

Healthcare use for communicable diseases among migrant workers in comparison with Thai workers

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Abstract: This study examines healthcare use in 2011 for communicable diseases among migrant workers compared with Thai workers in Thailand. The relative risks (RRs) of 14 communicable diseases (803,817 cases between ages 18 and 59) were calculated using the National Epidemiological Surveillance System, a nationwide hospital database. Regarding the migrant workers, 71.0% were Burmese and 17.3% were Cambodians. Significantly high comparative RRs for migrant workers were found for tuberculosis (TB) (male, RR=1.41; female, RR=2.33), sexually transmitted infections (STIs) (male, RR=2.39; female, RR=1.64), and malaria (male, RR=8.31; female, RR=11.45). Significantly low comparative RRs for migrant workers were found for diarrhea (male, RR=0.39; female, RR=0.28), food poisoning (male, RR=0.33; female, RR=0.24), dengue (male, RR=0.82; female, RR=0.68), and others. By occupation, RRs for TB and STIs were high among laborers but low among farmers. RRs for malaria among farmers (male, RR=18.26, female, RR=25.49) was higher than among laborers (male, RR=10.04; female, RR=13.93). The study indicated a higher risk of TB, STIs, and malaria for migrant workers, but a lower risk of diarrhea, food poisoning, dengue, and others. Although general health support program for migrants have promoted maternal and child health, prevention of communicable diseases should be further strengthened to meet the needs of migrants.

Key words: Migrant workers, Communicable diseases, Tuberculosis, STIs, Malaria, ASEAN

Introduction

A sharp increase was seen recently, in the number of migrants in the ASEAN (Association of Southeast Asian Nations) region from 2,876,616 in 1990 to 9,867,722 in 2015. Thailand is now the major destination in this region for migrants, an estimated 3.9 million, including documented and undocumented workers, their families and refugees¹. The Thai Office of Foreign Workers Administration, Department of Employment of the Ministry of

Labour reported that in 2014 over 1.3 million migrants from more than 40 nations worked in Thailand with documentation. The majority of the migrant workers came from Burma, Cambodia and Lao People's Democratic Republic (Lao PDR)².

This surge of migration is challenging the health of migrant workers, with potential increase of a demand for healthcare services³. Most migrant workers are employed in low-skilled jobs and their living and working conditions are generally poor⁴. Case studies report general malaria⁵ and tuberculosis (TB)⁶ among migrant workers in link with their low socioeconomic status.

The nationwide surveillance of diseases among foreign residents started in 1996 in Thailand. It revealed that the

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healthcare use among migrants for malaria, was more than 10 times higher than the general Thai population in the first ten years⁷⁾.

Thailand has developed two health protection plans for migrant workers. One is a social security scheme for documented migrant workers who are working in the formal private sector. Another program is Compulsory Migrant Health Insurance Scheme for registered migrant workers, undocumented migrant workers and their families who came from Burma, Cambodia, and Lao PDR who cannot participate in the above mentioned scheme. Migrant workers are required to have health insurance from at least one of these two programs^{8, 9)}.

The regional integration framework launched by the ASEAN Economic Community (AEC) at the end of 2015 is expected to enhance mobility of workers among ASEAN countries¹⁰⁾. Disease prevention programs considering migrants' disease pattern and healthcare use are in need.

The objective of this study was to investigate healthcare use for communicable diseases among migrant workers in comparison with Thai workers in Thailand.

Subjects and Methods

Data collection

We analyzed healthcare use among migrants and Thai nationals aged 18 to 59 years old working in Thailand, using a nationwide hospital patient record. Data on healthcare by disease category, age, gender, nationality, marital status, occupation, place of residence (rural or urban), and region within Thailand where they lived were collected from the 2011 National Epidemiological Surveillance System, performed by the Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health. This data consisted of 2,526,749 cases covering all patients having one or more of 84 selected diseases throughout the year in all public and private hospitals and clinics. The National Epidemiological Surveillance System is a mandatory reporting system that uses the Morbidity Notification Card 506 (form 506), regardless of the patient's nationality and legal status.

The gross number of the working population (Thai citizens and foreigners) living in Thailand was obtained from the 2010 Population and Housing Census, National Statistical Office, Ministry of Information and Communication Technology. The Population and Housing Census data was collected from all the members of each household living in Thailand; Thai people residing in Thailand on the census date and foreigners who had been living in Thailand for

at least three months prior to the census date. The census data included information on gender, age, occupation, and nationality.

