

## Accounting for Immigrant Status when Calculating Cancer Incidence Rates for Bangkok

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### Abstract

**Objective:** Cancer-registry data are crucial for defining cancer incidence rates for use in setting service priorities and monitoring service effects. This applies in Thailand where cancer is the leading cause of death and service needs are high. The Bangkok Cancer Registry (population-based) was established in 1990 to determine cancer incidence rates for Bangkok. This proved difficult, however, because the Bangkok population (>8 million) fluctuates with numbers of temporary visitors, many of whom visit Bangkok temporarily for services. If these visitors are mis-categorized as usual residents, cancer incidence rates would be inflated. During 2013-2015, residential addresses on the Registry were cross-checked against official addresses on the National Civil Registration records of the Ministry of Interior. The effects of this cross-checking on incidence rates are discussed. **Methods:** Residential addresses recorded on the Registry for cancer diagnoses in 2013-2015 were corrected using official Ministry data. Effects on numbers of recorded cancers and crude and directly age-standardized rates (World Population) were determined. **Results:** Of 44,813 cancer cases diagnosed and recorded on the Registry during 2013-2015, 36,327 (81.1%) had an official Bangkok address. When limiting analyses to these cases, the crude incidence for all cancer sites combined reduced by 18.9% (19.7% for males and 18.3% for females). Corresponding reductions in age-standardized incidence rates were 20.0% for males and 18.8% for females. These reductions varied for common cancer sites: in males, from 14.8% for lung to 25.9% for colorectal cancer; and in females, from 12.9% for lung to 24.0% for cervical cancer. **Conclusions:** These differences are considered sufficient in magnitude to justify routine use of official residential data when calculating cancer incidence rates for Bangkok. If these rates are to be compared with comparable rates for other Asian cities that serve broader populations, equivalent methodologies for determining residential status would be needed for all cities.

**Keywords:** Cancer incidence- Bangkok- accuracy

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### Introduction

Bangkok, the capital of Thailand, is located centrally on the banks of Chao Praya River. The city extends over 1,569 square kilometres and has a population that exceeds 8 million (i.e., 12.6 % of the Thai population) (NESDB, 2017). It is bordered by Nonthaburi and Pathumthani provinces to the North, Chachoengsoa to the East, Samut Prakan to the South, and Nakhon Pathom and Samut Sakhon to the West. Over 14 million people (22.2 % of the national population) were recorded to live in the broader Bangkok Metropolitan Region in the 2010 census. This far surpasses the population sizes of other urban centres in Thailand.

The Bangkok Cancer Registry (the Registry) was established in 1990 at the National Cancer Institute of Thailand (NCI) with technical support from the International

Agency for Research on Cancer for population-based monitoring (Vatanasapt et al., 1993; (Martin et al, 2001). Initially, CanReg software from the International Agency for Research on Cancer (IARC) was used to create and manage the database (Vatanasapt et al., 1993). In 2012, NCI developed a customized program called the “Thai Cancer Based”, which was further developed in 2015 as a web-based system. Currently, the Registry has obtained voluntary cooperation from local hospitals, including small private hospitals to register cases. The total participation is around 500 hospitals across Thailand which provide cancer data to through the one “Thai Cancer Based” system. This helps to avoid duplicative registrations, improves data quality, and will facilitate planned extensions of the Registry to become a national population-based registry.

Current registrations for Bangkok residents cover

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122 hospitals comprising four university hospitals, 33 government hospitals and 85 private hospitals. Estimating from hospital coverage, Registry data would cover 95% or more of the cancers diagnosed in Bangkok residents.

A major challenge when determining cancer rates for Bangkok, is accounting for effects of population inflows for care from surrounding areas. The Thai National Civil Registration system can now be used to determine residential status (National Identity Card Act. B.E.2505). This system has evolved significantly over the decades from a manual, paper-based system to a centralized and online electronic system, providing better access to accurate records of official places of residence.

In the past, patients could receive medical services in hospitals without presenting ID cards that identified their official place of residence. Lack of reliable evidence of residential addresses was a problem since self-reported addresses were known to be unreliable and to sometimes include temporary Bangkok addresses for short-stays, as undertaken for access to clinical services.

Thailand has universal health coverage, with three major national health insurance schemes, i.e., the Universal Health Coverage Scheme (covering 48 million); Social Health Insurance (covering 10.6 million) and the Civil Servant Medical Benefit Scheme (covering 4.4 million) (Tangcharoensathien V, et al., 2018), which include coverage for cancer treatment. Since Thailand's Universal Coverage Scheme was implemented in all Thai provinces in January 2002, patients have been asked to show their ID cards to gain reimbursement for clinical charges (NHSO, 2012). In addition, with the introduction of digital technology, official addresses of patients can now be checked and any missing fields are filled using ID numbers from the national civil registration files of the Ministry of Interior. This enables exclusion of data for cancer patients whose official addresses are outside Bangkok, thus reducing and better defining cancer incidence rates for the official residential population of Bangkok.

This paper reports the effect of using official addresses on incidence rates by primary cancer site.

