0.001	Kruskal-Wallis

DOMICILE: STATUS

Domicile	Status	Mean (Visits/ person/year)	df	F-statistic	P-value
Mae Ramat	Uninsured	2.351	11	127.2078	<0.001
Mae Ramat	Stateless	1.992			
Mae Ramat	UCS	3.595			
Phop Phra	Uninsured	2.218			
Phop Phra	Stateless	1.531			
Phop Phra	UCS	3.602			
Tha Song Yang	Uninsured	2.262			
Tha Song Yang	Stateless	1.694			
Tha Song Yang	UCS	3.336			

Domicile	Status	Mean (Visits/ person/year)	df	F-statistic	P-value
Umphang	Uninsured	2.470			
Umphang	Stateless	1.934			
Umphang	UCS	3.0934			

YEAR OF OP VISIT

Visits/ person/ year	2013 (n=41958)	2014 (n=47261)	2015 (n=44921)	2016 (n=43450)	2017 (n=40407)	p-value	test
Mean (SD)	3.24 (3.08)	3.66 (3.43)	3.43 (3.34)	3.46 (3.32)	3.24 (3.03)	<0.001	ANOVA
Median [IQR]	2.00 [1, 4]	2.00 [1, 5]	2.00 [1, 4]	2.00 [2, 5]	2.00 [1, 4]	<0.001	Kruskal-Wallis

YEAR: STATUS

Year	Status	Mean (Visits/person/year)	df	F-statistic	P-value
2013	Uninsured	2.180			
2013	Stateless	2.067			
2013	UCS	3.262			
2014	Uninsured	2.320			
2014	Stateless	2.203			
2014	UCS	3.690			
2015	Uninsured	2.414			
2015	Stateless	1.823	14	88.930	<0.001
2015	UCS	3.453			
2016	Uninsured	2.360			
2016	Stateless	1.500			
2016	UCS	3.486			
2017	Uninsured	2.236			
2017	Stateless	1.718			
2017	UCS	3.267			

Results in incidence rate ratio (IRR) from Negative Binomial regression model with insurance and age group interactions

Variables	IRR [95% CI]	p
Insurance (vs UCS)		
Uninsured	0.66 [0.60, 0.72]	<0.001
HIPCP	0.54 [0.50, 0.58]	<0.001
Age group (vs 0-1 year)		
2-3 years	1.05 [1.04, 1.07]	<0.001
4-5 years	0.86 [0.85, 0.87]	<0.001
6-10 years	0.59 [0.58, 0.59]	<0.001
11-15 years	0.46 [0.46, 0.47]	<0.001
Sex (vs Male)		

Female	0.99 [0.99, 1.00]	0.062
Domicile (vs Mae Ramat)		
Phop Phra	0.97 [0.96, 0.98]	<0.001
Tha Song Yang	0.93 [0.92, 0.94]	<0.001
Umphang	0.85 [0.84, 0.86]	<0.001
Year of visit (vs 2013)		
2014	1.14 [1.13, 1.15]	<0.001
2015	1.13 [1.12, 1.15]	<0.001
2016	1.26 [1.25, 1.27]	<0.001
2017	1.27 [1.25, 1.28]	<0.001
Insurance*Age group (vs UCS*0-1 year)		
Uninsured*2-3 years	1.03 [0.90, 1.18]	0.702
HIPCP*2-3 years	0.57 [0.51, 0.65]	<0.001
Uninsured*4-5 years	0.96 [0.84, 1.10]	0.582
HIPCP*4-5 years	0.72 [0.64, 0.82]	<0.001
Uninsured*6-10 years	1.16 [1.04, 1.30]	0.009
HIPCP*6-10 years	1.42 [1.25, 1.62]	<0.001
Uninsured*11-15 years	1.22 [1.08, 1.36]	0.001
HIPCP*11-15 years	1.36 [1.20, 1.53]	<0.001

APPENDIX E Distribution of inpatient utilization rate (admissions/person/year) by covariates

AGE GROUP

Admissions /person/ year	**0-1 year (n=5075)**	**2-3 year (n=2970)**	**4-5 year (n=1555)**	**6-10 year (n=2318)**	**11-15 yr. (n=2833)**	**p-value**	**test**
Mean (SD)	1.55 (0.96)	1.72 (1.42)	1.65 (1.57)	1.64 (1.68)	1.56 (1.73)	<0.001	ANOVA
Median [IQR]	1.00 [1, 2]	1.00 [1, 2]	1.00 [1, 2]	1.00 [1, 1]	1.00 [1, 1]	<0.001	Kruskal-Wallis

AGE GROUP: STATUS

Age_group	**Status**	**Mean (Admissions/person/year)**	**df**	**F**	**p**
0-1 years	Uninsured	1.000			
6-10 years	Uninsured	1.125			
6-10 years	Stateless	2.402			
6-10 years	UCS	1.600			
11-15 years	Uninsured	1.270			
11-15 years	Stateless	2.044	14	8.985	<0.001
11-15 years	UCS	1.500			
0-1 years	Stateless	1.575			
0-1 years	UCS	1.547			
2-3 years	Uninsured	1.381			
2-3 years	Stateless	1.781			

Age_group	Status	Mean (Admissions/person/year)	df	F	p
2-3 years	UCS	1.724			
4-5 years	Uninsured	1.286			
4-5 years	Stateless	1.769			
4-5 years	UCS	1.645			

SEX

Admissions/person/ year	Male (n=8002)	Female (n=6749)	p-value	test
Mean (SD)	1.68 (1.52)	1.53 (1.28)	<0.001	ANOVA
Median [IQR]	1.00 [1, 2]	1.00 [1, 2]	<0.001	Kruskal-Wallis

SEX: STATUS

Status	Sex	Mean (Admissions/person/year)	df	F-statistic	P-value
Uninsured	Male	1.333	5	20.871	<0.001
Uninsured	Female	1.160			
Stateless	Male	2.097			
Stateless	Female	1.557			
UCS	Male	1.646			
UCS	Female	1.531			

DOMICILE

Admissions/ person/ year	Mae Ramat (n= 8268)	Phop Phra (n=856)	Tha Song Yang (n=2602)	Umphang (n=3025)	p-value	test
Mean (SD)	1.63 (1.34)	1.31 (0.78)	1.83 (1.91)	1.47 (1.23)	<0.001	ANOVA
Median [IQR]	1.00 [1, 5]	1.00 [1, 1]	1.00 [1, 1]	1.00 [1, 1]	<0.001	Kruskal-Wallis

DOMICILE: STATUS

Domicile	Status	Mean	df	F-statistic	P-value
Mae Ramat	Uninsured	1.000	11	23.895	<0.001
Mae Ramat	Stateless	1.898			
Mae Ramat	UCS	1.608			
Phop Phra	Uninsured	1.000			
Phop Phra	Stateless	1.529			
Phop Phra	UCS	1.294			
Tha Song Yang	Uninsured	1.289			
Tha Song Yang	Stateless	1.241			
Tha Song Yang	UCS	1.874			

Umphang	Uninsured	1.000
Umphang	Stateless	1.987
Umphang	UCS	1.378

YEAR OF ADMISSIONS

Admissions/ person/year	2013 (n=2996)	2014 (n=3128)	2015 (n=2418)	2016 (n=3030)	2017 (n=3179)	p-value	test
Mean (SD)	1.50 (1.06)	1.54 (1.04)	1.62 (1.27)	1.73 (1.70)	1.67 (1.78)	<0.001	ANOVA
Median [IQR]	1.00 [1, 2]	1.00 [1, 2]	1.00 [1, 2]	1.00 [1, 2]	1.00 [1, 2]	<0.001	Kruskal-Wallis

Note: SD: Standard deviation, IQR: Inter-quartile range

APPENDIX F Top ten most common principal diagnoses (OPD) by insurance status

Insurance	ICD10	ICD10 label	Count	%
Uninsured	1. Z001	Routine child health examination	828	19.13
	2. Z108	Routine general health check-up of other defined subpopulations	773	17.86
	3. J00	Acute nasopharyngitis [common cold]	651	15.04
	4. Z012	Dental examination	644	14.88
	5. Z011	Examination of ears and hearing	287	6.63
	6. U77	Health promotion and disease prevention	247	5.71
	7. Z240	Need for immunization against poliomyelitis	246	5.68
	8. Z002	Examination for period of rapid growth in childhood	238	5.5
	9. Z132	Special screening examination for nutritional disorders	226	5.22
	10. Z010	Examination of eyes and vision	189	4.37
Stateless	1. Z27.4 (73)	MMR2: Measles, mumps, rubella	280	11.44
	2. Z24.6 (41)	HBV1: Hepatitis B	273	11.16
	3. Z23.2 (10)	BCG: Tuberculosis	271	11.07
	4. Z27.1 (34)	DTP4: Diphtheria, tetanus, whooping cough	257	10.5
	5. Z24.0 (84)	OPV4: Polio	253	10.34
	6. Z27.4 (61)	MMR1: Measles, mumps, rubella	233	9.52
	7. Z24.0 (83)	OPV3: Polio	226	9.24
	8. Z24.0 (85)	OPV5: Polio	220	8.99
	9. Z24.0 (82)	OPV2: Polio	218	8.91
	10. Z27.1 (93)	DTPHB3: Diphtheria, tetanus, whooping cough, hepatitis B	216	8.83
UCS	1. Z001	Routine child health examination	159096	25.86
	2. J00	Acute nasopharyngitis [common cold]	120642	19.61
	3. Z012	Dental examination	76179	12.38
	4. Z132	Special screening examination for nutritional disorders	60379	9.81
	5. Z108	Routine general health check-up of other defined subpopulations	50410	8.19
	6. U77	Health promotion and disease prevention	38783	6.3
	7. Z002	Examination for period of rapid growth in childhood	33091	5.38
	8. Z240	Need for immunization against poliomyelitis	32265	5.24
	9. Z27.4 (73)	MMR4: Measles, mumps, rubella	22599	3.67
	10. Z011	Examination of ears and hearing	21732	3.53

APPENDIX G Top ten most common principal diagnosis (IPD) by icd10 by insurance status