Subjects

803,817 cases of healthcare use by workers aged between 18 and 59 reported between January 1 and December 31, 2011, were considered possible subjects for this study. The minimum number of cases necessary to provide a 95% confidence interval (0.8, 1.2) under the null hypothesis was calculated at 4,800. More than 4,800 cases were found in 14 communicable diseases (i.e., diarrhea, dysentery, food poisoning, TB, sexually transmitted infections (STIs), dengue (dengue fever, dengue hemorrhagic fever, and dengue shock syndrome), varicella, herpes zoster, viral hepatitis, hemorrhagic conjunctivitis, malaria, influenza, pneumonia, and fever of other and unknown origin).

Variables

Subjects were classified into two citizenship categories: Thai and non-Thai. Measured sociodemographic variables included age, gender, nationality, marital status, occupation, place of residence (urban or rural), and region. Study subjects were classified into three age groups (young adults: 18–24 years, adults: 25–39 years, and middle-aged adults: 40–59 years), two gender groups (male and female), four nationalities (Burmese, Cambodian, Laotian, and others), four marital statuses (single, married, divorced/widowed, and unknown), three occupational groups (farmers, laborers, and others), two areas of residence (urban and rural), as well as five regions (Bangkok, central (excluding Bangkok), north, northeast, and south). The 14 diseases were coded according to the ICD-10 system.

Statistical analysis

Sociodemographic characteristics were compared between migrant and Thai cases reported in the 2011 National Epidemiological Surveillance System data using a chi-square test. The relative risks (RRs) and 95% confidence intervals (95% CIs) for healthcare use due to 14 communicable diseases were calculated to compare the cumulative incidence between migrant workers and Thai workers, using the Thai workers as a reference population by gender, age group and occupational category. RRs¹¹⁾ and 95% CIs¹²⁾ were calculated with the following formulas:

$$RR = \frac{CI_m}{CI_t}$$

Where CI_m and CI_t were cumulative incidence among migrant workers and cumulative incidence among Thai workers which were calculated with the following equation:

$$CI_m = (\text{number of migrant worker cases reported for a disease from January 1 to December 31, 2011}) / (\text{number of migrant worker population as of September 1, 2010})$$

$$CI_t = (\text{number of Thai worker cases reported for a disease from January 1 to December 31, 2011}) / (\text{number of Thai worker population as of September 1, 2010})$$

95% CI for Ln (RR)

$$= \text{Ln}(\text{RR}) \pm Z \sqrt{\frac{(n_1 - x_1) / x_1}{n_1} + \frac{(n_2 - x_2) / x_2}{n_2}}$$

95% CI for RR = exp (lower limit), exp (upper limit)

Migrant workers without disease are represented by $n_1 - x_1$, x_1 was migrant workers with disease, n_1 was the total population of migrant workers, $n_2 - x_2$ was Thai workers without disease, x_2 was Thai workers with disease, and n_2 was the total population in Thai workers.

The population by age group and gender was obtained from the 2010 Population and Housing Census. The occupational categories and genders of the total population were calculated by applying the same proportion of categories and genders for migrant and Thai cases of 2011 National Epidemiological Surveillance System Data.

Ethical approval

This study was reviewed and approved by the Ethical Review Committee of the Tokyo Medical and Dental University (No. 1779). Official permission to use data from the National Epidemiological Surveillance System was obtained from the Bureau of Epidemiology, Ministry of Public Health in Thailand.

Results

Table 1 shows the distribution of sociodemographic characteristics for migrant and Thai workers. Workers aged under 40 years stood at 81.1 percent of migrants and 49.1 percent of Thai. Among the migrant workers, the three largest national groups were Burmese (71.0 percent), Cambodians (17.3 percent) and others (6.8 percent). Farmers were 9.2 percent of migrant workers and 41.9 percent of Thai workers. Looking at the region of Thailand where they lived, fewer migrant workers lived in the northeast (2.3 percent) compared with Thai workers (36.0 percent).

