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Analyses of Reported Viral Hepatitis Cases, Thailand Ministry of Public Health, 2013 – 2017

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Analyses of Reported Viral Hepatitis Cases, Thailand Ministry of Public Health, 2013 – 2017

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Hubert Department of Global Health
2019

Abstract

Analyses of Reported Viral Hepatitis Cases, Thailand Ministry of Public Health, 2013 – 2017

By Panuwat Wongkulab

Background

The massive influx of migrants that support Thai economic growth is a challenge for Thai public health. Outbreaks of communicable diseases are a major public health concern; and immigrants may have difficulty accessing preventive and curative healthcare services; they may experience more unfavorable outcomes. The Thai National Surveillance System was created to include reports from non-Thai immigrants; however, the quality of public health surveillance (PHS) data and timeliness has not been evaluated to assess sensitivity and representativeness. This study examined the temporal and geographic trends of hepatitis among Thai and non-Thai residents to evaluate PHS performance, including timeliness.

Methods

We analyze reported cases of hepatitis from 2013 – 2017 contained in the Thailand National Surveillance Database. Data cleaning and analyses were done. We analyzed various characteristics between Thai and non-Thai reported cases, using chi-square and unpaired t-tests.

Results

While the total number of reported cases of hepatitis decreased during the study period (8,678 to 7,821), reported cases increased among non-Thai residents (2.6% to 3.7%). Case reports of hepatitis A increased over time; reported cases of hepatitis B remained constant; and report cases of hepatitis C and non-specific hepatitis decreased. Reported cases among non-Thai residents were likely to be younger ($p<0.001$), from an agriculture setting ($p<0.001$), had greater access to private healthcare ($p<0.001$), and took a longer time to diagnose ($p=0.003$). The number of reported cases varied by region (for hepatitis A, the number of reports increased in the north and Bangkok).

Conclusions

Analyses of Thai national PHS showed poor efficiency in reporting hepatitis among non-Thai residents, despite their increasing reports over time. Healthcare barriers to non-Thai residents may affect their health status and outcomes. Therefore, we recommend renewing efforts to include non-Thai residents in the Thai national PHS.

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Acknowledgments

I am incredibly grateful to the Royal Thai Government for supporting me the opportunity to learn and strengthen my professional level on my Master of Public Health at Emory University.

I want to thank Dr. Nakorn Premsir, the former Director of Bureau of Epidemiology, Dr. Panithee Thammawijaya, and Dr. Pawind Dougn-ngern, staffs of Bureau of Epidemiology, for assisting, supporting, and suggesting on this thesis from the beginning until it finished. I am also thankful the lovely officers, especially, Mr. Samarn, Dr. Thanawadee Chantian, to help me on seeking data and supporting documents.

I want to thank my advisor, Dr. Scott McNabb, for his continuous encouragement, guidance, and sharpening my public health perspective. I am grateful to my prior mentors, Dr. Khunchai Supparatpinyo and Dr. Romanee Chaiwarit, who are my role models, and continuously supported and encouraged me.

Finally, I would like to thank my family for unconditional support and providing my endless inspiration.

Table of contents

Introduction and literature review……1

Methods…….. ..6

Results…….…….8

Hepatitis A virus (HAV) infection ……..9

Hepatitis B virus (HBV) infection ……10

Hepatitis C virus (HCV) infection ……11

Non-Specific hepatitis.……....12

Discussion……...14

Bibliography……19

Tables and Figures

Figure 1. Data Cleaning of Reported Cases of Viral Hepatitis, Thailand Ministry of Public Health, 2013 – 2017 ……22

Figure 2. Number of Reported Cases of Viral Hepatitis, by Type and Year, Thailand Ministry of Public Health, 2013 – 2017 ……23

Figure 3. Reported Cases of Viral Hepatitis, by Nationality and Year, Thailand Ministry of Public Health, 2013 – 2017……..24

Table 1. Number of Reported Cases of Viral Hepatitis, by Type and Nationality, Thailand Ministry of Public Health, 2013 – 2017……..25

Table 2. Characteristics of Reported Cases of Viral Hepatitis, by Type and Nationality, Thailand Ministry of Public Health, 2013 – 2017……..26

Table 3. Number of Reported Cases of Viral Hepatitis, by Quartile, Region, Type and Nationality, Thailand Ministry of Public Health, 2013 – 2017…….27

Table 4. Number of Reported Cases of Viral Hepatitis A and B, by Nationality and Age-group, Thailand Ministry of Public Health, 2013 – 2017…….28

Figure 4. Figure 4. Reported Cases of Viral Hepatitis A, B, C and non-specific, Thailand Ministry of Public Health, 2013 – 2017…….29

Introduction

Viral hepatitis has various transmission routes and agents or types (A, B, and C) with a wide range of clinical presentations; acute and chronic infections depend on the type of hepatitis virus and the age at infection. Hepatitis A virus (HAV) is transmitted via the fecal-oral route, and is one endemic communicable disease found in Thailand. Thailand is a hepatitis endemic area, as evidenced by high seroprevalence among the Thai population (1).

Hepatitis B (HBV) and hepatitis C viruses (HCV) are associated with liver cirrhosis and cancer, resulting in high morbidity (2). HBV is a blood-borne infection and was commonly found among the Thai population before the national vaccination program began in 1992 (2, 3). Interestingly, the prevalence of hepatitis C substantially varies depending on the study population and location and time of the study; the prevalence gradually increased from 1.95% to 2.15% from 1994 to 2004. Whereas, in 2014, the prevalence from multicenter sites represented in each region was 0.94% (4).

Improved sanitation and personal hygiene has resulted in a decrease of hepatitis A seroprevalence in Thailand; and the national hepatitis B vaccination program played a significant role in the prevention of HBV infection among children and adolescents (1, 3). The prevalence of HCV serology among blood donors from the Thai National Blood Center showed a decreased in the prevalence of HCV infection, presumably because of increasing awareness of blood-borne pathogens and a new screening program for HCV for blood donors (4).

Neighboring Thai countries – Myanmar, Laos People's Democratic Republic, and Cambodia – have a higher burden of HAV than Thailand as evidenced by higher seroprevalence of HAV antibody among migrant workers from these countries (5). Moreover, the prevalence of HAV antibody was greater among people living around Thailand when compared to the Thai general population; 71% and 27%, respectively (6). Therefore, ongoing transmission of HAV at the Thai border is more prevalent because children infected with HAV have either asymptomatic or subtle symptoms. HAV vaccine is not in the national Thai vaccine program, plus a decline in HAV immunity in the general population place the Thai population at risk for HAV infection and future HAV outbreaks (1, 7).