Insurance	ICD10	ICD10 label	Count	%
Uninsured	1. A099	Gastroenteritis and colitis of unspecified origin	12	12.24
	2. J189	Pneumonia, unspecified	11	11.22
	3. O800	Spontaneous vertex delivery	11	11.22
	4. Z370	Single live birth	11	11.22
	5. E876	Hypokalaemia	10	10.2
	6. J209	Acute bronchitis, unspecified	9	9.18
	7. E86	Volume depletion	7	7.14
	8. D561	Beta thalassaemia	6	6.12
	9. A753	Typhus fever due to Rickettsia tsutsugamushi	5	5.1
	10. J181	Lobar pneumonia, unspecified	4	4.08
Stateless	1. Z380	Singleton, born in hospital	203	24.79
	2. Z370	Single live birth	86	10.5
	3. J189	Pneumonia, unspecified	85	10.38
	4. A099	Gastroenteritis and colitis of unspecified origin	76	9.28
	5. O800	Spontaneous vertex delivery	76	9.28
	6. E876	Hypokalaemia	67	8.18
	7. E86	Volume depletion	66	8.06
	8. D561	Beta thalassaemia	61	7.45
	9. A090	Other and unspecified gastroenteritis and colitis of infectious origin	54	6.59
	10. J209	Acute bronchitis, unspecified	45	5.49
UCS	1. Z380	Singleton, born in hospital	1744	17.56
	2. J189	Pneumonia, unspecified	1676	16.88
	3. E876	Hypokalaemia	1206	12.15
	4. A099	Gastroenteritis and colitis of unspecified origin	1172	11.8
	5. E86	Volume depletion	1059	10.67
	6. J209	Acute bronchitis, unspecified	883	8.89
	7. A090	Other and unspecified gastroenteritis and colitis of infectious origin	754	7.59
	8. D561	Beta thalassaemia	603	6.07
	9. R509	Fever, unspecified	433	4.36
	10. N390	Urinary tract infection, site not specified	399	4.02

APPENDIX H Identifying diseases by principal diagnosis (IPD ICD10-TM)

ICD 10	ICD 10 labels	Disease categories	Count
(a) Certain infectious and parasitic diseases (A01-B89)			
A010	Typhoid fever	Intestinal infectious diseases	1
A020	Salmonella enteritis	Intestinal infectious diseases	1
A021	Salmonella septicaemia	Intestinal infectious diseases	2
A029	Salmonella infection, unspecified	Intestinal infectious diseases	1
A039	Shigellosis, unspecified	Intestinal infectious diseases	5
A049	Bacterial intestinal infection, unspecified	Intestinal infectious diseases	55
A059	Bacterial food-borne intoxication, unspecified	Intestinal infectious diseases	99
A060	Acute amoebic dysentery	Intestinal infectious diseases	4
A063	Amoeboma of intestine	Intestinal infectious diseases	80
A069	Amoebiasis, unspecified	Intestinal infectious diseases	18
A071	Giardiasis [lambliasis]	Intestinal infectious diseases	49
A073	Isosporiasis	Intestinal infectious diseases	8
A083	Other viral enteritis	Intestinal infectious diseases	2
A084	Viral intestinal infection, unspecified	Intestinal infectious diseases	85
A090	Other and unspecified gastroenteritis and colitis of infectious origin	Intestinal infectious diseases	839
A099	Gastroenteritis and colitis of unspecified origin	Intestinal infectious diseases	1,326
A160	Tuberculosis of lung, bacteriologically and histologically negative	Tuberculosis	4
A162	Tuberculosis of lung, without mention of bacteriological or histological confirmation	Tuberculosis	3
A165	Tuberculous pleurisy, without mention of bacteriological or histological confirmation	Tuberculosis	1
A182	Tuberculous peripheral lymphadenopathy	Tuberculosis	1
A188	Tuberculosis of other specified organs	Tuberculosis	2
A199	Miliary tuberculosis, unspecified	Tuberculosis	1
A244	Melioidosis, unspecified	Other bacterial infection	2
A369	Diphtheria, unspecified	Other bacterial infection	1
A38	Scarlet fever	Other bacterial infection	7
A390	Meningococcal meningitis (G01*)	Other bacterial infection	1
A394	Meningococcaemia, unspecified	Other bacterial infection	2
A400	Septicaemia due to Streptococcus, group A	Other bacterial infection	1
A409	Streptococcal septicaemia, unspecified	Other bacterial infection	2
A410	Septicaemia due to Staphylococcus aureus	Other bacterial infection	4
A411	Septicaemia due to other specified staphylococcus	Other bacterial infection	3
A412	Septicaemia due to unspecified staphylococcus	Other bacterial infection	3

ICD 10	ICD 10 labels	Disease categories	Count
A413	Septicaemia due to Haemophilus influenzae	Other bacterial infection	2
A415	Septicaemia due to other gram-negative organisms	Other bacterial infection	4
A419	Septicaemia, unspecified	Other bacterial infection	109
A483	Toxic shock syndrome	Other bacterial infection	1
A490	Staphylococcal infection, unspecified	Other bacterial infection	3
A493	Mycoplasma infection, unspecified	Other bacterial infection	3
A499	Bacterial infection, unspecified	Other bacterial infection	214
A753	Typhus fever due to Rickettsia tsutsugamushi	Rickettsiosis	364
A759	Typhus fever, unspecified	Rickettsiosis	10
A791	Rickettsialpox due to Rickettsia akari	Rickettsiosis	1
A799	Rickettsiosis, unspecified	Rickettsiosis	45
A830	Japanese encephalitis	Viral CNS infection	3
A86	Unspecified viral encephalitis	Viral CNS infection	6
A879	Viral meningitis, unspecified	Viral CNS infection	4
A880	Enteroviral exanthematous fever [Boston exanthem]	Viral CNS infection	6
A90	Dengue fever [classical dengue]	Dengue	361
A91	Dengue haemorrhagic fever	Dengue	69
A910	Dengue hemorrhagic fever with shock (TM)	Dengue	20
A911	Dengue hemorrhagic fever without shock (TM)	Dengue	56
A919	Dengue hemorrhagic fever, unspecified (TM)	Dengue	143
B002	Herpesviral gingivostomatitis and pharyngotonsillitis	Viral skin infection	1
B004	Herpesviral encephalitis (G05.1*)	Viral skin infection	2
B009	Herpesviral infection, unspecified	Viral skin infection	6
B012	Varicella pneumonia (J17.1*)	Viral skin infection	1
B019	Varicella without complication	Viral skin infection	19
B020	Zoster encephalitis (G05.1*)	Viral skin infection	1
B023	Zoster ocular disease	Viral skin infection	1
B027	Disseminated zoster	Viral skin infection	1
B029	Zoster without complication	Viral skin infection	3
B07	Viral warts	Viral skin infection	2
B082	Exanthema subitum [sixth disease]	Viral skin infection	5
B084	Enteroviral vesicular stomatitis with exanthem	Viral skin infection	20
B085	Enteroviral vesicular pharyngitis	Viral skin infection	46
B09	Unspecified viral infection characterized by skin and mucous membrane lesions	Viral skin infection	8
B159	Hepatitis A without hepatic coma	Hepatitis	49
B169	'Acute hepatitis B without delta-agent and without hepatic coma	Hepatitis	9
B179	Acute viral hepatitis, unspecified	Hepatitis	12
B181	Chronic viral hepatitis B without delta-agent	Hepatitis	1

ICD 10	ICD 10 labels	Disease categories	Count
B1819	'Chronic hepatitis B unspecified delta agent status	Hepatitis	1
B182	Chronic viral hepatitis C	Hepatitis	2
B199	Unspecified viral hepatitis without coma	Hepatitis	2
B206	HIV disease resulting in Pneumocystis carinii pneumonia	Unspecified viral infection	1
B24	Unspecified human immunodeficiency virus [HIV] disease	Unspecified viral infection	2
B279	Infectious mononucleosis, unspecified	Unspecified viral infection	1
B300	Keratoconjunctivitis due to adenovirus (H19.2)	Unspecified viral infection	1
B309	Viral conjunctivitis, unspecified	Unspecified viral infection	1
B333	Retrovirus infections, not elsewhere classified	Unspecified viral infection	1
B349	Viral infection, unspecified	Unspecified viral infection	66
B350	Tinea barbae and tinea capitis	Mycoses	7
B354	Tinea corporis	Mycoses	6
B356	Tinea cruris	Mycoses	1
B359	Dermatophytosis, unspecified	Mycoses	1
B360	Pityriasis versicolor	Mycoses	2
B369	Superficial mycosis, unspecified	Mycoses	2
B370	Candidal stomatitis	Mycoses	4
B372	Candidiasis of skin and nail	Mycoses	6
B373	Candidiasis of vulva and vagina (N77.1)	Mycoses	2
B379	Candidiasis, unspecified	Mycoses	6
B409	Blastomycosis, unspecified	Mycoses	25
B49	Unspecified mycosis	Mycoses	2
B508	Other severe and complicated Plasmodium falciparum malaria	Malaria	17
B509	Plasmodium falciparum malaria, unspecified	Malaria	49
B510	Plasmodium vivax malaria with rupture of spleen	Malaria	1
B519	Plasmodium vivax malaria without complication	Malaria	112
B54	Unspecified malaria	Malaria	1
B664	Paragonimiasis	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	2
B669	Fluke infection, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	1
B680	Taenia solium taeniasis	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	1
B690	Cysticercosis of central nervous system	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	8

ICD 10	ICD 10 labels	Disease categories	Count
B699	Cysticercosis, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	1
B769	Hookworm disease, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	5
B770	Ascariasis with intestinal complications	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm	1
B779	Ascariasis, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm	225
B789	Strongyloidiasis, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	3
B79	Trichuriasis	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm	13
B80	Enterobiasis	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	3
B820	Intestinal helminthiasis, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	1
B829	Intestinal parasitism, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	4
B839	Helminthiasis, unspecified	Helminthiases (ascariasis, Trichuriasis, Cysticercosis, Hookworm)	1
B850	Pediculosis due to Pediculus humanus capitis	Pediculosis acariasis	2
B852	Pediculosis, unspecified	Pediculosis acariasis	6
B86	Scabies	Pediculosis acariasis	7
B89	Unspecified parasitic disease	Pediculosis acariasis	80
(b) Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism (D500-D649)			
D500	Iron deficiency anaemia secondary to blood loss (chronic)	Anaemia	1
D508	Other iron deficiency anaemias	Anaemia	159
D509	Iron deficiency anaemia, unspecified	Anaemia	40
D539	Nutritional anaemia, unspecified	Anaemia	5
D550	Anaemia due to glucose-6-phosphate dehydrogenase [G-6-PD] deficiency	Anaemia	262
D560	Alpha thalassaemia	Anaemia	16
D561	Beta thalassaemia	Anaemia	670
D562	Delta-beta thalassaemia	Anaemia	1
D563	Thalassaemia trait	Anaemia	16
D569	Thalassaemia, unspecified	Anaemia	51
D572	Double heterozygous sickling disorders	Anaemia	2
D582	Other haemoglobinopathies	Anaemia	9