Table 1. Sociodemographic characteristics of healthcare use among migrant and Thai workers in 2011

Characteristics	Migrant workers (total = 17,193)		Thai workers (total = 786,624)		p-value
	Number	%	Number	%	
Age (years)					
Young adults (18–24)	5,061	29.4	85,428	10.9	***
Adults (25–39)	8,889	51.7	300,785	38.2	
Middle-aged adults (40–59)	3,243	18.9	400,411	50.9	
Gender					
Male	9,667	56.2	320,804	40.8	***
Female	7,526	43.8	465,820	59.2	
Nationality					
Burmese	12,206	71.0	—	—	
Cambodian	2,979	17.3	—	—	
Laotian	838	4.9	—	—	
Others	1,170	6.8	—	—	
Marital status					
Single	8,616	50.1	226,254	28.8	***
Married	8,338	48.5	542,510	69.0	
Divorced/widowed	98	0.6	13,533	1.7	
Unknown	141	0.8	4,327	0.5	
Occupation					
Farmers ^a	1,585	9.2	329,570	41.9	***
Laborers ^b	14,790	86.0	356,155	45.3	
Others ^c	818	4.8	100,899	12.8	
Place of residence					
Urban	5,015	29.2	191,747	24.4	***
Rural	12,178	70.8	594,877	75.6	
Region					
Bangkok (metropolis)	624	3.6	16,133	2.1	***
Central (excl. Bangkok)	6,819	39.7	201,842	25.7	
North	5,345	31.1	189,248	24.1	
Northeast	394	2.3	283,456	36.0	
South	4,011	23.3	95,945	12.2	

^a Farmers cultivate crops, working on rice, vegetable, and fruit farms, among others.

^b Laborers are employed by and receive a wage from an employer or work in a company e.g., housemaids, machine operators in a factory or laborers in the industrial and manufacturing sector.

^c Others means occupations not listed elsewhere, such as government officers, vendors, fishermen, teachers, and sex workers.

The sum of the percentages does not equal 100 percent due to rounding. p-values were computed by χ^2 test, and *** = $p < 0.001$

The five most frequently reported diseases among migrant workers were diarrhea, followed by malaria, fever of other and unknown origin, TB and STIs. Among Thai workers, diarrhea, fever of other and unknown origin, hemorrhagic conjunctivitis, food poisoning, and pneumonia were the five most frequent diseases.

Table 2 shows the RRs of 14 diseases by healthcare use among migrant workers compared by gender with Thai workers. Among migrant workers, the risks of healthcare use were high for TB (male, RR = 1.41; female, RR = 2.33), STIs (male, RR = 2.39; female, RR = 1.64), and malaria

Table 2. Relative risks (RRs) of healthcare use due to 14 communicable diseases, comparing migrant and Thai workers by gender