## Materials and Methods

### Data Collection

Projection population data was sourced from the Office of the National Economic and Social Development Board (NESDB) for each province in Thailand, totaling 23,935,307 people during 2013-15 (11,513,528 male and 12,421,779 female). Data on cancer incidence cases were collected from hospitals, pathology and haematology laboratories, and death certificates during 2013-2015. Data items included names, official civil registration ID number, Registry number, residential address, date of birth, age at diagnosis, sex, dates and methods of diagnosis, topographic site of the cancer, histology type, extent of cancer spread, and vital status. Operational details have been reported in greater detail previously (Imsamran et al., 2015).

The International Classification of Diseases for

Oncology Third Edition (ICD-O 3) is used to code cancers by primary site and morphology type (WHO, 2000). The data are recorded on the Registry using the Thai Cancer Based (TCB) Software (NCI, 2017).

Because Thai people often believe that they will obtain better treatment in Bangkok than in regional settings, Bangkok hospitals generally have patients from other provinces. While self-reported residential addresses have been recorded by hospitals and laboratories since the Registry inception, partly to enable follow-up, these addresses often have included Bangkok addresses used only for temporary stays.

For the first time in 2015, official residential addresses held by Ministry of Interior became available for cross-checking with Registry recorded addresses and for filling missing fields. For the patients found through Ministry records to have an official address in Bangkok, the numbers of years lived in Bangkok were also obtained from Ministry records. For patients with an official address in other provinces, checks could be made whether they had previously lived in Bangkok.

### Identifying duplicative data in other registries

Currently, there are 500 hospitals in Thailand which record cancers for the national TCB registry program. All cases recorded in the Bangkok Cancer Registry were checked to determine whether there were duplicate entries with other Thai hospitals and registries.

### Data analyses

Numbers of cancers, crude and directly age-standardized (World Population) incidence rates were calculated, using all cancers registered on the Registry for: (a) all invasive cancers collectively; and (b) common primary sites (MacLennan, 1991). This was done initially for all notifications on the Registry, irrespective of official residential address, and then only for patients who had an official address in Bangkok at time of diagnosis, in order to quantify differences.

## Results

### All registered cancers

A total of 44,813 newly diagnosed cancer cases were registered by the Registry in 2013-2015, 24,839 (55.4%) in females and 19,974 (44.6%) in males. Their age distribution in years was: <40=9.3%; 40-49=13.8%; 50-59=25.1%; 60-69=25.1%; and 70+=26.7%.

Leading primary sites for both sexes combined included the breast (7,483, 16.7%), colon/rectum (5,911, 13.2%), and lung (4,879, 10.9%), and liver (4,148, 9.3%) whereas 2,165 (4.8%) had cervical cancer (Table 1). For all sites combined, the age-standardized incidence was 4.1% higher for males than females. Predictably, virtually all breast cancers affected females (99.2%). By comparison, males had a higher age-standardized incidence than females for cancers of the liver (+194.8%), lung (+109.5%), and colon/rectum (+61.3%).

In general, data quality appeared to be higher for females than males as indicated by the % death certificate only (DCO)

Table 1. Crude and Age-standardized Rates Per 100,000 for All Registered Cases and Those Confirmed to have a Permanent Address in Bangkok; Bangkok Cancer Registry, 2013-2015

Cancer	All registered						Cases with a confirmed Bangkok address					
	Number		Crude rate		ASR*		Number		Crude rate		ASR*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Colorectal	3,288	2,623	28.6	21.2	26.3	16.3	2,443	2,027	21.2	16.4	19.5	12.5
Liver	2,917	1,231	25.3	9.9	22.7	7.7	2,440	1,052	21.2	8.5	18.9	6.5
Lung	3,007	1,872	26.1	15.1	24.3	11.6	2,568	1,625	22.3	13.1	20.7	10.1
Breast	60	7,423	0.5	59.8	0.5	44.6	45	6,047	0.4	48.7	0.3	36.2
Cervix	-	2,165	-	17.4	-	12.9	-	1,641	-	13.2	0.0	9.8
Other sites	10,702	9,525	92.9	76.5	87.5	61.9	8,548	7,891	74.2	63.4	69.7	50.7
All sites	19,974	24,839	173.4	199.9	161.3	155.0	16,044	20,283	139.3	163.3	129.1	125.8

\* ASR-age-standardized rate (World Population)

Table 2. For All Registered Cases, the Percentage Morphologically Verified and the Percentage Notified from Death Certificate Evidence Only; Bangkok Cancer Registry, 2013-2015\*

Cancer	All registered					
	Number		Male		Female	
	Male	Female	% MV	%DCO	% MV	% DCO
Colorectal	3,288	2,623	84.5	0.7	82.5	0.4
Liver	2,917	1,231	38.5	13.5	42.6	17.2
Lung	3,007	1,872	68.4	12.8	68.4	14.9
Breast	60	7,423	100.0	2.9	86.7	0.7
Cervix	-	2,165	-	-	84.5	1.5
Other sites	10,702	9,525	82.4	4.2	83.7	4.8
All sites	19,974	24,839	75.9	6.0	81.7	3.7