ICD 10	ICD 10 labels	Disease categories	Count
D589	Hereditary haemolytic anaemia, unspecified	Anaemia	29
D591	Other autoimmune haemolytic anaemias	Anaemia	4
D594	Other nonautoimmune haemolytic anaemias	Anaemia	1
D598	Other acquired haemolytic anaemias	Anaemia	1
D599	Acquired haemolytic anaemia, unspecified	Anaemia	1
D610	Constitutional aplastic anaemia	Anaemia	2
D619	Aplastic anaemia, unspecified	Anaemia	15
D62	Acute posthaemorrhagic anaemia	Anaemia	24
D630	Anaemia in neoplastic disease (C00-D48+)	Anaemia	11
D631	Anaemia due to liver, renal and endocrine disorders (TM)	Anaemia	2
D638	Anaemia in other chronic diseases classified elsewhere	Anaemia	12
D640	Hereditary sideroblastic anaemia	Anaemia	1
D649	Anaemia, unspecified	Anaemia	189
(c) Endocrine, nutritional and metabolic diseases (E40-E880)			
E40	Kwashiorkor	Malnutrition	2
E43	Unspecified severe protein-energy malnutrition	Malnutrition	3
E440	Moderate protein-energy malnutrition	Malnutrition	65
E441	Mild protein-energy malnutrition	Malnutrition	105
E46	Unspecified protein-energy malnutrition	Malnutrition	283
E509	Vitamin A deficiency, unspecified	Malnutrition	1
E60	Dietary zinc deficiency	Malnutrition	1
E611	Iron deficiency	Malnutrition	1
E669	Obesity, unspecified	Malnutrition	4
E703	Albinism	Metabolic disorders	1
E731	Secondary lactase deficiency	Metabolic disorders	10
E779	Disorder of glycoprotein metabolism, unspecified	Metabolic disorders	1
E781	Pure hyperglyceridaemia	Metabolic disorders	1
E782	Mixed hyperlipidaemia	Metabolic disorders	2
E785	Hyperlipidaemia, unspecified	Metabolic disorders	5
E786	Lipoprotein deficiency	Metabolic disorders	14
E806	Other disorders of bilirubin metabolism	Metabolic disorders	1
E831	Disorders of iron metabolism	Metabolic disorders	12
E833	Disorders of phosphorus metabolism	Metabolic disorders	9
E834	Disorders of magnesium metabolism	Metabolic disorders	16
E835	Disorders of calcium metabolism	Metabolic disorders	12
E86	Volume depletion	Metabolic disorders	1,186
E870	Hyperosmolality and hypernatraemia	Metabolic disorders	8
E871	Hyposmolality and hyponatraemia	Metabolic disorders	253
E872	Acidosis	Metabolic disorders	285
E873	Alkalosis	Metabolic disorders	1

ICD 10	ICD 10 labels	Disease categories	Count
E874	Mixed disorder of acid-base balance	Metabolic disorders	1
E875	Hyperkalaemia	Metabolic disorders	11
E876	Hypokalaemia	Metabolic disorders	1,309
E877	Fluid overload	Metabolic disorders	26
E878	Other disorders of electrolyte and fluid balance, not elsewhere classified	Metabolic disorders	1
E880	Disorders of plasma-protein metabolism, not elsewhere classified	Metabolic disorders	20
(d) Diseases of the nervous system (G003-G998)			
G003	Staphylococcal meningitis	Other Central nervous system diseases	1
G008	Other bacterial meningitis	Other Central nervous system diseases	1
G009	Bacterial meningitis, unspecified	Other Central nervous system diseases	15
G01	Meningitis in bacterial diseases classified elsewhere	Other Central nervous system diseases	1
G030	Nonpyogenic meningitis	Other Central nervous system diseases	6
G039	Meningitis, unspecified	Other Central nervous system diseases	28
G040	Acute disseminated encephalitis	Other Central nervous system diseases	1
G042	Bacterial meningoencephalitis and meningomyelitis, not elsewhere classified	Other Central nervous system diseases	1
G049	Encephalitis, myelitis and encephalomyelitis, unspecified	Other Central nervous system diseases	21
G051	Encephalitis, myelitis and encephalomyelitis in viral diseases classified elsewhere	Other Central nervous system diseases	3
G060	Intracranial abscess and granuloma	Other Central nervous system diseases	9
G253	Myoclonus	Other Central nervous system diseases	2
G259	Extrapyramidal and movement disorder, unspecified	Other Central nervous system diseases	1
G318	Other specified degenerative diseases of the nervous system	Other Central nervous system diseases	1
G319	Degenerative disease of the nervous system, unspecified	Other Central nervous system diseases	1
G373	Acute transverse myelitis in demyelinating disease of the central nervous system	Other Central nervous system diseases	3
G403	Generalized idiopathic epilepsy and epileptic syndromes	Other Central nervous system diseases	8
G409	Epilepsy, unspecified	Epilepsy	102
G410	Grand mal status epilepticus	Epilepsy	6
G418	Other status epilepticus	Epilepsy	1
G419	Status epilepticus, unspecified	Epilepsy	15
G442	Tension-type headache	Epilepsy	4
G510	Bell's palsy	Cerebral palsy paralytic	1

ICD 10	ICD 10 labels	Disease categories	Count
		syndrome brain disorder	
G609	Hereditary and idiopathic neuropathy, unspecified	Cerebral palsy paralytic syndrome brain disorder	1
G610	Guillain-Barre syndrome	Cerebral palsy paralytic syndrome brain disorder	1
G723	Periodic paralysis	Cerebral palsy paralytic syndrome brain disorder	2
G800	Spastic cerebral palsy	Cerebral palsy paralytic syndrome brain disorder	4
G801	Spastic diplegia	Cerebral palsy paralytic syndrome brain disorder	2
G809	Infantile cerebral palsy, unspecified	Cerebral palsy paralytic syndrome brain disorder	53
G811	Spastic hemiplegia	Cerebral palsy paralytic syndrome brain disorder	1
G819	Hemiplegia, unspecified	Cerebral palsy paralytic syndrome brain disorder	3
G820	Flaccid paraplegia	Cerebral palsy paralytic syndrome brain disorder	2
G839	Paralytic syndrome, unspecified	Cerebral palsy paralytic syndrome brain disorder	3
G908	Other disorders of the autonomic nervous system	Cerebral palsy paralytic syndrome brain disorder	1
G909	Disorder of the autonomic nervous system, unspecified	Cerebral palsy paralytic syndrome brain disorder	1
G910	Communicating hydrocephalus	Cerebral palsy paralytic syndrome brain disorder	2
G919	Hydrocephalus, unspecified	Cerebral palsy paralytic syndrome brain disorder	7
G931	Anoxic brain damage, not elsewhere classified	Cerebral palsy paralytic syndrome brain disorder	3
G934	Encephalopathy, unspecified	Cerebral palsy paralytic syndrome brain disorder	3
G935	Compression of brain	Cerebral palsy paralytic syndrome brain disorder	1
G938	Other specified disorders of brain	Cerebral palsy paralytic syndrome brain disorder	1
G939	Disorder of brain, unspecified	Cerebral palsy paralytic syndrome brain disorder	1
G959	Disease of spinal cord, unspecified	Cerebral palsy paralytic syndrome brain disorder	1
G968	Other specified disorders of the central nervous system	Cerebral palsy paralytic syndrome brain disorder	1
G969	Disorder of the central nervous system, unspecified	Cerebral palsy paralytic syndrome brain disorder	1
G978	Other postprocedural disorders of the nervous system	Cerebral palsy paralytic syndrome brain disorder	1
G998	Other specified disorders of the nervous system in diseases classified elsewhere	Cerebral palsy paralytic syndrome brain disorder	8
(e) Diseases of the eye and adnexa (H000-H588)			
H000	Hordeolum and other deep	Conjunctivitis eyelid	24

ICD 10	ICD 10 labels	Disease categories	Count
	inflammation of eyelid	inflammation	
H001	Chalazion	Conjunctivitis eyelid inflammation	1
H010	Blepharitis	Conjunctivitis eyelid inflammation	1
H050	Acute inflammation of orbit	Conjunctivitis eyelid inflammation	11
H101	Acute atopic conjunctivitis	Conjunctivitis eyelid inflammation	1
H103	Acute conjunctivitis, unspecified	Conjunctivitis eyelid inflammation	3
H109	Conjunctivitis, unspecified	Conjunctivitis eyelid inflammation	28
H113	Conjunctival haemorrhage	Conjunctivitis eyelid inflammation	2
H131	Conjunctivitis in infectious and parasitic diseases classified elsewhere	Conjunctivitis eyelid inflammation	1
H160	Corneal ulcer	Conjunctivitis eyelid inflammation	10
H168	Other keratitis	Conjunctivitis eyelid inflammation	1
H192	Keratitis and keratoconjunctivitis in other infectious and parasitic diseases classified elsewhere	Conjunctivitis eyelid inflammation	1
H210	Hyphaema	Conjunctivitis eyelid inflammation	1
H440	Purulent endophthalmitis	Conjunctivitis eyelid inflammation	1
H492	Sixth [abducent] nerve palsy	Conjunctivitis eyelid inflammation	1
H500	Convergent concomitant strabismus	Conjunctivitis eyelid inflammation	1
H520	Hypermetropia	Conjunctivitis eyelid inflammation	1
H521	Myopia	Conjunctivitis eyelid inflammation	1
H530	Amblyopia ex anopsia	Conjunctivitis eyelid inflammation	1
H531	Subjective visual disturbances	Conjunctivitis eyelid inflammation	1
H535	Colour vision deficiencies	Conjunctivitis eyelid inflammation	1
H578	Other specified disorders of eye and adnexa	Conjunctivitis eyelid inflammation	1
H588	Other specified disorders of eye and adnexa in diseases classified elsewhere	Conjunctivitis eyelid inflammation	1
(f) Diseases of the ear and mastoid process (H600-H921)			
H600	Abscess of external ear	Otitis media	4
H601	Cellulitis of external ear	Otitis media	2
H603	Other infective otitis externa	Otitis media	1
H605	Acute otitis externa, noninfective	Otitis media	5