Diseases	ICD-10 codes	Male (Migrant population=775,387, Thai population=16,761,836)						Female (Migrant population=587,257, Thai population=16,124,859)					
		Number of migrant workers	Number of Thai workers	CI _m	CI _t	RR	95% CI	Number of migrant workers	Number of Thai workers	CI _m	CI _t	RR	95% CI
Diarrhea	A02, A04, A08-A09	2,855	157,462	0.0037	0.0094	0.39	0.38–0.41	2,826	280,844	0.0048	0.0174	0.28	0.27–0.29
Dysentery	A03, A06	26	1,836	0.0000	0.0001	0.31	0.21–0.45	37	2,967	0.0001	0.0002	0.34	0.25–0.47
Food poisoning	A05	209	13,854	0.0003	0.0008	0.33	0.28–0.37	235	26,981	0.0004	0.0017	0.24	0.21–0.27
Tuberculosis (TB)	A15–A16, A17.0†–A17.1†, A17.9†, A18–A19, B20.0, J65, K23.0*, K67.3*, K93.0*, M01.0*, M49.0*, M90.0*, N33.0*, N74.0*, N74.1*	1,004	15,446	0.0013	0.0009	1.41	1.32–1.50	566	6,661	0.0010	0.0004	2.33	2.14–2.54
Sexually transmitted infections (STIs)	A50–A60, A63.0, B37.3†, B37.4, B85.3, I98.0*, K67.1*, M03.1*, M73.0*, N29.0*, N34.1, N74.3*, O98.1–O98.2	556	5,021	0.0007	0.0003	2.39	2.19–2.61	726	12,169	0.0012	0.0008	1.64	1.52–1.77
Dengue	A90-A91	337	8,909	0.0004	0.0005	0.82	0.73–0.91	207	8,315	0.0004	0.0005	0.68	0.60–0.78
Varicella	B01	100	6,533	0.0001	0.0004	0.33	0.27–0.40	96	9,136	0.0002	0.0006	0.29	0.24–0.35
Herpes zoster	B02, G53.0*	96	5,407	0.0001	0.0003	0.38	0.31–0.47	78	7,524	0.0001	0.0005	0.28	0.23–0.36
Viral hepatitis	B15-B17, B19	78	4,381	0.0001	0.0003	0.38	0.31–0.48	52	2,673	0.0001	0.0002	0.53	0.41–0.70
Hemorrhagic conjunctivitis	B30, H10.9	511	28,342	0.0007	0.0017	0.39	0.36–0.43	429	39,199	0.0007	0.0024	0.30	0.27–0.33
Malaria	B50-B54	1,929	5,021	0.0025	0.0003	8.31	7.88–8.75	830	1,990	0.0014	0.0001	11.45	10.56–12.42
Influenza	J10-J11	141	7,128	0.0002	0.0004	0.43	0.36–0.51	107	9,274	0.0002	0.0006	0.32	0.26–0.38
Pneumonia	J12-J16, J17.0*–J17.1*, J18, J85.1	303	15,833	0.0004	0.0009	0.41	0.37–0.46	283	13,874	0.0005	0.0009	0.56	0.50–0.63
Fever of other and unknown origin	R50	1,522	45,631	0.0020	0.0027	0.72	0.69–0.76	1,054	44,213	0.0018	0.0027	0.65	0.62–0.70

CI_m was the cumulative incidence among migrant workers. CI_t was the cumulative incidence among Thai workers.

ICD-10 (International Statistical Classification of Diseases and Related Health Problems 10th Revision) codes: Codes that indicate causes of diseases have dagger symbols (†) following them, while codes that indicate specific organs of disease have an asterisk (*). Codes without symbols indicate neither causes nor specific organs.

(male, RR=8.31; female, RR=11.45). Significant low risks of healthcare use of migrant workers compared with Thai workers were shown for diarrhea (male, RR=0.39; female, RR=0.28), food poisoning (male, RR=0.33; female, RR=0.24), dengue (male, RR=0.82; female, RR=0.68) hemorrhagic conjunctivitis (male, RR=0.39; female, RR=0.30), pneumonia (male, RR=0.41; female, RR=0.56), and others.

Table 3 shows the RRs of 14 diseases for migrant workers compared with Thai workers stratified by age group. Healthcare use for TB and malaria was high among all age groups in both male and female migrant workers. Young female adults, adults and middle-aged male adults were at higher risk of STIs.

Table 4 shows the RRs for healthcare use comparing migrant and Thai workers by occupational group. Healthcare use due to TB was significantly high only among laborers (male, RR=1.41; female, RR=2.55). The risks of healthcare use by migrant workers for STIs was higher

among laborers (male, RR=2.07; female, RR=1.35) compared with Thai workers. Healthcare use to treat malaria in migrant workers was high (among all occupational groups) compared with Thai workers, revealing a greater risk among farmers (male, RR=18.26; female, RR=25.49).

Discussion

Using hospital-based data records, this study revealed the most frequent occurrences of communicable diseases among the working population. Healthcare use by migrant workers for diarrhea, dysentery, food poisoning, dengue, varicella, herpes zoster, viral hepatitis, hemorrhagic conjunctivitis, influenza, pneumonia, and fever of other and unknown origin was lower. However, healthcare usage for TB, STIs, and malaria was higher among migrant workers compared with Thai workers. The risk of healthcare use for TB and STIs was high among migrant laborers, and the risk of healthcare use for malaria was at the greatest risk

Table 3. Relative risks (RRs) of healthcare use due to 14 communicable diseases, comparing migrant and Thai workers by age