\* % MV – the percentage morphologically verified; %DCO – the percentage reported from death-certificate evidence only

Table 3. Duplicative Data for All New Invasive Cancer Cases, All Registered Cases; Bangkok Cancer Registry, 2013-2015\*

Place of registration	Number	%
Bangkok only	43,074	96.1
Duplicated in other regions	1,739	3.9
North	165	
North East	174	
Central	1,126	
East	201	
South	73	
Total	44,813	100

(3.7% compared with 6.0%) and the % morphologically verified (MV) (81.7% compared with 75.9%) (Table 2). Exceptions applied, however, with a higher %DCO for liver and lung cancer in females and a lower %MV for colorectal cancer and breast in females. No difference in %MV was apparent by sex for cancers of the lung.

Most cases (n=36,327) were found from official records to be Bangkok residents (81.1%), the majority (87.0%) being longstanding residents of 10 years or more. Of the 8,486 found to be residents of other provinces of Thailand, the majority (81.3%) were from the Central province, 7.3% from the East, 5.4% from the North East, 3.1% from the North and 2.9% from the South. A past

residency history in Bangkok applied to 3,941 (46.4%) of the registered cases found to be current residents of these other provinces.

In general, most cases (40,480, 90.3%) were diagnosed and had their treatment completed at the one hospital and 4,333(9.7%) received care at two or more hospitals. Most cases (43,074, 96.1%) were recorded only on the Registry, but 1,739 (3.9%) had duplicative registrations in another region, 1,126 of them (64.7%) in the Central province (Table 3).

#### Cases registered among Bangkok residents

The percentage of cases registered on the Registry with an official Bangkok residential address was 81.1%, i.e., 18.9% fewer than for all cases. The corresponding percentage was 19.7% lower for males and 18.3% lower for females. As a result, age-standardized incidence rates for all cancers combined among Bangkok residents were 20.0% lower in males and 18.8% lower in females after subtracting non-residents from the total (Table 1). The effect of excluding non-residents varied by primary cancer site, for example: in males, from 14.8% for lung to 25.9% for colorectal cancer; and in females, from 12.9% for lung to 24.0% for cervical cancer.

## Discussion

Data quality indices for the Registry generally fall

within the ranges seen for other Asian populations. The percentages of cases morphologically verified for all sites combined in 2013-2015 are similar: in males, to those reported for Beijing, Osaka and Busan; and in females, to those reported for Hong Kong, Mumbai and Hiroshima (Forman et al., 2014). Similarly, the percentages registered on the basis of death certificate evidence only fell within the range for other Asian populations, being similar for all sites combined: in males, to those reported for Nagasaki and Mumbai; and in females, to those reported for Manilla and Fukui (Forman et al., 2014).

Data quality issues have presented, as experienced in many large cities, due to difficulties aligning numbers of cancers registered with the source population (in this study, the officially verified population of Bangkok). Our results indicate that of the cancer cases registered by the Registry in 2013-2015, 81.1% had an official residential address in Bangkok. There are a number of possible reasons for the registration of non-residents, including the inadvertent inclusion of: (1) patients from other provinces attending Bangkok temporarily for clinical care; (2) patients from other provinces working in Bangkok and using Bangkok clinical services; and (3) former residents of Bangkok still reporting a Bangkok residency after purchasing a new house outside Bangkok (note: these cases probably contributed to the 3,941 cases found in this study to have previously lived Bangkok).

Bangkok is a relatively expensive city. While many people choose to work there because of employment opportunities, many have the intention of moving to another region after retirement. In addition, some Bangkok residents purchase and move to new houses that are more spacious outside Bangkok, due to price advantages, but their addresses on the Registry may remain unchanged. The population is therefore quite mobile and difficult to define from health records. This problem has been overcome in the present study through the use of official residential addresses from the Ministry.

The Ministry of Public Health now encourages all hospitals to use an ID smart card reader to record addresses, reduce typing errors, and save time completing hospital record cards. If this can be fully implemented throughout the country, patients will have only one address and duplications will be avoided. Periodic checks against National Civil Registration records of the Ministry of Interior, as undertaken in this study, can serve as an additional check and enable the completion of missing fields.

In addition to these data-quality gains, the use of official places of residence from the Ministry of Interior has greatly improved the quality of the Registry reports by avoiding artificial inflation of incidence rates through inadvertent incorporation of cancer data for non-residents. It has also enabled avoidance of duplicative registration across multiple registries.

In conclusion, 1. The differences in calculated incidence found in this study from using official address information are considered to be sufficient in magnitude to justify the routine use of official residential data for calculating cancer incidence rates.

2. It is likely that if cancer rates are to be compared with those of other Asian cities as benchmarks, equivalent methodologies would be needed for all cities that, like Bangkok, are heavily used by residents from other areas.

3. Accurately defining cancer incidence is fundamentally important for evidence-based service planning and evaluating the impact of preventive initiatives across the Thai population.

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#### *Conflict of interest*

Nil.

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