ICD 10	ICD 10 labels	Disease categories	Count
H609	Otitis externa, unspecified	Otitis media	4
H610	Perichondritis of external ear	Otitis media	2
H612	Impacted cerumen	Otitis media	1
H669	Otitis media, unspecified	Otitis media	116
H701	Chronic mastoiditis	Otitis media	1
H729	Perforation of tympanic membrane, unspecified	Otitis media	12
H811	Benign paroxysmal vertigo	Otitis media	2
H905	Sensorineural hearing loss, unspecified	Otitis media	2
H919	Hearing loss, unspecified	Otitis media	1
H920	Otalgia	Otitis media	1
H921	Otorrhoea	Otitis media	1
(g) Diseases of the respiratory system (J00-J988)			
J00	Acute nasopharyngitis [common cold]	Acute upper respiratory infection (AURI)	171
J028	Acute pharyngitis due to other specified organisms	Acute upper respiratory infection (AURI)	4
J029	Acute pharyngitis, unspecified	Acute upper respiratory infection (AURI)	344
J030	Streptococcal tonsillitis	Acute upper respiratory infection (AURI)	2
J039	Acute tonsillitis, unspecified	Acute upper respiratory infection (AURI)	217
J040	Acute laryngitis	Acute upper respiratory infection (AURI)	1
J041	Acute tracheitis	Acute upper respiratory infection (AURI)	1
J050	Acute obstructive laryngitis [croup]	Acute upper respiratory infection (AURI)	56
J068	Other acute upper respiratory infections of multiple sites	Acute upper respiratory infection (AURI)	24
J069	Acute upper respiratory infection, unspecified	Acute upper respiratory infection (AURI)	210
J101	Influenza with other respiratory manifestations, influenza virus identified	Pneumonia	8
J110	Influenza with pneumonia, virus not identified	Pneumonia	5
J111	Influenza with other respiratory manifestations, virus not identified	Pneumonia	84
J128	Other viral pneumonia	Pneumonia	1
J129	Viral pneumonia, unspecified	Pneumonia	170
J14	'Pneumonia due to Haemophilus influenzae	Pneumonia	1
J150	'Pneumonia due to Klebsiella pneumoniae	Pneumonia	6
J151	Pneumonia due to Pseudomonas	Pneumonia	2
J152	'Pneumonia due to staphylococcus	Pneumonia	2
J153	'Pneumonia due to streptococcus, group B	Pneumonia	1
J154	'Pneumonia due to other streptococci	Pneumonia	5

ICD 10	ICD 10 labels	Disease categories	Count
J157	'Pneumonia due to Mycoplasma pneumoniae	Pneumonia	2
J158	Other bacterial pneumonia[TM]	Pneumonia	2
J1588	'Other bacterial pneumonia	Pneumonia	1
J159	'Bacterial penumonia, unspecified	Pneumonia	370
J160	'Chlamydial pneumonia	Pneumonia	3
J171	Pneumonia in viral diseases classified elsewhere [B012]	Pneumonia	1
J180	'Bronchopneumonia, unspecified	Pneumonia	348
J181	'Lobar pneumonia, unspecified	Pneumonia	83
J188	Other pneumonia, organism unspecified	Pneumonia	1
J189	Pneumonia, unspecified	Pneumonia	1,807
J204	Acute bronchitis due to parainfluenza virus	Bronchitis	1
J208	Acute bronchitis due to other specified organisms	Bronchitis	83
J209	Acute bronchitis, unspecified	Bronchitis	982
J218	Acute bronchiolitis due to other specified organisms	Bronchitis	3
J219	Acute bronchiolitis, unspecified	Bronchitis	358
J304	Allergic rhinitis, unspecified	Asthma respiratory failure other pulmonary diseases	4
J310	Chronic rhinitis	Asthma respiratory failure other pulmonary diseases	1
J320	Chronic maxillary sinusitis	Asthma respiratory failure other pulmonary diseases	4
J329	Chronic sinusitis, unspecified	Asthma respiratory failure other pulmonary diseases	2
J351	Hypertrophy of tonsils	Asthma respiratory failure other pulmonary diseases	1
J358	Other chronic diseases of tonsils and adenoids	Asthma respiratory failure other pulmonary diseases	1
J36	Peritonsillar abscess	Asthma respiratory failure other pulmonary diseases	5
J391	Other abscess of pharynx	Asthma respiratory failure other pulmonary diseases	2
J40	Bronchitis, not specified as acute or chronic	Asthma respiratory failure other pulmonary diseases	7
J439	Emphysema, unspecified	Asthma respiratory failure other pulmonary diseases	1
j442	Wheezing associated respiratory illness (WARI) (TM)	Asthma respiratory failure other pulmonary diseases	2
J452	Bronchial hyperresponsiveness (TM)	Asthma respiratory failure other pulmonary diseases	16
J459	Asthma, unspecified	Asthma respiratory failure other pulmonary diseases	52
J46	Status asthmaticus	Asthma respiratory failure other pulmonary diseases	46
J47	Bronchiectasis	Asthma respiratory failure other pulmonary diseases	2
J683	Other acute and subacute respiratory	Asthma respiratory failure	2

ICD 10	ICD 10 labels	Disease categories	Count
	conditions due to chemicals, gases, fumes and vapours	other pulmonary diseases	
J690	Pneumonitis due to food and vomit	Asthma respiratory failure other pulmonary diseases	9
J80	Adult respiratory distress syndrome	Asthma respiratory failure other pulmonary diseases	3
J81	Pulmonary oedema	Asthma respiratory failure other pulmonary diseases	5
J82	Pulmonary oedema	Asthma respiratory failure other pulmonary diseases	1
J849	Interstitial pulmonary disease, unspecified	Asthma respiratory failure other pulmonary diseases	1
J869	Pyothorax without fistula	Asthma respiratory failure other pulmonary diseases	4
J90	Pleural effusion, not elsewhere classified	Asthma respiratory failure other pulmonary diseases	27
J91	Pleural effusion in conditions classified elsewhere	Asthma respiratory failure other pulmonary diseases	1
J931	Other spontaneous pneumothorax	Asthma respiratory failure other pulmonary diseases	1
J939	Pneumothorax, unspecified	Asthma respiratory failure other pulmonary diseases	3
J950	Tracheostomy malfunction	Asthma respiratory failure other pulmonary diseases	1
J951	Acute pulmonary insufficiency following thoracic surgery	Asthma respiratory failure other pulmonary diseases	1
J955	Postprocedural subglottic stenosis	Asthma respiratory failure other pulmonary diseases	2
J960	Acute respiratory failure	Asthma respiratory failure other pulmonary diseases	27
J969	Respiratory failure, unspecified	Asthma respiratory failure other pulmonary diseases	24
J980	Diseases of bronchus, not elsewhere classified	Asthma respiratory failure other pulmonary diseases	17
J981	Pulmonary collapse	Asthma respiratory failure other pulmonary diseases	17
J982	Interstitial emphysema	Asthma respiratory failure other pulmonary diseases	1
J985	Diseases of mediastinum, not elsewhere classified	Asthma respiratory failure other pulmonary diseases	1
J988	Other specified respiratory disorders	Asthma respiratory failure other pulmonary diseases	10
(h) Diseases of the digestive system (K021-K868)			
K021	Caries of dentine	Diseases of oral cavity salivary glands and jaws	5
K029	Dental caries, unspecified	Diseases of oral cavity salivary glands and jaws	6
K040	Pulpitis	Diseases of oral cavity salivary glands and jaws	2
K0402	Suppurative pulpitis [pulpal abscess]	Diseases of oral cavity salivary glands and jaws	1
K041	Necrosis of pulp	Diseases of oral cavity	5

ICD 10	ICD 10 labels	Disease categories	Count
		salivary glands and jaws	
K047	Periapical abscess without sinus	Diseases of oral cavity salivary glands and jaws	16
K050	Acute gingivitis	Diseases of oral cavity salivary glands and jaws	1
K051	Chronic gingivitis	Diseases of oral cavity salivary glands and jaws	2
K0529	Acute periodontitis, unspecified (TM)	Diseases of oral cavity salivary glands and jaws	1
K054	Periodontosis	Diseases of oral cavity salivary glands and jaws	1
K068	Other specified disorders of gingiva and edentulous alveolar ridge	Diseases of oral cavity salivary glands and jaws	4
K088	Other specified disorders of teeth and supporting structures	Diseases of oral cavity salivary glands and jaws	2
K112	Sialoadenitis	Diseases of oral cavity salivary glands and jaws	3
K113	Abscess of salivary gland	Diseases of oral cavity salivary glands and jaws	1
K120	Recurrent oral aphthae	Diseases of oral cavity salivary glands and jaws	20
K1209	Recurrent oral aphthae, unspecified (TM)	Diseases of oral cavity salivary glands and jaws	3
K121	Other forms of stomatitis	Diseases of oral cavity salivary glands and jaws	26
K122	Cellulitis and abscess of mouth	Diseases of oral cavity salivary glands and jaws	18
K123	Oral mucositis (ulcerative)	Diseases of oral cavity salivary glands and jaws	1
K130	Diseases of lips	Diseases of oral cavity salivary glands and jaws	1
K1309	Disease of lips, unspecified (TM)	Diseases of oral cavity salivary glands and jaws	1
K137	Other and unspecified lesions of oral mucosa	Diseases of oral cavity salivary glands and jaws	1
K140	Glossitis	Diseases of oral cavity salivary glands and jaws	2
K219	Gastro-oesophageal reflux disease without oesophagitis	Gastritis dyspepsia	6
K25	Gastric ulcer	Gastritis dyspepsia	1
K263	Duodenal ulcer: acute without haemorrhage or perforation	Gastritis dyspepsia	1
K271	Peptic ulcer, site unspecified: acute with perforation	Gastritis dyspepsia	2
K276	Peptic ulcer, site unspecified: chronic or unspecified with both haemorrhage and perforation	Gastritis dyspepsia	1
K291	Other acute gastritis	Gastritis dyspepsia	324
K296	Other gastritis	Gastritis dyspepsia	46
K297	Gastritis, unspecified	Gastritis dyspepsia	89
K298	Duodenitis	Gastritis dyspepsia	1
K299	Gastroduodenitis, unspecified	Gastritis dyspepsia	1