Diseases	Young Adults (18–24 years old)							
	Male (Migrant population = 183,898, Thai population = 1,766,146)				Female (Migrant population = 179,075, Thai population = 1,447,758)			
	CI _m	CI _t	RR	95% CI	CI _m	CI _t	RR	95% CI
Diarrhea	0.0046	0.0096	0.48	0.45–0.52	0.0045	0.0213	0.21	0.20–0.23
Dysentery	0.0000	0.0001	0.23	0.09–0.63	0.0000	0.0002	0.14	0.06–0.35
Food poisoning	0.0004	0.0007	0.50	0.39–0.64	0.0003	0.0017	0.18	0.14–0.24
Tuberculosis (TB)	0.0010	0.0004	2.33	1.98–2.74	0.0008	0.0004	2.00	1.66–2.40
Sexually transmitted infections (STIs)	0.0006	0.0008	0.82	0.68–0.99	0.0020	0.0011	1.82	1.62–2.04
Dengue	0.0007	0.0015	0.47	0.39–0.55	0.0005	0.0014	0.38	0.31–0.47
Varicella	0.0003	0.0008	0.35	0.27–0.46	0.0003	0.0016	0.16	0.12–0.22
Herpes zoster	0.0002	0.0002	0.92	0.65–1.30	0.0001	0.0002	0.54	0.35–0.83
Viral hepatitis	0.0002	0.0002	0.95	0.64–1.40	0.0001	0.0002	0.57	0.35–0.95
Hemorrhagic conjunctivitis	0.0007	0.0015	0.50	0.42–0.59	0.0006	0.0023	0.25	0.20–0.30
Malaria	0.0034	0.0006	5.99	5.43–6.62	0.0013	0.0002	5.87	4.96–6.96
Influenza	0.0002	0.0005	0.45	0.33–0.62	0.0002	0.0006	0.32	0.23–0.44
Pneumonia	0.0003	0.0004	0.77	0.59–1.02	0.0003	0.0004	0.73	0.55–0.97
Fever of other and unknown origin	0.0025	0.0028	0.87	0.79–0.96	0.0018	0.0031	0.59	0.53–0.66
Diseases	Adults (25–39 years old)							
	Male (Migrant population = 433,140, Thai population = 6,733,167)				Female (Migrant population = 314,209, Thai population = 6,626,251)			
	CI _m	CI _t	RR	95% CI	CI _m	CI _t	RR	95% CI
Diarrhea	0.0036	0.0092	0.39	0.37–0.41	0.0048	0.0160	0.30	0.29–0.32
Dysentery	0.0000	0.0001	0.34	0.20–0.57	0.0001	0.0002	0.48	0.32–0.72
Food poisoning	0.0002	0.0007	0.31	0.26–0.38	0.0004	0.0015	0.29	0.25–0.35
Tuberculosis (TB)	0.0013	0.0008	1.65	1.52–1.80	0.0010	0.0004	2.58	2.29–2.90
Sexually transmitted infections (STIs)	0.0007	0.0003	2.23	1.98–2.52	0.0010	0.0008	1.24	1.11–1.39
Dengue	0.0004	0.0006	0.65	0.56–0.76	0.0003	0.0006	0.51	0.42–0.62
Varicella	0.0001	0.0006	0.17	0.12–0.23	0.0001	0.0008	0.19	0.14–0.25
Herpes zoster	0.0001	0.0002	0.50	0.38–0.66	0.0001	0.0003	0.47	0.35–0.64
Viral hepatitis	0.0001	0.0002	0.36	0.26–0.51	0.0001	0.0001	0.65	0.45–0.94
Hemorrhagic conjunctivitis	0.0007	0.0016	0.40	0.35–0.45	0.0007	0.0023	0.32	0.28–0.37
Malaria	0.0020	0.0003	6.28	5.80–6.79	0.0012	0.0001	9.24	8.18–10.45
Influenza	0.0002	0.0005	0.40	0.32–0.50	0.0002	0.0006	0.32	0.25–0.41
Pneumonia	0.0004	0.0006	0.59	0.50–0.70	0.0005	0.0006	0.80	0.68–0.95
Fever of other and unknown origin	0.0019	0.0026	0.71	0.67–0.77	0.0017	0.0024	0.69	0.63–0.75
Diseases	Middle-aged adults (40–59 years old)							
	Male (Migrant population = 158,349, Thai population = 8,262,523)				Female (Migrant population = 93,973, Thai population = 8,050,850)			
	CI _m	CI _t	RR	95% CI	CI _m	CI _t	RR	95% CI
Diarrhea	0.0029	0.0095	0.30	0.28–0.33	0.0054	0.0179	0.30	0.28–0.33
Dysentery	0.0001	0.0001	0.41	0.20–0.82	0.0001	0.0002	0.42	0.21–0.84
Food poisoning	0.0003	0.0009	0.29	0.21–0.39	0.0005	0.0018	0.27	0.20–0.36
Tuberculosis (TB)	0.0016	0.0011	1.42	1.25–1.61	0.0012	0.0004	2.73	2.26–3.29
Sexually transmitted infections (STIs)	0.0009	0.0002	4.57	3.83–5.45	0.0007	0.0007	1.00	0.78–1.29
Dengue	0.0002	0.0002	0.71	0.48–1.04	0.0001	0.0003	0.48	0.27–0.85
Varicella	0.0000	0.0001	0.19	0.07–0.50	0.0000	0.0002	0.12	0.03–0.46
Herpes zoster	0.0001	0.0004	0.15	0.08–0.28	0.0001	0.0007	0.20	0.11–0.35
Viral hepatitis	0.0001	0.0003	0.32	0.19–0.52	0.0001	0.0002	0.40	0.19–0.84
Hemorrhagic conjunctivitis	0.0006	0.0018	0.34	0.27–0.41	0.0010	0.0026	0.40	0.33–0.49
Malaria	0.0027	0.0002	11.94	10.74–13.27	0.0025	0.0001	23.85	20.63–27.57
Influenza	0.0001	0.0004	0.30	0.19–0.48	0.0001	0.0005	0.20	0.11–0.37
Pneumonia	0.0006	0.0013	0.45	0.36–0.55	0.0009	0.0012	0.79	0.64–0.98
Fever of other and unknown origin	0.0016	0.0028	0.58	0.52–0.66	0.0022	0.0030	0.74	0.65–0.85