HBV immunization in the Thai national vaccination program could reduce HBV infection from vertical transmission and infection among children; however, the prevalence of HBV infection still remains high in Thailand. The weaning of HBV antibody is one of the factors that contributes to the sustained high prevalence of HBV infection. Only 16.9% have protective HBV immunity among Thai adolescents, and the estimated prevalence of HBsAg carriers was > 1.1% at ages > 10 years and continuously increases until late adulthood (8, 9). The study among medical students revealed 93.1% had immunity to HBV below the protective level. The study, combined with HBV and HCV infection, showed that 7.9% were HBV carriers and the risk factors were extramarital sex and sexual contact before marriage (10, 11). Lower education was also associated with HBV infection, which was reflected by higher rates of HBV coinfection in HIV patients who have only seven years of education (12).

Therefore, booster vaccination in adolescents (especially high-risk groups) and sexual education are practical approaches to decrease HBV infection. Another future challenge for controlling HBV infection in low-endemic areas of Thailand are immigrants from HBV-endemic areas (13). The prevalence of HBsAg was greater among migrant workers who came from Cambodia, Laos, and Myanmar; 10.8%, 6.9%, and 9.7%, respectively (14). However, there is no direct evidence that migrant workers cause increases in HBV infection in Thailand.

Overall, the prevalence of HCV infection declined in the Thai population; however, its prevalence is still high among drug users (86% among drug injectors and 5.3% among non-injectors) (15). Other risk factors for HCV infection are associated with receiving blood components and sexual behaviors (16). Agriculture workers use stimulants to keep them awake and easily access these substances; as a consequence, the number of substance users is high, approximately 1.2 million (17). Further, 57.7% of migrant workers on the Thai-Laos border use stimulants, including methamphetamine (18). And 22.8% of Myanmar fishermen with HCV co-infection and HIV have a history of drug injection and unsafe sex behaviors. Fishing is one of the major industries for migrant workers in Thailand (19). The prevalence of HCV infection, 1.3%, in Thai couples, was associated with sexual contact and intravenous drug use (10).

There were roughly 3 million migrant workers in Thailand in October 2018, according to the International Labour Organization (20). Only 40% of migrant workers register to work and about 1 million complete their nationality verification to receive benefits or social security services and legal rights, including health insurance. Thailand has international agreements with neighboring countries known as Memoranda of Understanding (MOU) for migrant employment; established

in 2002 and 2003 and updated in 2015 and 2016, they improve the registration process (20). Migrant workers continuously increased from 1 million in 2012 to 2 million in 2017 (21). By December 2017, roughly 90% of migrant workers were non-skilled and who had already verified their nationality, working under the MOU according to the Department of Employment, Thailand (22). Myanmar has the largest number of migrant workers, following by Cambodia and Lao People's Democratic Republic. Migrant workers contributed approximately 4.3% - 6.6% of Thailand's GDP in 2010; they predominantly worked in low-skilled positions (e.g., fishing, agriculture, construction, industrial section, and domestic work) (20).

Besides economic benefits from migrant workers supporting the industrial and agriculture sections, Thailand now faces (re)emerging communicable diseases like tuberculosis (TB) and malaria (23). Migrant workers are vulnerable to TB through overcrowding and poor air-ventilation; they often have difficulty seeking healthcare services, including treatment due to cultural beliefs, mistrust of healthcare providers, and financial constraints (24). Moreover, 1.36% of migrant workers have asymptomatic malaria infection and a 4-times higher rate of symptomatic malarial infection, compared with Thai nationals (25, 26). Additionally, female migrant workers are a vulnerable group for human trafficking and at risk for HIV infection. They cannot refuse to serve in unsafe sexual encounters due to debts to their employers (27).

Living conditions and the workplace settings of migrants are not hygienic and even dangerous, especially in construction sites and fishing boats (28). Physical abuse from overworking, harsh living conditions, and sexual abuse have been reported. Also, migrants could not report crimes

because employers limit their communication and transportation. They are often beaten and extorted by police (28).

The Thai National Epidemiologic Surveillance Database was established for awareness and actions for investigation and disease control. In 1996, the database was improved to support reports from foreigners in Thailand (29). Analyzing these data can provide a national perspective for Thai public health.

Because of varying hepatitis transmission routes, the number of reported cases of hepatitis A might represent community sanitation indices. Additionally, reported cases of hepatitis B and C might indirectly reflect safe sex practices and intravenous drug use. Lastly, reported cases of non-specific hepatitis could be an indicator of public health improvements in diagnosing hepatitis. Another point is the quality of reporting in terms of registration and timeliness.

The objective of this study was to analyze the temporal and geographic trends of reported cases of hepatitis for Thai and non-Thai populations and calculate timeliness of reporting.

Methods

Data Collection

We analyzed reported cases of hepatitis A, B, C and non-specific hepatitis reported between 2013 – 2017 from the Thailand National Epidemiologic Surveillance Database. All hepatitis records included possible, probable, and confirmed hepatitis A, B, C, and non-specific, following the National Epidemiology Surveillance case definitions. Characteristics of reported cases, by type of hepatitis, age, gender, nationality, marital status, occupation, type of healthcare treatment, type of patient care, outcome of treatment, surveillance timeliness, date of report, and region were analyzed. The data consisted of 41,400 reported cases of hepatitis type A, B, C and non-specific.

Data Cleaning

We excluded data duplicates using Microsoft^{R} Excel^{R}; 312 duplicative reports represented 0.07% of the total database. Approximate 50% of these were the duplicate records in multiple years. (Figure 1)

Variables

Reported hepatitis cases were subdivided into Thai and non-Thai. The missing reported variable of nationality was found in six records (.01%) and misreported in eight (.02%). In 2017, 161 (12.6%) reported cases from non-Thai residents had missing or mislabelled information. Characteristic variables included age, age-group, gender, marital status, occupation, healthcare setting, treatment outcome, and PHS timeliness. We classified occupation into three groups: agriculture, non-agriculture, and unknown. Agriculture careers were composed of farmer,

laborer, housewife, fisherman, and animal husbandry. Non-agricultural occupations were government officer, trader, student, soldier or policeman, teacher, priest, healthcare worker, and unique careers. Forty-one records (0.1%) had "occupation" missing. Healthcare facilities were categorized into two groups: public and private. We categorized PHS timeliness into two types: time to detect (TTD) (i.e., duration between the time of disease onset and the time of diagnosis) and time to record (TTR) (i.e., duration between the date of diagnosis and the recording the case-patient in PHS).

Statistical Analyses

Characteristics of reported cases were compared between Thai and non-Thai from 2013 to 2017. The chi-square test analyzed categorical data and the unpair t-test analyzed numeric data with SAS 9.4. We analyzed data for Thai nationals and non-Thai residents. We created graphs and Tables using Microsoft^{R} Powerpoint^{R} and Excel^{R}.