ICD 10	ICD 10 labels	Disease categories	Count
K30	Dyspepsia	Gastritis dyspepsia	185
K310	Acute dilatation of stomach	Gastritis dyspepsia	1
K318	Other specified diseases of stomach and duodenum	Gastritis dyspepsia	6
K352	Acute appendicitis with generalized peritonitis	Appendicitis hernia	16
K353	Acute appendicitis with localized peritonitis	Appendicitis hernia	23
K358	Acute appendicitis, other and unspecified	Appendicitis hernia	146
K400	Bilateral inguinal hernia, with obstruction, without gangrene	Appendicitis hernia	1
K404	Unilateral or unspecified inguinal hernia, with gangrene	Appendicitis hernia	2
K409	Unilateral or unspecified inguinal hernia, without obstruction or gangrene	Appendicitis hernia	49
K449	Diaphragmatic hernia without obstruction or gangrene	Appendicitis hernia	2
K469	Unspecified abdominal hernia without obstruction or gangrene	Appendicitis hernia	1
K5220	Allergic and dietetic gastroenteritis and colitis due to cow's milk protein (TM)	Diseases of intestine peritoneum	1
K529	Noninfective gastroenteritis and colitis, unspecified	Diseases of intestine peritoneum	21
K551	Chronic vascular disorders of intestine	Diseases of intestine peritoneum	2
K560	Paralytic ileus	Diseases of intestine peritoneum	2
K561	Intussusception	Diseases of intestine peritoneum	1
K564	Other impaction of intestine	Diseases of intestine peritoneum	12
K565	Intestinal adhesions [bands] with obstruction	Diseases of intestine peritoneum	2
K566	Other and unspecified intestinal obstruction	Diseases of intestine peritoneum	38
K567	Ileus, unspecified	Diseases of intestine peritoneum	25
K590	Constipation	Diseases of intestine peritoneum	40
K599	Functional intestinal disorder, unspecified	Diseases of intestine peritoneum	1
K628	Other specified diseases of anus and rectum	Diseases of intestine peritoneum	2
K650	Acute peritonitis	Diseases of intestine peritoneum	6
K6500	Primary peritonitis (TM)	Diseases of intestine peritoneum	1
K659	Peritonitis, unspecified	Diseases of intestine peritoneum	7

ICD 10	ICD 10 labels	Disease categories	Count
K712	Toxic liver disease with acute hepatitis	Diseases of liver gallbladder	1
K719	Toxic liver disease, unspecified	Diseases of liver gallbladder	1
K720	Acute and subacute hepatic failure	Diseases of liver gallbladder	5
K729	Hepatic failure, unspecified	Diseases of liver gallbladder	5
K746	Other and unspecified cirrhosis of liver	Diseases of liver gallbladder	2
K750	Abscess of liver	Diseases of liver gallbladder	6
K753	Granulomatous hepatitis, not elsewhere classified	Diseases of liver gallbladder	1
K759	Inflammatory liver disease, unspecified	Diseases of liver gallbladder	37
K769	Liver disease, unspecified	Diseases of liver gallbladder	2
K810	Acute cholecystitis	Diseases of liver gallbladder	2
K831	Obstruction of bile duct	Diseases of liver gallbladder	7
K839	Disease of biliary tract, unspecified	Diseases of liver gallbladder	1
K861	Other chronic pancreatitis	Diseases of liver gallbladder	1
K868	Other specified diseases of pancreas	Diseases of liver gallbladder	1
(i) Diseases of the skin and subcutaneous tissue (L00-L988)			
L00	Staphylococcal scalded skin syndrome	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L010	Impetigo [any organism][any site]	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	20
L020	Cutaneous abscess, furuncle and carbuncle of face	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	10
L021	Cutaneous abscess, furuncle and carbuncle of neck	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	20
L022	Cutaneous abscess, furuncle and carbuncle of trunk	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	43
L023	Cutaneous abscess, furuncle and carbuncle of buttock	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	25
L024	Cutaneous abscess, furuncle and carbuncle of limb	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	84
L028	Cutaneous abscess, furuncle and carbuncle of other sites	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	19

ICD 10	ICD 10 labels	Disease categories	Count
L029	Cutaneous abscess, furuncle and carbuncle, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	4
L030	Cellulitis of finger and toe	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	7
L031	Cellulitis of other parts of limb	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	101
L032	Cellulitis of face	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	5
L033	Cellulitis of trunk	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	10
L038	Cellulitis of other sites	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	4
L039	Cellulitis, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	3
L040	Acute lymphadenitis of face, head and neck	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	6
L041	Acute lymphadenitis of trunk	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L042	Acute lymphadenitis of upper limb	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	2
L043	Acute lymphadenitis of lower limb	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	3
L048	Acute lymphadenitis of other sites	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	5
L049	Acute lymphadenitis, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	8
L080	Pyoderma	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	4
L088	Other specified local infections of the skin and subcutaneous tissue	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L089	Local infection of the skin and subcutaneous tissue, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	24
L130	Dermatitis herpetiformis	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	2
L209	Atopic dermatitis, unspecified	Skin diseases (cellulitis, urticaria, abscess,	1

ICD 10	ICD 10 labels	Disease categories	Count
		dermatitis, lymphadenitis)	
L219	Seborrhoeic dermatitis, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L22	Diaper [napkin] dermatitis	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	4
L239	Allergic contact dermatitis, unspecified cause	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	4
L245	Irritant contact dermatitis due to other chemical products	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L272	Dermatitis due to ingested food	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L293	Anogenital pruritus, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	17
L299	Pruritus, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L303	Infective dermatitis	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	22
L309	Dermatitis, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	69
L403	Pustulosis palmaris et plantaris	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L500	Allergic urticaria	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	15
L508	Other urticaria	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L509	Urticaria, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	85
L511	Bullous erythema multiforme	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L538	Other specified erythematous conditions	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L539	Erythematous condition, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L639	Alopecia areata, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L659	Nonscarring hair loss, unspecified	Skin diseases (cellulitis,	1

ICD 10	ICD 10 labels	Disease categories	Count
		urticaria, abscess, dermatitis, lymphadenitis)	
L739	Follicular disorder, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	8
L743	Miliaria, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L891	Stage II decubitus ulcer	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L899	Decubitus ulcer and pressure area, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	2
L905	Scar conditions and fibrosis of skin	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L929	Granulomatous disorder of the skin and subcutaneous tissue, unspecified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L950	Livedoid vasculitis	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L958	Other vasculitis limited to the skin	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L984	hronic ulcer of skin, not elsewhere classified	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
L988	Other specified disorders of the skin and subcutaneous tissue	Skin diseases (cellulitis, urticaria, abscess, dermatitis, lymphadenitis)	1
(j) Diseases of the genitourinary system (N000-N946)			
N000	Acute nephritic syndrome: minor glomerular abnormality	Nephritic syndrome	1
N008	Acute nephritic syndrome: other	Nephritic syndrome	4
N009	Acute nephritic syndrome: unspecified	Nephritic syndrome	58
N049	Nephrotic syndrome: unspecified	Nephritic syndrome	95
N058	Unspecified nephritic syndrome: other	Nephritic syndrome	1
N059	Unspecified nephritic syndrome: unspecified	Nephritic syndrome	18
N085	Glomerular disorders in systemic connective tissue disorders	Nephritic syndrome	1
N10	Acute tubulo-interstitial nephritis	Renal tubulo-interstitial diseases	27
N132	Hydronephrosis with renal and ureteral calculous obstruction	Renal tubulo-interstitial diseases	2
N133	Other and unspecified hydronephrosis	Renal tubulo-interstitial diseases	3
N142	Nephropathy induced by unspecified drug, medicament or biological	Renal tubulo-interstitial diseases	1

ICD 10	ICD 10 labels	Disease categories	Count
	substance		
N170	Acute renal failure with tubular necrosis	Renal failure	1
N179	Acute renal failure, unspecified	Renal failure	30
N184	Chronic kidney disease, stage 4	Renal failure	1
N185	Chronic kidney disease, stage 5	Renal failure	3
N189	Chronic renal failure, unspecified	Renal failure	1
N19	Unspecified renal failure	Renal failure	1
N300	Acute cystitis	Urinary tract infection	2
N309	Cystitis, unspecified	Urinary tract infection	34
N342	Other urethritis	Urinary tract infection	9
N343	Urethral syndrome, unspecified	Urinary tract infection	1
N390	Urinary tract infection, site not specified	Urinary tract infection	442
N399	Disorder of urinary system, unspecified	Urinary tract infection	1
N433	Hydrocele, unspecified	Other genital organs diseases	60
N459	Orchitis, epididymitis and epididymo-orchitis without abscess	Other genital organs diseases	14
N47	Redundant prepuce, phimosis and paraphimosis	Other genital organs diseases	41
N481	Balanoposthitis	Other genital organs diseases	2
N482	Other inflammatory disorders of penis	Other genital organs diseases	5
N492	Inflammatory disorders of scrotum	Other genital organs diseases	4
N61	Inflammatory disorders of breast	Other genital organs diseases	11
N63	Unspecified lump in breast	Other genital organs diseases	2
N700	Acute salpingitis and oophoritis	Other genital organs diseases	1
N709	Salpingitis and oophoritis, unspecified	Other genital organs diseases	1
N710	Acute inflammatory disease of uterus	Other genital organs diseases	1
N719	Inflammatory disease of uterus, unspecified	Other genital organs diseases	1
N739	Female pelvic inflammatory disease, unspecified	Other genital organs diseases	3
N751	Abscess of Bartholin's gland	Other genital organs diseases	1
N771	Vaginitis, vulvitis and vulvovaginitis in infectious and parasitic diseases classified elsewhere	Other genital organs diseases	2
N809	Endometriosis, unspecified	Other genital organs diseases	1
N810	Female urethrocele	Other genital organs diseases	1
N829	Female genital tract fistula,	Other genital organs	1