Table 4. Relative risks (RRs) of healthcare use due to 14 communicable diseases, comparing migrant and Thai workers by occupational group

Diseases	Farmers							
	Male (Migrant population = 69,785, Thai population = 6,771,782)				Female (Migrant population = 55,202, Thai population = 6,998,189)			
	CI _m	CI _t	RR	95% CI	CI _m	CI _t	RR	95% CI
Diarrhea	0.0015	0.0087	0.17	0.14–0.20	0.0033	0.0168	0.20	0.17–0.23
Dysentery	0.0001	0.0001	0.69	0.33–1.44	0.0001	0.0003	0.36	0.15–0.86
Food poisoning	0.0001	0.0010	0.14	0.07–0.26	0.0003	0.0020	0.15	0.09–0.24
Tuberculosis (TB)	0.0003	0.0009	0.39	0.26–0.58	0.0002	0.0004	0.49	0.27–0.88
Sexually transmitted infections (STIs)	0.0001	0.0001	0.57	0.26–1.28	0.0002	0.0006	0.28	0.15–0.52
Dengue	0.0001	0.0002	0.58	0.31–1.08	0.0001	0.0002	0.33	0.12–0.87
Varicella	0.0000	0.0002	0.12	0.03–0.48	0.0001	0.0003	0.22	0.08–0.59
Herpes zoster	0.0000	0.0003	0.04	0.01–0.30	—	0.0005	—	—
Viral hepatitis	—	0.0002	—	—	0.0001	0.0001	0.60	0.25–1.46
Hemorrhagic conjunctivitis	0.0006	0.0019	0.29	0.21–0.40	0.0014	0.0027	0.50	0.40–0.62
Malaria	0.0076	0.0004	18.26	16.65–20.03	0.0048	0.0002	25.49	22.35–29.06
Influenza	0.0001	0.0002	0.30	0.12–0.71	0.0001	0.0003	0.22	0.08–0.60
Pneumonia	0.0004	0.0010	0.38	0.26–0.56	0.0004	0.0010	0.45	0.30–0.68
Fever of other and unknown origin	0.0016	0.0034	0.47	0.39–0.56	0.0018	0.0032	0.57	0.47–0.69
Diseases	Laborers							
	Male (Migrant population = 676,913, Thai population = 7,811,016)				Female (Migrant population = 497,994, Thai population = 7,111,063)			
	CI _m	CI _t	RR	95% CI	CI _m	CI _t	RR	95% CI
Diarrhea	0.0038	0.0099	0.39	0.37–0.40	0.0051	0.0182	0.28	0.27–0.29
Dysentery	0.0000	0.0001	0.33	0.21–0.53	0.0001	0.0001	0.51	0.35–0.73
Food poisoning	0.0003	0.0007	0.40	0.34–0.46	0.0004	0.0013	0.31	0.27–0.35
Tuberculosis (TB)	0.0014	0.0010	1.41	1.32–1.51	0.0011	0.0004	2.55	2.33–2.80
Sexually transmitted infections (STIs)	0.0008	0.0004	2.07	1.89–2.27	0.0010	0.0007	1.35	1.23–1.48
Dengue	0.0005	0.0007	0.64	0.57–0.72	0.0004	0.0008	0.53	0.46–0.61
Varicella	0.0001	0.0005	0.27	0.22–0.33	0.0002	0.0008	0.23	0.18–0.28
Herpes zoster	0.0001	0.0003	0.47	0.38–0.57	0.0001	0.0004	0.37	0.29–0.47