Ethical Approval

This study was reviewed and determined to not be human subject's research by the Ethical Review Committee of Emory University. Official permission to use these data came from the National Epidemiological Surveillance System and approved by the Bureau of Epidemiology, Ministry of Public Health, Thailand.

Results

Between 2013 – 2017 the total number of reported cases of viral hepatitis decreased by 800. Among the reported cases, hepatitis B remained the most frequently reported: 6,000 – 6,500 reported cases per year. (Figure 2) HCV was the least reported: 200– 450 cases per year. Only HAV case reports increased from 370 to 577 over the 5-year period. Whereas, the number of reported cases of HCV and non-specific hepatitis declined. (Figure 2)

The total number of reported cases gradually declined over 5 years from 8,678 to 7,821. A reduction in the number was the result of a decrease in the number of reported cases among Thai nationals: 8456 to 7533. Whereas, the number of reported cases increased among non-Thai: 228 (2.56%) in 2013 to 288 (3.68%) in 2017. (Figure 3, Table 1)

Reported cases among non-Thai residents were younger than Thai nationals (32.5 vs. 43.7 years old: $p = 0.05$). Among non-Thai residents, the reported cases of hepatitis had a statistically significant differences in marital status, occupation, healthcare setting, type of treatment, and outcome, compared with Thai nationals. The mean TTD was significantly longer among non-Thai residents (4.74 days for non-Thai vs 3.43 days for Thai nationals: $p=0.03$). Eighteen deaths were reported among Thai nationals in the five years. (Table 2)

The number of reported cases of hepatitis by quartile was not different in either population ($p= 0.17$). Overall, the first quartile had the greatest number of reports (31.6% Thai vs 29.9% non-Thai); while the fourth quartile had the fewest (18.2% Thai vs 19% non-Thai). (Table 3)

The number of cases in each region was statistically significant among Thai and non-Thai. Northeast and western regions reported the majority of cases as Thai nationals; while, Bangkok, northern, central, and the south regions reported both Thai and non-Thai. (Table 3)

Hepatitis A Virus (HAV) Infection

During 2013 – 2017, the total number of reported cases of acute HAV gradually increased due to an increasing number of reported cases in both Thai nationals and non-Thai residents. (Table 1) Age among non-Thai was approximately 10 years younger than Thai. Viral hepatitis A likely infects children and adolescents; however, age-groups among infected reported cases were different in either population. Among non-Thai, children, adolescents, and younger adults were most susceptible to HAV infection, while Thai nationals likely got infected when they were over 20 years old. (Table 4) Most of the reported cases among non-Thai were single in marital status and worked in agriculture and non-agriculture sections. The majority responded using public healthcare, but the number seeing private was greater than Thai nationals reported. Having an unknown outcome was reported by a majority of Thai nationals. The duration of illness before detection and recording was not statically significant comparing the two groups. (Table 2)

The number of reported cases of HAV by quartile revealed no statistically significant differences among groups; reported cases were reported slightly differently throughout the year, 24 - 31%. However, the fourth quartile was the period having the fewest number of reported cases in both populations, 16% Thai vs 14% non-Thai. (Table 3)

Regional reports of HAV varied: Bangkok, northern, and center regions showed an increasing number of reported cases over the 5-year period. However, the reported cases among non-Thai and Thai increased in Bangkok and the northern region. In the central region, most of the reported cases were Thai with the fluctuation of the number among non-Thai. Most reported cases in the north-east region were Thai, and the number of reported cases continuously decreased in the northeast, as well as the southern region. (Figure 3)

Hepatitis B Virus (HBV) Infection

During the 5-year period, the number of reported cases of acute HBV infection hovered around 6,000 - 6,600, annually. The number among Thai nationals was > 6,000 per year. Only in 2017, did the number declined to 5,808. Whereas, the number among non-Thai gradually increased to reach 3.4% of the total number in 2017. (Table 1) The reported cases among non-Thai were roughly 10 years younger. Children were rarely reported as having hepatitis B in either group. The number of reported cases increased with age and peaked at 20-30 years among non-Thai. Thai nationals likely became infected between 20 – 30 years old and 75 years old, with a peak at 31 – 45 years old. (Table 4)

Males were more likely to be infected with HBV than females in both population groups. Agriculture was the most frequent occupation reported; however, the number was significantly greater among non-Thai. Public hospitals were the most frequently reported healthcare facility for both groups (94.5 % for Thai and 86.3% for non-Thai). The outcome of ongoing treatment was no different in either group, but recovery rate was greater among non-Thai. Among Thai, there were five fatal reports, and unknown treatment status was the most common treatment

result. Time to detection and duration of record among reported cases was not statistically significant. (Table 2)

Reported HBV cases occurred throughout the year in both populations and the number of reports per quartile was not statistically significant between groups. The first quartile was the period having the greatest number of reports; whereas, the fourth quartile had the fewest number in both groups. (Table 3) The number of reported in each region was a statistically significant difference between Thai nationals and non-Thai. The trends in each region had various directions, and the number of reported cases were different among groups. North-east, the region with the highest reports, and western regions were the regions where almost cases were Thai nationals. (Table 3) Bangkok, northern and central regions were the areas reporting cases both Thai nationals and non-Thai. Therefore, non-Thai likely stayed in specific regions. Noticeably, Bangkok was the area in which the number of reported cases both groups continuously increased. (Figure 4)

Hepatitis C Virus (HCV) Infection

The number of reported cases of HCV continuously decreased by nearly 50% from 2013 to 2017. The number of reported cases among non-Thai was deficient in the range 1 to 13 cases with zero cases reported in 2016. The greatest number among non-Thai was 13 cases in 2014. (Table 1) The mean age of reported cases was late forties in both groups. Nearly 80% of reported cases were 31 – 75 years old in both groups. (Table 4) Males were infected with HCV more commonly than females. Most reported cases were married, and agriculture was the most reported career among Thais. Most Thai case patients received treatment in public hospitals, in contrast to non-Thai who sought care in private hospitals. Outcome was unknown for most in both groups, and

there was one fatal case reported among Thai nationals. Differences in onset duration and record time were not found. (Table 2)

The number of reported cases among Thai was stable throughout the year, with the first quartile having the greatest number of reports. The greatest number of reported cases occurred in the fourth quartile. (Table 3) The north-east region had the greatest number of reported cases among Thai nationals, while, Bangkok was the area with the greatest number among non-Thai. The western region rarely had HCV reported cases for either group. Non-Thai were rarely reported from other regions, except Bangkok. (Table 3, Figure 4)