ICD 10	ICD 10 labels	Disease categories	Count
	unspecified	diseases	
N832	Other and unspecified ovarian cysts	Other genital organs diseases	2
N897	Haematocolpos	Other genital organs diseases	1
N908	Other specified noninflammatory disorders of vulva and perineum	Other genital organs diseases	3
N911	Secondary amenorrhoea	Other genital organs diseases	1
N920	Excessive and frequent menstruation with regular cycle	Other genital organs diseases	3
N938	Other specified abnormal uterine and vaginal bleeding	Other genital organs diseases	1
N946	Dysmenorrhoea, unspecified	Other genital organs diseases	6
(k) Certain conditions originating in the perinatal period (P050-P90)			
P050	Light for gestational age	Low birth weight	3
P051	Small for gestational age	Low birth weight	2
P059	Slow fetal growth, unspecified	Low birth weight	2
P071	Other low birth weight	Low birth weight	167
P073	Other preterm infants	Low birth weight	25
P081	Other heavy for gestational age infants	Low birth weight	3
P113	Birth injury to facial nerve	Birth injury	1
P120	Cephalhaematoma due to birth injury	Birth injury	10
P121	Chignon due to birth injury	Birth injury	1
P122	Epicranial subaponeurotic haemorrhage due to birth injury	Birth injury	1
P123	Bruising of scalp due to birth injury	Birth injury	1
P154	Birth injury to face	Birth injury	1
P158	Other specified birth injuries	Birth injury	1
P159	Birth injury, unspecified	Birth injury	3
P363	Sepsis of newborn due to other and unspecified staphylococci	Neonatal infections sepsis	1
P368	Other bacterial sepsis of newborn	Neonatal infections sepsis	1
P369	Bacterial sepsis of newborn, unspecified	Neonatal infections sepsis	141
P371	Congenital toxoplasmosis	Neonatal infections sepsis	1
P38	Omphalitis of newborn with or without mild haemorrhage	Neonatal infections sepsis	26
P394	Neonatal skin infection	Neonatal infections sepsis	2
P399	Infection specific to the perinatal period, unspecified	Neonatal infections sepsis	1
P588	Neonatal jaundice due to other specified excessive haemolysis	Neonatal jaundice	3
P589	Neonatal jaundice due to excessive haemolysis, unspecified	Neonatal jaundice	1
P590	Neonatal jaundice associated with preterm delivery	Neonatal jaundice	1
P592	Neonatal jaundice from other and unspecified hepatocellular damage	Neonatal jaundice	1
P593	Neonatal jaundice from breast milk	Neonatal jaundice	18

ICD 10	ICD 10 labels	Disease categories	Count
	inhibitor		
P598	Neonatal jaundice from other specified causes	Neonatal jaundice	127
P599	Neonatal jaundice, unspecified	Neonatal jaundice	439
P001	Fetus and newborn affected by maternal renal and urinary tract diseases	Other perinatal conditions	4
P002	Fetus and newborn affected by maternal infectious and parasitic diseases	Other perinatal conditions	4
P008	Fetus and newborn affected by other maternal conditions	Other perinatal conditions	2
P011	Fetus and newborn affected by premature rupture of membranes	Other perinatal conditions	7
P015	Fetus and newborn affected by multiple pregnancy	Other perinatal conditions	4
P023	Fetus and newborn affected by placental transfusion syndromes	Other perinatal conditions	1
P025	Fetus and newborn affected by other compression of umbilical cord	Other perinatal conditions	1
P031	Fetus and newborn affected by other malpresentation, malposition and disproportion during labour and delivery	Other perinatal conditions	1
P210	Severe birth asphyxia	Other perinatal conditions	3
P211	Mild and moderate birth asphyxia	Other perinatal conditions	6
P219	Birth asphyxia, unspecified	Other perinatal conditions	8
P220	Respiratory distress syndrome of newborn	Other perinatal conditions	5
P221	Transient tachypnoea of newborn	Other perinatal conditions	3
P229	Respiratory distress of newborn, unspecified	Other perinatal conditions	4
P239	Congenital pneumonia, unspecified	Other perinatal conditions	8
P240	Neonatal aspiration of meconium	Other perinatal conditions	8
P243	Neonatal aspiration of milk and regurgitated food	Other perinatal conditions	1
P249	Neonatal aspiration syndrome, unspecified	Other perinatal conditions	2
P251	Pneumothorax originating in the perinatal period	Other perinatal conditions	1
P271	Bronchopulmonary dysplasia originating in the perinatal period	Other perinatal conditions	3
P280	Primary atelectasis of newborn	Other perinatal conditions	1
P283	Primary sleep apnoea of newborn	Other perinatal conditions	1
P284	Other apnoea of newborn	Other perinatal conditions	5
P285	Respiratory failure of newborn	Other perinatal conditions	5
P293	Persistent fetal circulation	Other perinatal conditions	1
P298	Other cardiovascular disorders originating in the perinatal period	Other perinatal conditions	1
P521	Intraventricular (nontraumatic) haemorrhage grade 2, of fetus and newborn	Other perinatal conditions	1

ICD 10	ICD 10 labels	Disease categories	Count
P528	Other intracranial (nontraumatic) haemorrhages of fetus and newborn	Other perinatal conditions	1
P543	Other neonatal gastrointestinal haemorrhage	Other perinatal conditions	2
P551	ABO isoimmunization of fetus and newborn	Other perinatal conditions	16
P579	Kernicterus, unspecified	Other perinatal conditions	1
P60	Disseminated intravascular coagulation of fetus and newborn	Other perinatal conditions	1
P610	Transient neonatal thrombocytopenia	Other perinatal conditions	1
P611	Polycythaemia neonatorum	Other perinatal conditions	8
P614	Other congenital anaemias, not elsewhere classified	Other perinatal conditions	10
P701	Syndrome of infant of a diabetic mother	Other perinatal conditions	1
P704	Other neonatal hypoglycaemia	Other perinatal conditions	95
P714	Transitory neonatal hypoparathyroidism	Other perinatal conditions	1
P77	Necrotizing enterocolitis of fetus and newborn	Other perinatal conditions	8
P800	Cold injury syndrome	Other perinatal conditions	1
P809	Hypothermia of newborn, unspecified	Other perinatal conditions	3
P810	Environmental hyperthermia of newborn	Other perinatal conditions	2
P819	Disturbance of temperature regulation of newborn, unspecified	Other perinatal conditions	4
P835	Congenital hydrocele	Other perinatal conditions	1
P838	Other specified conditions of the integument specific to fetus and newborn	Other perinatal conditions	1
P839	Condition of the integument specific to fetus and newborn, unspecified	Other perinatal conditions	1
P90	Convulsions of newborn	Other perinatal conditions	4
Persons encountering health services in circumstances related to reproduction			
Z370	Single live birth	Child gave birth	423
Z380	Singleton, born in hospital	Child born in hospital	1,999

APPENDIX I Diseases outcomes by covariates: Age groups, Sex, Domicile, Year of hospitalization

Diseases by age groups

Disease and illness	year (N=3367	2-3 years (N=1602)	4-5 years (N=936)	6-10 years (N=1652)	11-15 years (N=1887)	p-value
Intestinal infectious diseases, n (%)	982 (29.2)	531 (33.1)	210 (22.4)	260 (15.7)	131 (6.9)	<0.001
Tuberculosis, n (%)	2 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	3 (0.2)	0.610
Other bacterial infection, n (%)	112 (3.3)	68 (4.2)	40 (4.3)	71 (4.3)	48 (2.5)	0.015
Rickettsiosis, n (%)	47 (1.4)	68 (4.2)	53 (5.7)	122 (7.4)	115 (6.1)	<0.001
Viral CNS infection, n (%)	7 (0.2)	1 (0.1)	3 (0.3)	5 (0.3)	2 (0.1)	0.397
Dengue, n (%)	24 (0.7)	55 (3.4)	55 (5.9)	198 (12.0)	241 (12.8)	<0.001
Viral skin infection, n (%)	43 (1.3)	39 (2.4)	7 (0.7)	10 (0.6)	8 (0.4)	<0.001
Hepatitis, n (%)	5 (0.1)	11 (0.7)	7 (0.7)	32 (1.9)	15 (0.8)	<0.001
Other viral infection, n (%)	18 (0.5)	10 (0.6)	11 (1.2)	17 (1.0)	13 (0.7)	0.155
Mycoses, n (%)	19 (0.6)	12 (0.7)	11 (1.2)	10 (0.6)	9 (0.5)	0.233
Malaria, n (%)	6 (0.2)	19 (1.2)	13 (1.4)	50 (3.0)	75 (4.0)	<0.001
Helminthiasis, n (%)	95 (2.8)	68 (4.2)	40 (4.3)	38 (2.3)	12 (0.6)	<0.001
Pediculosis acariasis, n (%)	28 (0.8)	27 (1.7)	13 (1.4)	24 (1.5)	2 (0.1)	<0.001
Anaemia, n (%)	246 (7.3)	135 (8.4)	70 (7.5)	99 (6.0)	94 (5.0)	<0.001
Malnutrition, n (%)	126 (3.7)	124 (7.7)	62 (6.6)	66 (4.0)	8 (0.4)	<0.001
Metabolic disorders, n (%)	746 (22.2)	539 (33.6)	247 (26.4)	309 (18.7)	232 (12.3)	<0.001
Other CNS diseases, n (%)	19 (0.6)	17 (1.1)	6 (0.6)	21 (1.3)	19 (1.0)	0.078
Epilepsy, n (%)	14 (0.4)	9 (0.6)	7 (0.7)	21 (1.3)	25 (1.3)	0.001
Cerebral palsy, n (%)	11 (0.3)	9 (0.6)	4 (0.4)	19 (1.2)	12 (0.6)	0.009
Conjunctivitis, n (%)	22 (0.7)	21 (1.3)	13 (1.4)	17 (1.0)	15 (0.8)	0.092
Otitis media, n (%)	59 (1.8)	31 (1.9)	12 (1.3)	10 (0.6)	9 (0.5)	<0.001
AURI, n (%)	252 (7.5)	209 (13.0)	125 (13.4)	156 (9.4)	96 (5.1)	<0.001
Pneumonia, n (%)	942 (28.0)	503 (31.4)	172 (18.4)	146 (8.8)	55 (2.9)	<0.001
Bronchitis, n (%)	487 (14.5)	299 (18.7)	109 (11.6)	95 (5.8)	21 (1.1)	<0.001
Asthma, n (%)	67 (2.0)	48 (3.0)	23 (2.5)	58 (3.5)	37 (2.0)	0.006
Diseases oral cavity, n (%)	32 (1.0)	36 (2.2)	21 (2.2)	12 (0.7)	2 (0.1)	<0.001
Gastritis, n (%)	108 (3.2)	97 (6.1)	85 (9.1)	163 (9.9)	122 (6.5)	<0.001
Appendicitis, n (%)	13 (0.4)	12 (0.7)	12 (1.3)	70 (4.2)	118 (6.3)	<0.001
Diseases intestine, n (%)	45 (1.3)	26 (1.6)	25 (2.7)	23 (1.4)	18 (1.0)	0.008
Diseases liver gallbladder, n (%)	7 (0.2)	9 (0.6)	11 (1.2)	15 (0.9)	15 (0.8)	0.001
Skin diseases, n (%)	183 (5.4)	116 (7.2)	60 (6.4)	123 (7.4)	92 (4.9)	0.002
Nephritic syndrome, n (%)	10 (0.3)	15 (0.9)	24 (2.6)	46 (2.8)	22 (1.2)	<0.001
Renal tubule-interstitial diseases, n (%)	3 (0.1)	3 (0.2)	3 (0.3)	5 (0.3)	18 (1.0)	<0.001
Renal failure, n (%)	2 (0.1)	1 (0.1)	5 (0.5)	7 (0.4)	19 (1.0)	<0.001
Urinary tract infection, n	83 (2.5)	78 (4.9)	65 (6.9)	119 (7.2)	103 (5.5)	<0.001