Viral hepatitis	0.0001	0.0002	0.46	0.36–0.57	0.0001	0.0002	0.58	0.43–0.78
Hemorrhagic conjunctivitis	0.0006	0.0015	0.43	0.40–0.48	0.0007	0.0021	0.32	0.29–0.36
Malaria	0.0020	0.0002	10.04	9.33–10.79	0.0011	0.0001	13.93	12.39–15.66
Influenza	0.0002	0.0005	0.37	0.31–0.44	0.0002	0.0007	0.28	0.23–0.34
Pneumonia	0.0004	0.0009	0.42	0.37–0.47	0.0005	0.0008	0.64	0.57–0.73
Fever of other and unknown origin	0.0020	0.0023	0.87	0.83–0.92	0.0019	0.0024	0.78	0.73–0.83
Diseases	Others							
	Male (Migrant population = 29,465, Thai population = 2,179,039)				Female (Migrant population = 34,061, Thai population = 2,015,607)			
	CI _m	CI _t	RR	95% CI	CI _m	CI _t	RR	95% CI
Diarrhea	0.0051	0.0097	0.52	0.45–0.61	0.0036	0.0167	0.22	0.18–0.26
Dysentery	0.0000	0.0001	0.34	0.05–2.40	0.0000	0.0002	0.18	0.03–1.30
Food poisoning	0.0005	0.0009	0.57	0.35–0.93	0.0004	0.0018	0.24	0.15–0.40
Tuberculosis (TB)	0.0006	0.0007	0.80	0.49–1.28	0.0001	0.0004	0.40	0.17–0.97
Sexually transmitted infections (STIs)	0.0007	0.0005	1.47	0.95–2.26	0.0066	0.0012	5.47	4.77–6.27
Dengue	0.0002	0.0007	0.30	0.13–0.67	0.0000	0.0007	0.04	0.01–0.31
Varicella	0.0001	0.0004	0.25	0.08–0.78	0.0001	0.0006	0.15	0.05–0.45
Herpes zoster	0.0001	0.0004	0.18	0.05–0.74	0.0002	0.0005	0.34	0.15–0.76
Viral hepatitis	0.0001	0.0004	0.17	0.04–0.68	—	0.0002	—	—
Hemorrhagic conjunctivitis	0.0014	0.0018	0.76	0.56–1.04	0.0007	0.0027	0.26	0.18–0.39
Malaria	0.0014	0.0003	4.67	3.39–6.42	0.0002	0.0000	5.09	2.47–10.48
Influenza	0.0002	0.0006	0.32	0.14–0.71	0.0000	0.0009	0.03	0.00–0.24
Pneumonia	0.0005	0.0008	0.58	0.34–0.98	0.0001	0.0007	0.12	0.04–0.37
Fever of other and unknown origin	0.0019	0.0022	0.85	0.65–1.10	0.0009	0.0023	0.39	0.27–0.56

among migrant farmers.

This study revealed the nationwide pattern of healthcare use for workers aged 18 to 59 years, regardless of nationality and legal status. Data were collected from all national and private health facilities in Thailand using standardized reporting based on disease surveillance guidelines. This surveillance covers only cases of patients who visited healthcare facilities. The number of the cases from this passive surveillance system might be underreporting the actual occurrence of communicable diseases.