Non-specific Hepatitis Infection

The number of reported cases of non-specific hepatitis decreased in the 5-year period and significantly plunged from 2013 – 2014, then leveled off around 960 - 1000 cases per year from 2015 – 2017. (Figure 1) The decreasing reported cases happened both among Thai and non-Thai; however, the number of reported cases substantially decreased among Thai. (Table 1) Among non-Thai, the reported cases were younger, single in marital status, and worked more in agriculture sections, compared with Thai. Public healthcare facilities were the leading healthcare access for both groups and both received treatment as outpatients. However, non-Thai received treatment in private healthcare settings and the number of reported cases receiving ongoing treatment was higher, compared with Thai. During 5-year period, five cases (0.9%) in Thai reported deaths, in contrast to zero reports for non-Thai. The time to detect was longer in non-Thai, compared with Thai nationals (10.4 days for non-Thai vs 4.2 days for Thai). Whereas, there was no statistical difference for the duration of the record. (Table 2)

The number of reported cases by quartile had the same pattern as other hepatitis infections. The first quartile had the greatest number of records; the fourth quartile had the fewest. (Table 3) Among Thai nationals, northeast was the region with the greatest number of reports; whereas, northern regions had the greatest number for non-Thai. The western region reported the fewest number of reports for both groups. (Table 3, Figure 4)

Discussion

The Thailand National Epidemiological Surveillance database is the passive PHS in which cases are received reports from healthcare facilities, including from both public and private. Healthcare workers report from local healthcare into a system that connects to the regional and central database. Therefore, errors in data reports, data entry, and data transfer can occur. Data inspection and correction occur at each step before submitting from districts to provinces to regions and finally reaching the central database. Previously, the quality of data at the national level has been poor. Our study showed fewer than 1% data entry errors – duplication, missing values, implausible values, and false entries. Our results showed efficiency in data management; however, there were a large number of missing values in the classification among non-Thai residents as a result of the difficulty in determining which groups of non-Thai were vulnerable to hepatitis infection. This information was useful for disease awareness, prevention, and implementation of public health interventions in the era of a large influx of migrants.

Our study showed better performance, compared with neighboring countries' PHS which showed 1% – 5% inconsistent data reporting (30). However, the Thai national PHS database should improve in weak areas like recording type of foreigners and strengthen database efficiency for sustainability. Additionally, future amendments in the database should be flexible to create standard forms for regions, share outbreak information, and control future regional outbreaks.

The number of total reported hepatitis cases substantially decreased during the study period. We could explain this by improved healthcare and increases in healthcare providers and medical technology. The number of medical doctors and nurses increased by 3,000 and 30,000 positions

nationwide during the study period (31). Also, the number of qualified medical laboratories increased to improve diagnosis (32). Moreover, officers and medical personnel responsible for PHS in the Department of Disease Control, Ministry of Health continuously received training in PHS (33). Therefore, the number of diagnoses increased and the accuracy in data entry improved.

The number of reported HCV cases was relatively lower than other HCV hepatitis studies, such as approximately 1% from the blood sample (4). There are a few reasons for this. First, the numbers did not include chronic asymptomatic cases like other studies. The numbers mainly reported those who experienced acute events which were likely acute or chronic active hepatitis types. Second, the difficulty in the making diagnosis of acute hepatitis requires the detection of active replication of hepatitis C virus RNA; laboratories to perform this testing were only available in large hospitals. Therefore, the number from the PHS database did not reflect the actual burden of HCV.

The mean age of hepatitis among non-Thai was considerably younger than Thai nationals. Only, HCV reported cases had the same ages for both groups and HAV mainly infects children to adolescents in both groups. However, Thais likely get infected in adolescence. This finding supports the evidence that Thailand might have HAV outbreaks in adults due to weaning of antibody. Regarding viral hepatitis B, both groups likely were infected during adolescence and adults. Therefore, the interventions, like vaccination, family education, and sexual education for preventing HBV should focus on at-risk age groups and the interventions should be implemented in older children in non-Thais before they become sexually active.

Public hospitals were the preferred healthcare section both groups; however, the number of cases in private settings were slightly higher in non-Thai. Non-Thai, also, required more hospitalization than Thai nationals, especially individuals having viral hepatitis A and B. Our results supported the study that showed migrant workers prefer private clinics and sought medical treatment for major health problems (34).

The outcome of treatment was difficult to interpret because it was the result in detecting time which cases were an investigation period. The unknown outcome was the most common result in both groups that could explain with few possibilities. Time of record was relatively short to determine the outcome of hepatitis cases. Usually, people with viral hepatitis usually recover in 4-8 weeks after symptoms begin (35). Most of the cases were OPD cases that they might loss follow up during treatment. Additionally, only Thai with hepatitis died in this study and HBV was the most common causes, following to non-specific hepatitis, and HCV that could explain by these diseases occurs in older age in Thai nationals with might have more complications or co-morbidity (36).

Time to detection case was statistically significant in total hepatitis, but, in detail, only non-specific hepatitis showed a statistically significant difference. The duration was statically significant longer in non-Thai. It might explain with few possibilities. It required complex investigations and migrant workers could not afford investigations immediately. Therefore, the duration for diagnosis or detection were a significant difference in non-specific hepatitis cases.

Reporting on viral hepatitis cases occurred throughout the year which supported Thailand is an endemic of viral hepatitis. We found the time-interval pattern which the number of cases was the highest on the first quartile, and continuously decreased until the end of the year. Then, the numbers increased to reach a peak again in the early next year. This pattern is not related to seasoning or festivals. Therefore, the interventions to reduce the number of hepatitis should be promoted throughout the year, but focus on the end of the year before the numbers increased in the next year.

The number of reports in regions could illustrate the how nationality effect to hepatitis occurrence and this information would be used to apply interventions. Some regions, like north-east and western region, most of HBV cases were Thai nationals. On the other hand, some areas, HBV, the number of cases in Thai nationals and non-Thai gradually increased during the study period in Bangkok and number of reports, in HAV, continuously increased in Bangkok and northern regions. Therefore, interventions to reduce viral hepatitis cases not only focus on regions, but also consider nationality.

This study has significant strengths and potential limitations. Length of the study period and large sample size are potential strengths. Sample size showed the number of cases at the national level. Furthermore, continuous analyzing data for five years period revealed the possible trends of hepatitis to provide any clues for future public health interventions. Lastly, we analyzed the quality of data management on an existing surveillance system that disclosure the strengths and weakness to give feedbacks for system improvement. There are a few potential limitations.

Firstly, the possible limitation is that the reports include all possibility of hepatitis diagnosis and the reports from surveillance are passive surveillance. Therefore, the number of reports might not be accurate to actual occurrence, might be overestimating or underestimating. Secondly, we analyzed the non-Thai population included all type of migrants, including medical tourists, that might not be accurate for migrant workers. Lastly, we did not report in the prevalence of diseases because of the limitation of population migration and an actual number of non-Thai on a specific period. Therefore, further in-depth analysis studies to improve accuracy in diagnosis and the actual number of migrants required to determine the effect of migrants toward Thai public health.