Disease and illness	year (N=3367	2-3 years (N=1602)	4-5 years (N=936)	6-10 years (N=1652)	11-15 years (N=1887)	p-value
(%)						
Other genital organs diseases, n (%)	21 (0.6)	28 (1.7)	20 (2.1)	39 (2.4)	45 (2.4)	<0.001
Low birth weight, n (%)	181 (5.4)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
Neonatal infections, n (%)	155 (4.6)	3 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
Neonatal jaundice, n (%)	486 (14.4)	2 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
Other perinatal conditions, n (%)	188 (5.6)	3 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
Catastrophic illness*, n (%)	190 (7.2)	89 (6.8)	56 (7.1)	106 (7.5)	118 (7.5)	0.942

Diseases by gender

Disease and illness	Male (N=4983)	Female (N=4461)	p-value	test
Intestinal infectious diseases, n (%)	1175 (23.6)	939 (21.0)	0.003	Chi-square
Tuberculosis, n (%)	5 (0.1)	2 (0.0)	0.541	Chi-square
Other bacterial infection, n (%)	192 (3.9)	147 (3.3)	0.162	Chi-square
Rickettsiosis, n (%)	229 (4.6)	176 (3.9)	0.132	Chi-square
Viral CNS infection, n (%)	11 (0.2)	7 (0.2)	0.636	Chi-square
Dengue, n (%)	306 (6.1)	267 (6.0)	0.785	Chi-square
Viral skin infection, n (%)	57 (1.1)	50 (1.1)	0.993	Chi-square
Hepatitis, n (%)	41 (0.8)	29 (0.7)	0.392	Chi-square
Other viral infection, n (%)	44 (0.9)	25 (0.6)	0.086	Chi-square
Mycoses, n (%)	29 (0.6)	32 (0.7)	0.490	Chi-square
Malaria, n (%)	85 (1.7)	78 (1.7)	0.936	Chi-square
Helminthiasis, n (%)	141 (2.8)	112 (2.5)	0.371	Chi-square
Pediculosis acariasis, n (%)	48 (1.0)	46 (1.0)	0.820	Chi-square
Anaemia, n (%)	424 (8.5)	220 (4.9)	<0.001	Chi-square
Malnutrition, n (%)	203 (4.1)	183 (4.1)	0.986	Chi-square
Metabolic disorders, n (%)	1102 (22.1)	971 (21.8)	0.701	Chi-square
Other CNS diseases, n (%)	50 (1.0)	32 (0.7)	0.166	Chi-square
Epilepsy, n (%)	41 (0.8)	35 (0.8)	0.927	Chi-square
Cerebral palsy, n (%)	31 (0.6)	24 (0.5)	0.688	Chi-square
Conjunctivitis, n (%)	55 (1.1)	33 (0.7)	0.083	Chi-square
Otitis media, n (%)	60 (1.2)	61 (1.4)	0.54	Chi-square
AURI, n (%)	447 (9.0)	391 (8.8)	0.753	Chi-square
Pneumonia, n (%)	997 (20.0)	821 (18.4)	0.051	Chi-square
Bronchitis, n (%)	575 (11.5)	436 (9.8)	0.006	Chi-square
Asthma, n (%)	127 (2.5)	106 (2.4)	0.636	Chi-square
Diseases oral cavity, n (%)	58 (1.2)	45 (1.0)	0.531	Chi-square
Gastritis, n (%)	286 (5.7)	289 (6.5)	0.145	Chi-square
Appendicitis, n (%)	138 (2.8)	87 (2.0)	0.011	Chi-square
Diseases intestine, n (%)	79 (1.6)	58 (1.3)	0.284	Chi-square
Diseases liver gallbladder, n (%)	34 (0.7)	23 (0.5)	0.362	Chi-square
Skin diseases, n (%)	335 (6.7)	239 (5.4)	0.006	Chi-square
Nephritic syndrome, n (%)	81 (1.6)	36 (0.8)	<0.001	Chi-square

Disease and illness	Male (N=4983)	Female (N=4461)	p-value	test
Renal tubule-interstitial diseases, n (%)	6 (0.1)	26 (0.6)	<0.001	Chi-square
Renal failure, n (%)	21 (0.4)	13 (0.3)	0.378	Chi-square
Urinary tract infection, n (%)	184 (3.7)	264 (5.9)	<0.001	Chi-square
Other genital organs diseases, n (%)	115 (2.3)	38 (0.9)	<0.001	Chi-square
Low birth weight, n (%)	95 (1.9)	87 (2.0)	0.937	Chi-square
Neonatal infections, n (%)	86 (1.7)	72 (1.6)	0.732	Chi-square
Neonatal jaundice, n (%)	294 (5.9)	194 (4.3)	0.001	Chi-square
Other perinatal conditions, n (%)	114 (2.3)	77 (1.7)	0.063	Chi-square
Catastrophic illness*, n (%)	322 (7.9)	237 (6.5)	0.017	Chi-square

Diseases by domicile

Disease and illness	Mae Ramat (N=4806)	Phop Phra (N=691)	Tha Song Yang (N=1857)	Umphang (N=2090)	p-value
Intestinal infectious diseases, n (%)	1163 (24.2)	119 (17.2)	477 (25.7)	355 (17.0)	<0.001
Tuberculosis, n (%)	1 (0.0)	1 (0.1)	1 (0.1)	4 (0.2)	0.098
Other bacterial infection, n (%)	104 (2.2)	6 (0.9)	120 (6.5)	109 (5.2)	<0.001
Rickettsiosis, n (%)	102 (2.1)	41 (5.9)	111 (6.0)	151 (7.2)	<0.001
Viral CNS infection, n (%)	9 (0.2)	0 (0.0)	6 (0.3)	3 (0.1)	0.351
Dengue, n (%)	354 (7.4)	65 (9.4)	51 (2.7)	103 (4.9)	<0.001
Viral skin infection, n (%)	65 (1.4)	3 (0.4)	18 (1.0)	21 (1.0)	0.12
Hepatitis, n (%)	23 (0.5)	9 (1.3)	31 (1.7)	7 (0.3)	<0.001
Other viral infection, n (%)	18 (0.4)	2 (0.3)	32 (1.7)	17 (0.8)	<0.001
Mycoses, n (%)	11 (0.2)	1 (0.1)	37 (2.0)	12 (0.6)	<0.001
Malaria, n (%)	75 (1.6)	8 (1.2)	24 (1.3)	56 (2.7)	0.002
Helminthiasis, n (%)	81 (1.7)	1 (0.1)	134 (7.2)	37 (1.8)	<0.001
Pediculosis acariasis, n (%)	32 (0.7)	0 (0.0)	51 (2.7)	11 (0.5)	<0.001
Anaemia, n (%)	326 (6.8)	13 (1.9)	169 (9.1)	136 (6.5)	<0.001
Malnutrition, n (%)	371 (7.7)	2 (0.3)	5 (0.3)	8 (0.4)	<0.001
Metabolic disorders, n (%)	1221 (25.4)	42 (6.1)	544 (29.3)	266 (12.7)	<0.001
Other CNS diseases, n (%)	22 (0.5)	1 (0.1)	32 (1.7)	27 (1.3)	<0.001
Epilepsy, n (%)	27 (0.6)	16 (2.3)	16 (0.9)	17 (0.8)	<0.001
Cerebral palsy, n (%)	22 (0.5)	4 (0.6)	10 (0.5)	19 (0.9)	0.157
Conjunctivitis, n (%)	43 (0.9)	2 (0.3)	18 (1.0)	25 (1.2)	0.189
Otitis media, n (%)	29 (0.6)	0 (0.0)	19 (1.0)	73 (3.5)	<0.001
AURI, n (%)	630 (13.1)	30 (4.3)	76 (4.1)	102 (4.9)	<0.001
Pneumonia, n (%)	1007 (21.0)	67 (9.7)	404 (21.8)	340 (16.3)	<0.001
Bronchitis, n (%)	684 (14.2)	31 (4.5)	173 (9.3)	123 (5.9)	<0.001
Asthma, n (%)	91 (1.9)	10 (1.4)	63 (3.4)	69 (3.3)	<0.001
Diseases oral cavity, n (%)	57 (1.2)	5 (0.7)	24 (1.3)	17 (0.8)	0.326
Gastritis, n (%)	403 (8.4)	18 (2.6)	98 (5.3)	56 (2.7)	<0.001
Appendicitis, n (%)	129 (2.7)	12 (1.7)	23 (1.2)	61 (2.9)	0.001
Diseases intestine, n (%)	69 (1.4)	12 (1.7)	36 (1.9)	20 (1.0)	0.07
Diseases liver gallbladder, n (%)	17 (0.4)	2 (0.3)	29 (1.6)	9 (0.4)	<0.001
Skin diseases, n (%)	289 (6.0)	29 (4.2)	135 (7.3)	121 (5.8)	0.026

Disease and illness	Mae Ramat (N=4806)	Phop Phra (N=691)	Tha Song Yang (N=1857)	Umphang (N=2090)	p-value
Nephritic syndrome, n (%)	39 (0.8)	3 (0.4)	48 (2.6)	27 (1.3)	<0.001
Renal tubule-interstitial diseases, n (%)	4 (0.1)	3 (0.4)	8 (0.4)	17 (0.8)	<0.001
Renal failure, n (%)	14 (0.3)	2 (0.3)	8 (0.4)	10 (0.5)	0.614
Urinary tract infection, n (%)	339 (7.1)	15 (2.2)	69 (3.7)	25 (1.2)	<0.001
Other genital organs diseases, n (%)	82 (1.7)	9 (1.3)	35 (1.9)	27 (1.3)	0.409
Low birth weight, n (%)	102 (2.1)	0 (0.0)	0 (0.0)	80 (3.8)	<0.001
Neonatal infections, n (%)	134 (2.8)	0 (0.0)	1 (0.1)	23 (1.1)	<0.001
Neonatal jaundice, n (%)	291 (6.1)	0 (0.0)	0 (0.0)	197 (9.4)	<0.001
Other perinatal conditions, n (%)	148 (3.1)	0 (0.0)	1 (0.1)	42 (2.0)	<0.001
Catastrophic illness*, n (%)	167 (4.8)	26 (8.9)	267 (14.4)	99 (4.7)	<0.001