According to the annual incident statistics shown on Annual Epidemiological Surveillance Reports¹³⁾, there were no big outbreaks of some specific communicable diseases in 2011. Incidence rates in 2011 of diarrhea, dysentery, dengue, viral hepatitis, hemorrhagic conjunctivitis, malaria, pneumonia, and fever of other and unknown origin were within a range of $\pm 10\%$ of their 10-year averages from 2005 to 2014. Reporting of food poisoning was -16.0% of its 10-year average. Incidence rate of varicella fluctuated by years and its incidence in 2011 was 22.4% of its 10-year average, however it was within fluctuation. Incidence rates for TB, STIs, and herpes zoster, there has been a gradual, steady increase in 10 years, but no outbreaks were reported. There was an outbreak of influenza in 2009 and 2010, but in 2011, the incidence was just 11.5% larger than the 10-year average. Some fluctuations of incidence rates were observed, however, their influences to the statistics in 2011 were regarded as minimum.

Healthcare use due to TB among migrant workers was high compared with Thai workers in all age groups. Over 90 percent of migrant workers in this study came from three neighboring countries. Burma, Cambodia and Lao PDR have a high TB burden, with prevalence rates of 457, 668 and 464, respectively compared to a TB prevalence in Thailand of 236¹⁴⁾. Migrant workers are required to submit a health certificate when they first apply for a work permit for Thailand. For TB in particular, work permits are issued to new applicants only if their disease is inactive¹⁵⁾. The RRs of healthcare use for migrant workers due to TB was significantly higher only among laborers. Migrant laborers typically live with others from their home countries in crowded and poorly ventilated rooms^{16–18)}, which increases the risk of TB exposure and transmission.

Migrant workers except farmers (laborers and others) were at higher RRs (RRs 1.35–5.47) for STIs. Previous studies in Thailand have shown that migrant workers are more likely to engage in risky sex, including having multiple partners, visiting commercial sex workers and inconsistent condom use^{19,20)}. These high-risk sexual behaviors

would explain the high RRs for STIs among migrant workers.

Migrant farmers, on the other hand, were at high risk of contracting malaria. Certain agricultural activities increase risk of malaria²¹⁾. Malaria is prevalent in the thick, dense forest areas of provinces along the Thai-Burma and Thai-Cambodia borders^{22,23)}, and 95% of the migrant farmers in this survey lived in such provinces. In Thailand, the Royal Decree B.E. 2522 prohibits foreigners from engaging in 39 types of work, including that of farmer²⁴⁾. A small proportion of farmers among the migrant worker study subjects and high concentrations in risky areas are probably a reflection of the law.

Among migrant workers, the low RRs for dengue could also be explained by looking at where they lived. Dengue transmission intensity was the highest in northeastern Thailand²⁵⁾ but only 2.3 percent of migrant workers lived in the northeast, while 36.0 percent of the Thai workers lived there, in this study.

Healthcare for common diseases in Thailand, such as diarrhea, food poisoning, and pneumonia, was at a lower level among migrant workers compared with Thai workers. This pattern of healthcare use among migrant workers may be due to a poor understanding of health insurance²⁶⁾, language barriers^{3,26)}, and/or poor understanding of when to seek for professional healthcare³⁾. Previous studies of migrant workers in Thailand reported that their most frequent health-seeking behavior was for self-care^{27,28)}.

Health promotion and disease prevention programs using people's own language work effectively in multi-ethnic and multi-language contexts^{29,30)}. Ministry of Public Health and International Organization for Migration launched Migrant Health Program in 2003 in some provinces of Thailand where trained workers provide supports including linguistic services to help migrants to obtain health information, basic health prevention, and healthcare services in the communities. Increased use of antenatal care and vaccination is observed in the communities where migrant health program is installed³¹⁾. However, the study showed higher risks of communicable diseases of migrant workers. Disease prevention programs considering risks for communicable diseases among workers should be developed to meet the needs of migrants.

In conclusion, this nationwide study revealed increased healthcare use among migrant workers for TB, STIs, and malaria. The risk of disease differed according to occupational group, with a high risk of TB among migrant laborers and a high risk of malaria among migrant farmers.

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