In summary, the Thailand national PHS database revealed competency in data management and reporting time. HBV is the highest burden in Thailand; while, HAV gradually increased over time. The association between non-Thai and Thai was found in some hepatitis types, in specific regions. Further analysis to find the link and truly impact should be promoted. However, the public health intervention for preventing, controlling diseases spreading should initially implement in at-risk groups and regions on Thai nationals along with monitoring the number of cases in non-Thai.

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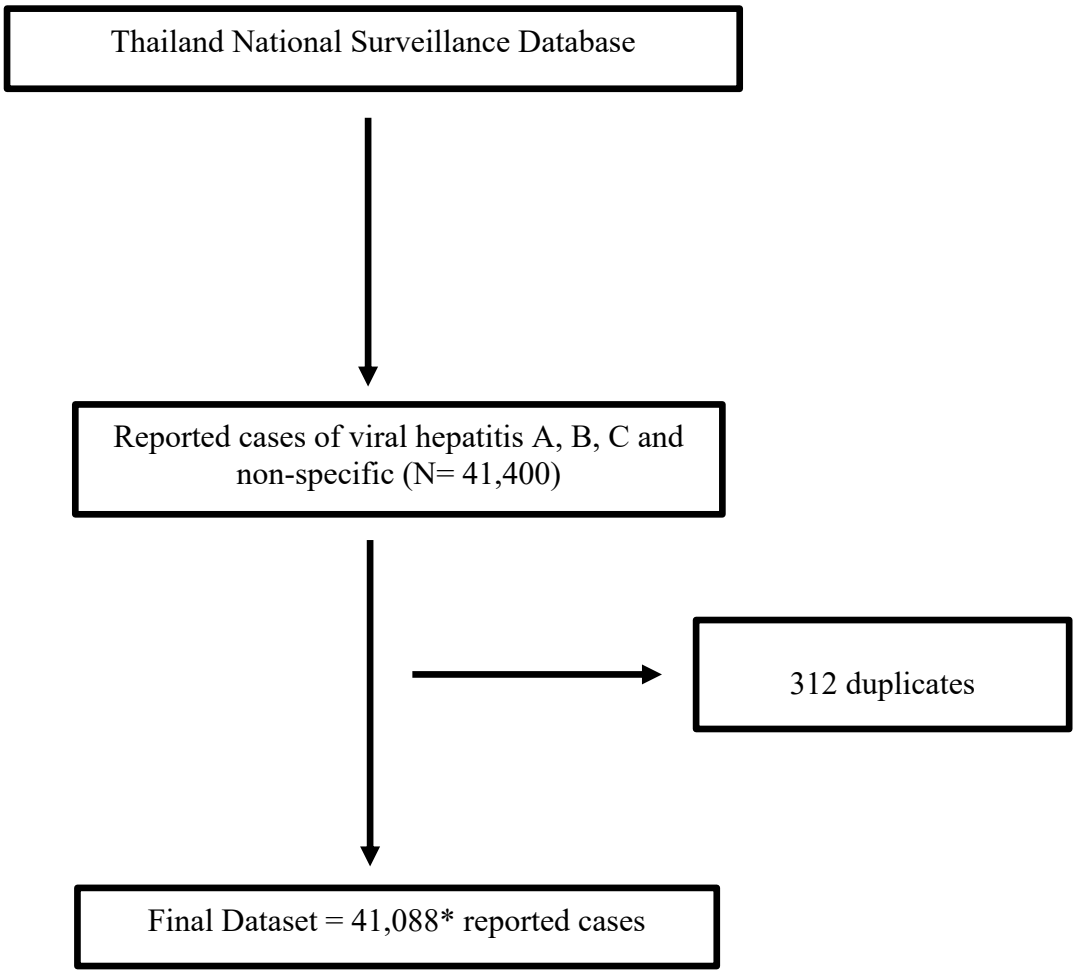
Figure 1. Data Cleaning of Reported Cases of Viral Hepatitis, Thailand Ministry of Public Health, 2013 – 2017



*14 missing or errors "nationality", 41 missing "occupation", 35 missing "surveillance time", 161 missing "foreigner type"

Figure 2. Number of Reported Cases of Viral Hepatitis, by Type and Year, Thailand Ministry of Public Health, 2013 – 2017

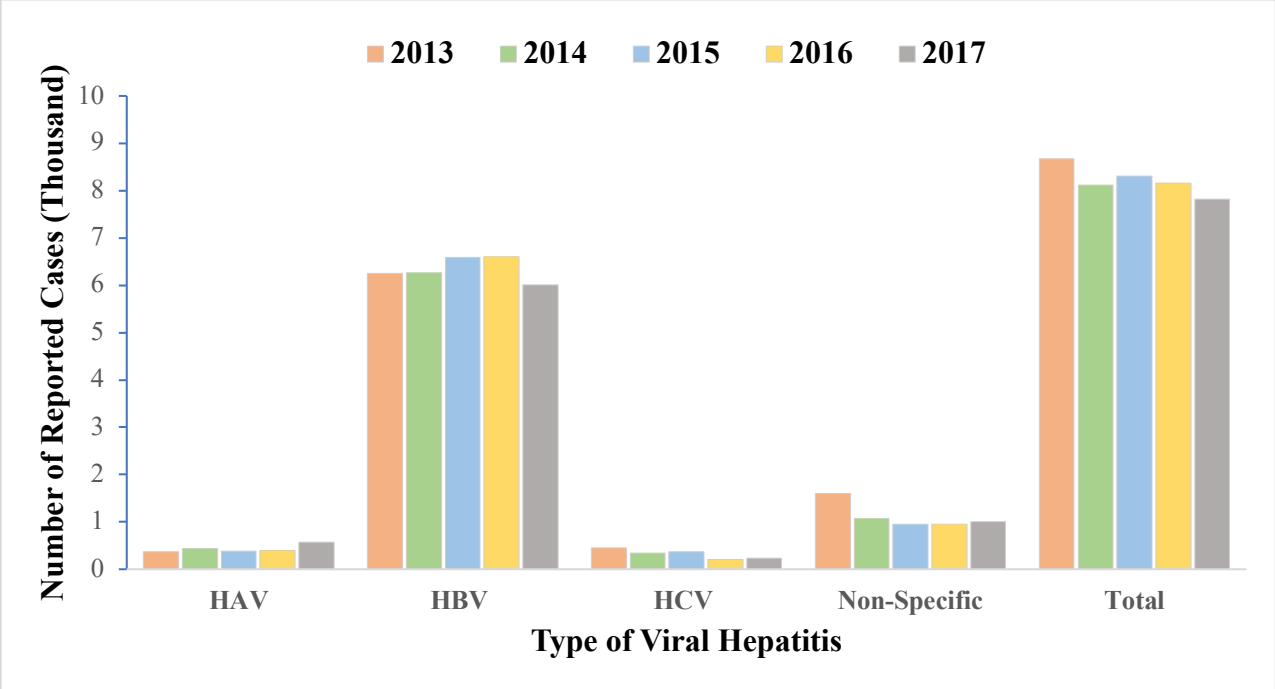


Figure 3. Reported Cases of Viral Hepatitis, by Nationality and Year, Thailand Ministry of Public Health, 2013 – 2017