Diseases by year of hospitalization of children

Disease and illness	2013 (N=1575)	2014 (N=1677)	2015 (N=1404)	2016 (N=2117)	2017 (N=2671)	p-value
Intestinal infectious diseases, n (%)	212 (13.5)	296 (17.7)	394 (28.1)	611 (28.9)	601 (22.5)	<0.001
Tuberculosis, n (%)	0 (0.0)	2 (0.1)	1 (0.1)	2 (0.1)	2 (0.1)	0.782
Other bacterial infection, n (%)	46 (2.9)	35 (2.1)	66 (4.7)	92 (4.3)	100 (3.7)	<0.001
Rickettsiosis, n (%)	54 (3.4)	47 (2.8)	80 (5.7)	78 (3.7)	146 (5.5)	<0.001
Viral CNS infection, n (%)	1 (0.1)	3 (0.2)	1 (0.1)	5 (0.2)	8 (0.3)	0.367
Dengue, n (%)	77 (4.9)	31 (1.8)	107 (7.6)	67 (3.2)	291 (10.9)	<0.001
Viral skin infection, n (%)	18 (1.1)	18 (1.1)	15 (1.1)	23 (1.1)	33 (1.2)	0.983
Hepatitis, n (%)	4 (0.3)	2 (0.1)	7 (0.5)	25 (1.2)	32 (1.2)	<0.001
Other viral infection, n (%)	9 (0.6)	11 (0.7)	3 (0.2)	19 (0.9)	27 (1.0)	0.049
Mycoses, n (%)	8 (0.5)	5 (0.3)	5 (0.4)	20 (0.9)	23 (0.9)	0.035
Malaria, n (%)	43 (2.7)	21 (1.3)	36 (2.6)	23 (1.1)	40 (1.5)	<0.001
Helminthiasis, n (%)	20 (1.3)	26 (1.6)	36 (2.6)	93 (4.4)	78 (2.9)	<0.001
Pediculosis acariasis, n (%)	11 (0.7)	11 (0.7)	9 (0.6)	36 (1.7)	27 (1.0)	0.003
Anaemia, n (%)	98 (6.2)	106 (6.3)	81 (5.8)	141 (6.7)	218 (8.2)	0.02
Malnutrition, n (%)	49 (3.1)	55 (3.3)	66 (4.7)	124 (5.9)	92 (3.4)	<0.001
Metabolic disorders, n (%)	305 (19.4)	336 (20.0)	275 (19.6)	543 (25.6)	614 (23.0)	<0.001
Other CNS diseases, n (%)	7 (0.4)	9 (0.5)	13 (0.9)	19 (0.9)	34 (1.3)	0.032
Epilepsy, n (%)	7 (0.4)	4 (0.2)	6 (0.4)	12 (0.6)	47 (1.8)	<0.001
Cerebral palsy, n (%)	3 (0.2)	8 (0.5)	13 (0.9)	5 (0.2)	26 (1.0)	0.001
Conjunctivitis, n (%)	9 (0.6)	15 (0.9)	18 (1.3)	17 (0.8)	29 (1.1)	0.27
Otitis media, n (%)	16 (1.0)	24 (1.4)	22 (1.6)	27 (1.3)	32 (1.2)	0.694
AURI, n (%)	104 (6.6)	130 (7.8)	130 (9.3)	219 (10.3)	255 (9.5)	<0.001
Pneumonia, n (%)	187 (11.9)	307 (18.3)	332 (23.6)	474 (22.4)	518 (19.4)	<0.001
Bronchitis, n (%)	110 (7.0)	146 (8.7)	181 (12.9)	259 (12.2)	315 (11.8)	<0.001

Disease and illness	2013 (N=1575)	2014 (N=1677)	2015 (N=1404)	2016 (N=2117)	2017 (N=2671)	p-value
Asthma, n (%)	31 (2.0)	28 (1.7)	41 (2.9)	48 (2.3)	85 (3.2)	0.01
Diseases oral cavity, n (%)	13 (0.8)	11 (0.7)	12 (0.9)	31 (1.5)	36 (1.3)	0.059
Gastritis, n (%)	71 (4.5)	76 (4.5)	60 (4.3)	160 (7.6)	208 (7.8)	<0.001
Appendicitis, n (%)	24 (1.5)	30 (1.8)	47 (3.3)	55 (2.6)	69 (2.6)	0.007
Diseases intestine, n (%)	14 (0.9)	23 (1.4)	15 (1.1)	32 (1.5)	53 (2.0)	0.035
Diseases liver gallbladder, n (%)	5 (0.3)	3 (0.2)	8 (0.6)	18 (0.9)	23 (0.9)	0.015
Skin diseases, n (%)	58 (3.7)	99 (5.9)	98 (7.0)	137 (6.5)	182 (6.8)	<0.001
Nephritic syndrome, n (%)	6 (0.4)	18 (1.1)	14 (1.0)	37 (1.7)	42 (1.6)	0.002
Renal tubulo-interstitial diseases, n (%)	4 (0.3)	2 (0.1)	6 (0.4)	7 (0.3)	13 (0.5)	0.31
Renal failure, n (%)	2 (0.1)	7 (0.4)	3 (0.2)	12 (0.6)	10 (0.4)	0.205
Urinary tract infection, n (%)	78 (5.0)	53 (3.2)	65 (4.6)	124 (5.9)	128 (4.8)	0.004
Other genital organs diseases, n (%)	22 (1.4)	12 (0.7)	29 (2.1)	36 (1.7)	54 (2.0)	0.009
Low birth weight, n (%)	49 (3.1)	68 (4.1)	20 (1.4)	22 (1.0)	23 (0.9)	<0.001
Neonatal infections, n (%)	42 (2.7)	52 (3.1)	23 (1.6)	18 (0.9)	23 (0.9)	<0.001
Neonatal jaundice, n (%)	145 (9.2)	167 (10.0)	59 (4.2)	58 (2.7)	59 (2.2)	<0.001
Other perinatal conditions, n (%)	49 (3.1)	70 (4.2)	26 (1.9)	22 (1.0)	24 (0.9)	<0.001
Catastrophic illness*, n (%)	0 (0.0)	0 (0.0)	61 (7.8)	189 (10.1)	309 (14.7)	<0.001

APPENDIX J Lengths of stay (LOS) (days/person/year) among inpatients

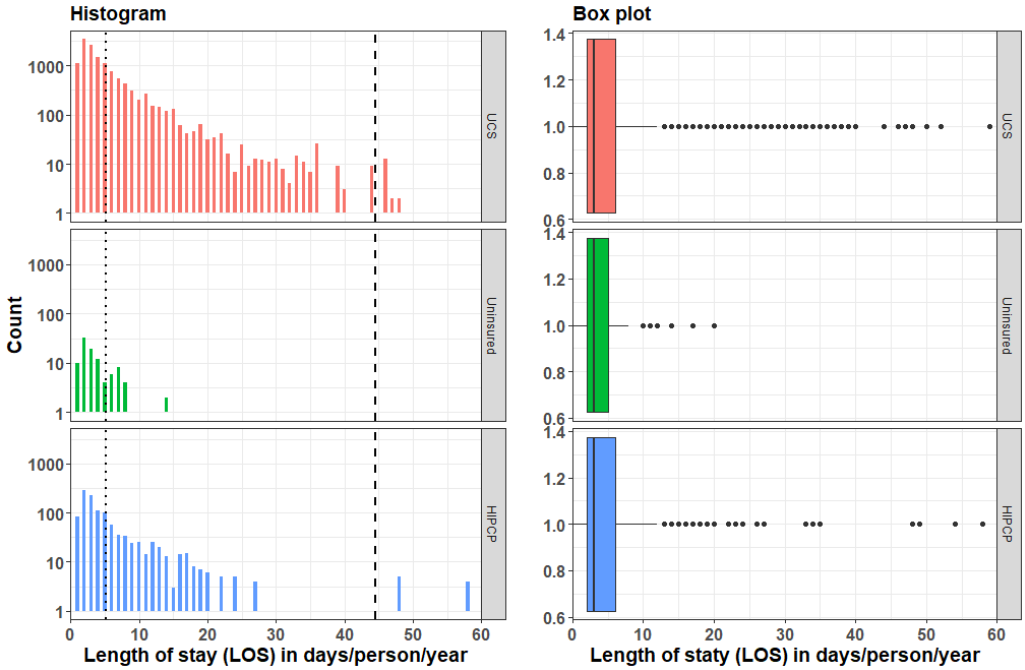

Figure The distribution of length of stay (LOS) rate in hospital (no. of days/person/year) by insurance status

Note: Length of stay (LOS) is truncated to 60 while maximum value is 297 days

Table Comparing mean and median numbers of length of stay (LOS) per person per year by insurance status

Length of stay	Uninsured	HIPCP	UCS	p-value	test
n	104	1,150	13,497		
Mean (SD)	4.07 (3.41)	6.7 (14.47)	5.05 (5.53)	<0.001	ANOVA
Median [IQR]	3.00 [2, 5]	3.00 [2, 6]	3.00 [2, 6]	0.004	Kruskal-Wallis

Note: SD: Standard deviation, IQR: Inter-quartile ratio, UCS: Universal coverage scheme

Multivariable analysis of results of negative binomial model of length of stay (LOS) rate by using negative binomial model insurance status

Variables	IRR [95% CI]	p
Insurance (vs UCS)		
Uninsured	0.82 [0.69, 0.97]	0.018
HIPCP	1.34 [1.27, 1.41]	<0.001
Age group (vs 0-1 year)		
2-3 years	1.05 [1.01, 1.09]	0.025
4-5 years	0.89 [0.85, 0.94]	<0.001
6-10 years	0.88 [0.84, 0.92]	<0.001
11-15 years	0.92 [0.88, 0.96]	<0.001

Sex (vs Male)		
Female	0.89 [0.86, 0.91]	<0.001
Domicile (vs Mae Ramat)		
Phop Phra	0.72 [0.67, 0.77]	<0.001
Tha Song Yang	1.01 [0.97, 1.06]	0.534
Umphang	0.99 [0.96, 1.03]	0.648
Year of hospitalization (vs 2013)		
Year2014	1.02 [0.98, 1.07]	0.306
Year2015	1.02 [0.97, 1.07]	0.435
Year2016	1.01 [0.96, 1.06]	0.639
Year2017	1.07 [1.02, 1.13]	0.005

Note: The research used negative binomial model because conditional variance is much larger than conditional mean (44.7 vs 5.17 days/person/year)