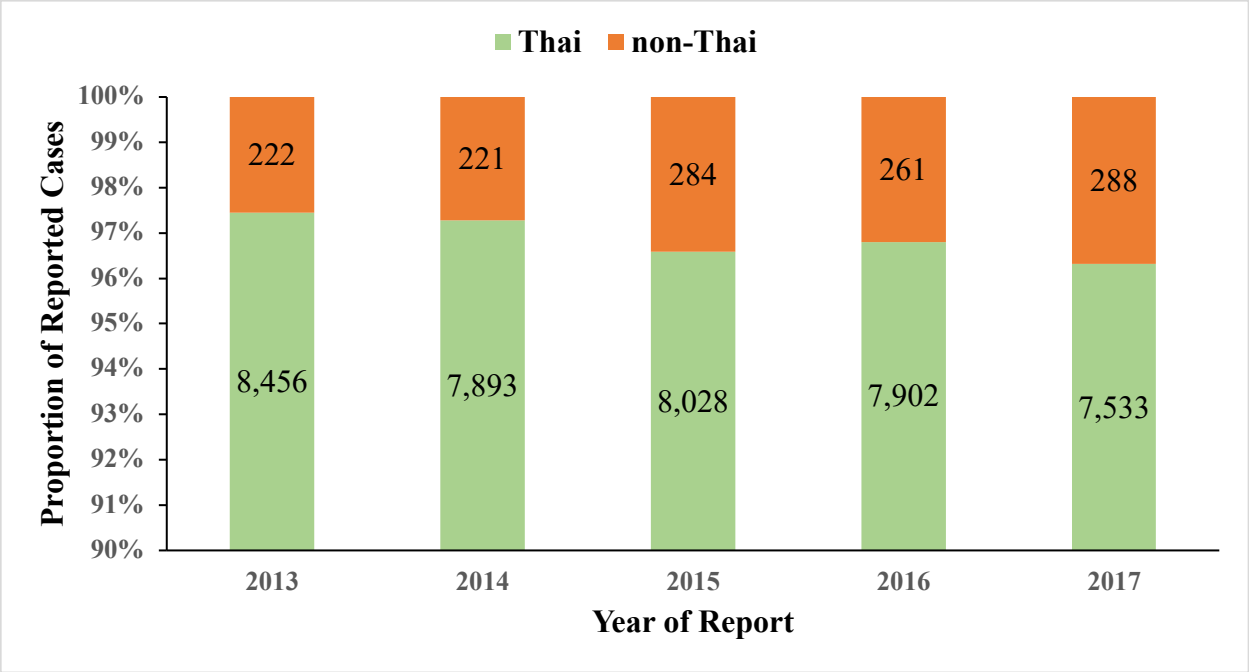


Table 1. Number of Reported Cases of Viral Hepatitis, by Type and Nationality, Thailand Ministry of Public Health, 2013 – 2017

	2013		2014		2015		2016		2017	
Type	**Thai (%)**	**non-Thai (%)**	**Thai (%)**	**non-Thai (%)**	**Thai (%)**	**non-Thai (%)**	**Thai (%)**	**non-Thai (%)**	**Thai (%)**	**non-Thai (%)**
HAV	355 (95.7)	16 (4.3)	423 (96.8)	14 (3.2)	364 (93.8)	24 (6.2)	376 (94.9)	20 (5.1)	539 (93.4)	38 (6.6)
HBV	6,107 (97.6)	149 (2.4)	6,113 (97.5)	155 (2.5)	6,391 (97)	204 (3)	6,414 (97.1)	192 (2.9)	5,808 (96.6)	207 (3.4)
HCV	440 (98.7)	6 (1.3)	328 (96.2)	13 (3.8)	361 (97.3)	10 (2.7)	213 (100)	0 (0)	229 (98.1)	1 (1.9)
Non-specific	1,554 (96.8)	51 (3.2)	1,029 (96.3)	39 (3.7)	912 (95.2)	46 (4.8)	899 (94.8)	49 (5.2)	957 (95.8)	42 (4.2)
Total	8,456 (97.4)	222 (2.6)	7,893 (97.3)	221 (2.7)	8,028 (96.6)	284 (3.4)	7,902 (96.8)	261 (3.2)	7,533 (96.3)	288 (3.7)

Table 2. Characteristics of Reported Cases of Viral Hepatitis, by Type and Nationality, Thailand Ministry of Public Health, 2013 – 2017

	HAV			HBV			HCV			Non-Specific			Total		
Characteristic	**Thai (%)**	**non-Thai (%)**	**P-value**	**Thai (%)**	**non-Thai (%)**	**P-value**	**Thai (%)**	**non-Thai (%)**	**P-value**	**Thai (%)**	**non-Thai (%)**	**P-value**	**Thai (%)**	**non-Thai (%)**	**P-value**
Age (mean+/-SD)	35.7 (19)	23.9 (17.4)	<0.0001	43.8 (14.7)	32.5 (13)	<0.0001	49.8 (13.3)	48.0 (2.4)	0.47	44.5 (17.1)	32.9 (14.7)	<0.0001	43.7 (15.4)	32.5 (13)	<0.0001
Gender Male (%)	1,155 (56.2)	58 (51.8)	0.37	17,766 (57.6)	733 (57.5)	0.88	1,019 (64.9)	15 (50)	0.09	3,012 (56.3)	125 (55.1)	0.72	22,949 (57.7)	733 (57.5)	0.88
Marital status			<0.0001			<0.0001			0.07			<0.0001			<0.0001
Single	1,072 (52.1)	86 (76.8)		11,344 (36.8)	730 (57.2)		432 (27.5)	14 (46.7)		1,805 (33.7)	121 (53.3)		14,653 (36.8)	730 (57.2)	
Married	934 (45.4)	25 (22.3)		18,772 (60.9)	533 (41.8)		892 (56.8)	16 (53.3)		3,337 (62.4)	101 (44.5)		23,935 (60.1)	533 (41.8)	
Divorce	26 (1.3)	0 (0)		320 (1)	6 (0.5)		8 (0.5)	0 (0)		76 (1.4)	2 (0.9)		430 (1.1)	6 (0.5)	
Widow	18 (0.9)	0 (0)		301 (1)	4 (0.3)		6 (0.4)	0 (0)		105 (2)	3 (1.3)		430 (1.1)	4 (0.3)	
Unknown	7 (0.3)	1 (0.9)		96 (0.3)	3 (0.2)		233 (14.8)	0 (0)		28 (0.5)	0 (0)		364 (0.9)	3 (0.2)	
Occupation			0.02			<0.0001			0.002			0.001			<0.0001
Agriculture	1,087 (53)	44 (39.3)		21,280 (69.1)	956 (75.2)		951 (60.6)	11 (36.7)		3,331 (62.4)	155 (68.3)		26,649 (67)	956 (75.2)	
Non-agriculture	540 (26.3)	39 (34.8)		5,342 (17.3)	107 (8.4)		153 (9.7)	1 (3.3)		1,008 (18.9)	21 (9.2)		7,043 (17.7)	107 (8.4)	
Unknown	423 (20.75)	29 (25.9)		4,188 (13.6)	209 (16.4)		466 (29.9)	18 (60)		1,003 (18.7)	51 (22.5)		6,083 (15.3)	209 (16.4)	
Healthcare			0.02			<0.0001			<0.0001			0.001			<0.0001
Public	1,732 (84.2)	85 (75.9)		29,123 (94.5)	1,065 (83.5)		1,301 (82.8)	10 (33.3)		4,776 (89.3)	187 (82.4)		36,932 (92.8)	1,065 (83.5)	
Private	325 (15.8)	27 (24.1)		1,710 (5.5)	211 (16.5)		270 (17.2)	20 (66.7)		575 (10.7)	40 (17.6)		2,880 (7.2)	211 (16.5)	
Patient type			0.72			0.04			0.89			0.68			0.04
Outpatient	1,716 (83.4)	92 (82.1)		28,701 (93.1)	1,119 (87.7)		1,240 (78.9)	24 (80)		3,965 (74.1)	171 (75.3)		35,622 (89.5)	1,119 (87.7)	
Inpatient	341 (16.6)	20 (17.9)		2,132 (6.9)	157 (12.3)		331 (21.1)	6 (20)		1,386 (25.9)	56 (24.6)		4,190 (10.5)	157 (12.3)	
Outcome			0.005			<0.0001			0.07			0.0001			<0.0001
Recovery	394 (19.2)	27 (24.1)		6,115 (19.8)	309 (24.2)		184 (11.7)	8 (26.7)		1,069 (19.9)	33 (14.5)		7,762 (19.5)	309 (24.2)	
Death	0 (0)	0 (0)		12 (0.1)	0 (0)		1 (0.1)	0 (0)		5 (0.1)	0 (0)		18 (0.1)	0 (0)	
Ongoing treatment	606 (29.5)	45 (40.2)		7,505 (24.3)	365 (28.6)		235 (14.9)	2 (6.7)		1,320 (24.7)	86 (37.9)		9,666 (24.3)	365 (28.6)	
Unknown	1,057 (51.3)	40 (35.7)		17,201 (55.8)	602 (47.2)		1,151 (73.3)	20 (66.6)		2,957 (55.3)	108 (47.6)		22,366 (56.1)	602 (47.2)	
Surveillance Time (Days) (Mean +/- SD)															
Time to detect[1]	4.1 (11.6)	4.2 (8.5)	0.94	3.11 (14.5)	3.4 (21)	0.61	6.2 (28.8)	5.8 (26.9)	0.94	4.2 (17.1)	10.4 (39.7)	<0.0001	3.4 (15.5)	4.7 (21)	0.003
Time to record[2]	4.0 (13.8)	3.2 (7.2)	0.57	3.50 (15.7)	3.7 (10.1)	0.66	4.5 (20.4)	2.4 (2.3)	0.57	3.2 (12.3)	2.4 (5.9)	0.33	3.5 (15.4)	3.4 (10.1)	0.82
Total	2,057	112		30,833	1,276		1571	30		5,351	227		39,812	1,276	

[1] Duration between disease onset and time of diagnosis, [2] Duration between a time of diagnosis and time of record cases.

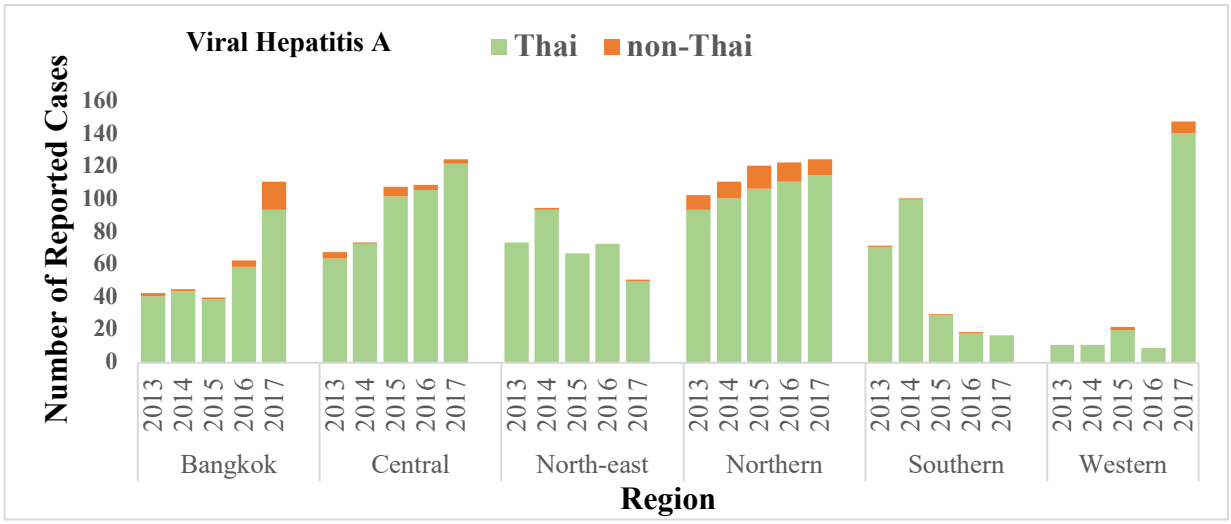
Table 3. Number of Reported Cases of Viral Hepatitis, by Quartile, Region, Type and Nationality, Thailand Ministry of Public Health, 2013 – 2017

	HAV			HBV			HCV			Non-Specific			Total		
Characteristic	**Thai (%)**	**non-Thai (%)**	**p-value**	**Thai (%)**	**non-Thai (%)**	**p-value**	**Thai (%)**	**non-Thai (%)**	**p-value**	**Thai (%)**	**non-Thai (%)**	**p-value**	**Thai (%)**	**non-Thai (%)**	**p-value**
Quartile			0.41			0.2			0.0002			0.75			0.18
First	650 (31.6)	31 (27.7)		9680 (31.4)	277 (30.5)		512 (32.6)	7 (23.3)		1761 (32.9)	67 (29.5)		12,603 (31.7)	382 (29.9)	
Second	577 (28)	30 (26.8)		7852 (25.5)	210 (23.2)		391 (24.9)	7 (23.3)		1380 (25.8)	63 (27.8)		10,200 (25.6)	310 (24.3)	
Third	499 (24.3)	35 (31.2)		579 (24.6)	247 (27.2)		366 (23.3)	1 (3.3)		1309 (24.5)	58 (25.5)		9,753 (24.5)	341 (26.7)	
Fourth	331 (16.1)	16 (14.3)		5722 (18.5)	173 (19.1)		302 (19.2)	15 (50)		901 (16.8)	39 (17.2)		7,256 (18.2)	243 (19)	
Region			<0.0001			< 0.0001			<0.0001			<0.0001			<0.0001
Bangkok	277 (13.5)	25 (22.3)		1534 (5)	119 (13.1)		249 (15.8)	20 (66.7)		523 (9.8)	39 (17.2)		2,583 (6.5)	203 (15.9)	
North-East	358 (17.4)	2 (1.8)		11,048 (35.8)	35 (3.9)		737 (46.9)	1 (3.3)		1,524 (28.5)	12 (5.3)		13,667 (34.2)	50 (3.9)	
Northern	528 (25.7)	55 (49.1)		7,001 (22.7)	275 (30.3)		156 (9.9)	5 (16.6)		1,225 (22.9)	97 (42.7)		8,910 (22.4)	432 (33.9)	
Southern	235 (11.4)	4 (3.6)		3,382 (11)	176 (19.4)		47 (3)	2 (6.7)		480 (9)	21 (9.3)		41,44 (10.4)	203 (15.9)	
Western	192 (9.3)	9 (8)		2,470 (8)	60 (6.6)		15 (1)	0 (0)		372 (6.9)	10 (4.4)		3,049 (7.7)	79 (6.2)	
Central	467 (22.7)	17 (15.2)		5,398 (17.5)	242 (26.7)		367 (23.4)	2 (6.7)		1,227 (22.9)	48 (21.1)		7,459 (18.7)	309 (24.2)	
Total	2,057	112		30,833	907		1,571	30		5,351	227		39,812	1,276	

Table 4. Number of Reported Cases of Viral Hepatitis A and B, by Nationality and Age-group, Thailand Ministry of Public Health, 2013 – 2017

	HAV			HBV		
Characteristic	**Thai (%)**	**Non-Thai (%)**	**P-value**	**Thai (%)**	**Non-Thai (%)**	**P-value**
Age-group			<0.0001			<0.0001
0 – 5	87 (4.2)	10 (8.9)		125 (0.4)	2 (0.2)	
6 – 9	117 (5.7)	21 (18.6)		60 (0.2)	1 (0.1)	
10 – 19	256 (12.6)	22 (19.6)		798 (2.6)	52 (5.7)	
20 – 30	395 (19.2)	23 (20.5)		5,528 (17.9)	397 (43.8)	
31 – 45	541 (26.3)	21 (18.8)		10,311 (33.4)	333 (36.7)	
46 – 60	449 (21.8)	12 (10.7)		9,898 (32.1)	106 (11.7)	
61 – 75	174 (8.5)	2 (1.8)		3,551 (11.5)	13 (1.4)	
> 75	38 (2)	1 (0.9)		562 (1.8)	3 (0.3)	
Total	2,057	112		30,833	907	

Figure 4. Reported Cases of Viral Hepatitis A, B, C, and non-specific, by Region and Year, Thailand Ministry of Public Health, 2013 – 2017



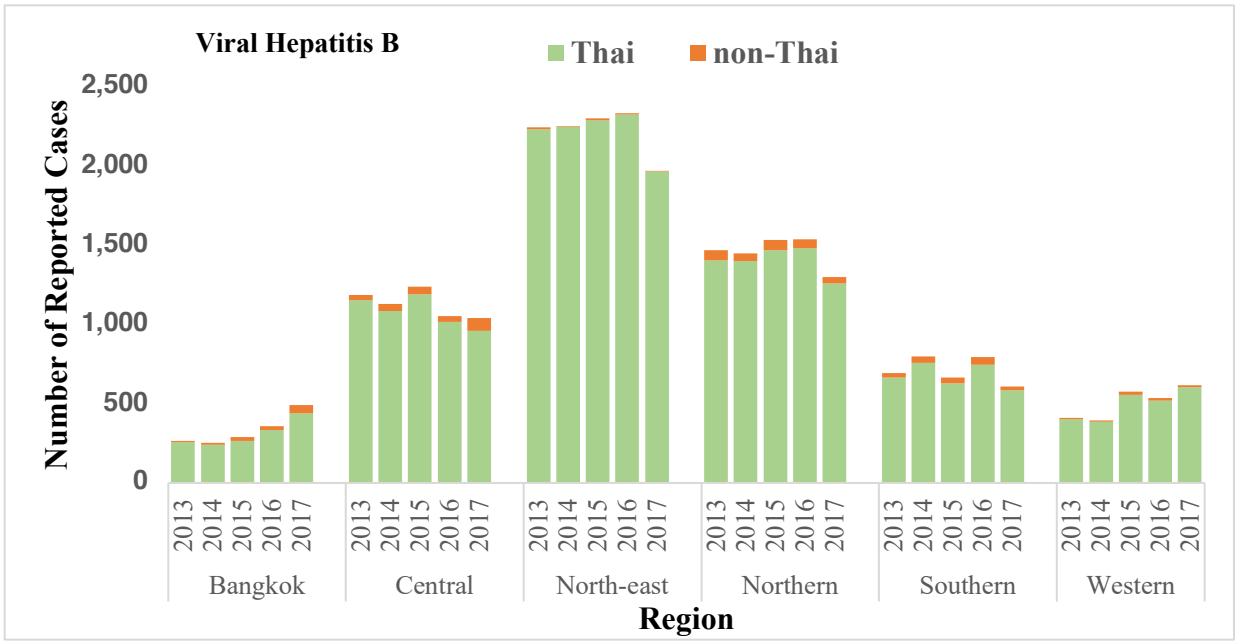


Figure 4 (Cont). Reported Cases of Viral Hepatitis A, B, C, and non-specific, by Region and Year, Thailand Ministry of Public Health, 2013 – 2017