REGIONAL REVIEW

Cancer Epidemiology in Mainland South-East Asia - Past, Present and Future

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Abstract

The countries of mainland South-East Asia, Myanmar, Thailand, Laos, Cambodia and Viet Nam, share a long history of interactions and many cultural similarities, as well as geographical contiguity. They therefore can be usefully examined as a group when considering measures for control of cancer and other non-communicable diseases. Liver cancer is consistently found at higher incidence than most other parts of Asia, with lung cancer as the other most important neoplasm in males. In females cervical and breast cancer about equally predominate, throughout. However, there are also major differences, particularly with regard to stomach and nasopharyngeal cancer, only found at relatively high incidence in Viet Nam. The present review was conducted to gather together registry data on cancer prevalence and epidemiological findings cited in PubMed in order to obtain as comprehensive picture as possible of the present status. It is hoped that future cooperation across the region will facilitate development of coordinated cancer control programs to reduce the burden.

Asian Pacific J Cancer Prev, **10**, 67-80

Introduction

The countries of the Myanmar (Burma), Thailand, Laos, Cambodia and Viet Nam constitute mainland South-East Asia with a population of approximately 200 million. They share a great deal in terms of culture and this is reflected to some extent in the prevalent cancers. Naturally, they also present socioeconomic diversity and this allows pointers to be gained into etiological factors. The present review concerns cancer registration findings, available at the International Agency for Cancer Research Descriptive Epidemiology group website (www-dep.iarc.fr), and published information on epidemiology of the disease, accessible through PubMed.

Cancer Registration in Mainland South-East Asia

The population-based cancer registries included in Cancer Incidence in Five Continents (CIV) are listed in Table 1 and members of the International Association for Cancer Registries within the region are shown in Figure 1. In Volume VIII in 2002 there were some seven regarded as sufficiently accurate for inclusion but this was reduced to only three in 2007. Therefore, for Tables 2 and 3, data from 2007 were used for Chiang Mai, Lampang and Songkhla, while those for other registries are from the 2002 volume. Since there are no national registries, data from Globocan 2002 have been used for comparison purposes to generate the percentages of all cancers accounted for by the five most frequent tumours in Figure 2 in the present report.

With the exception of Globocan, no data are publically available for Myanmar, Laos or Cambodia. In Thailand, cancer registration was started in 1971 by the National Cancer Institute, with the collection of information on cancer patients treated in 53 hospitals throughout the

Table 1. Numbers of Mainland South-East Registries in the Series of Nine Volumes of CIV

Volume	I	II	III	IV	V	VI	VII	VIII	IX
Chiang Mai						1	1	1	1
Lampang								1	1
Khon Kaen						1	1	1	
Bangkok								1	
Songkhla								1	1
Ho Chi Minh City								1	
Hanoi							1	1	

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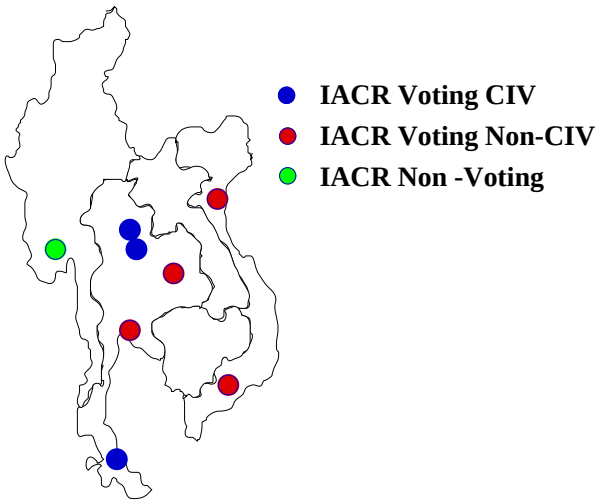

Figure 1. Cancer Registries in Mainland South-East Asia

country. The first population-based cancer registry started in 1986 in Chiang Mai, followed by Khon Kaen in 1988, Songkhla and Bangkok in 1990 and Lampang in 1993. With the cooperation of the registries, the National Cancer Institute in Bangkok, and the International Agency for Research on Cancer (IARC), the first volume of Cancer in Thailand was published in 1993 (Deerasamee et al., 1993). The second volume, with data from 1992-1994 was published in 1999, and the third in 2003**.** Updates have also been published by Sriplung et al (2005; 2006). In Viet Nam, first data were for Hanoi (Anh et al., 1993) and findings for adults and children in Ho Chi Minh City were published in 1998 and 2000, respectively (Nguyen et al., 1998; 2000). A series of papers have also appeared from the Ngoan group on populational based mortality and survival in different parts of the country (Ngoan, 2006a; 2006b; Ngoan et al., 2002; 2007a; 2007b), as well as differences in incidences between Hanoi in the north and Ho Chi Minh City in the south of the country (Ngoan et al., 2001). Both Thailand (Deerasamee et al., 2001) and Viet Nam (Anh, 2001) contributed to the 2001 APJCP supplement on Cancer in Asia (Parkin and Vatanasapt, 2001).

Organ Specific Epidemiology

Skin Cancer

Skin cancer is very infrequent in the region.

Oral Cancer

Cancer of the buccal cavity is relatively common in Myanmar, Cambodia and in the South of Thailand, where it occupies second place and equal numbers of tongue and mouth sites have been described. Otherwise it is generally rare (see Figure 3) and may be decreasing, as observed for Chiang Mai (Reichart et al., 2003). Betel chewing may be prevalent in elderly, like Cambodian women, but younger people do not take up the habit (Reichart et al., 1996; 1997; 2002). In Songkhla, genetic influence has been proposed to interact with environmental factors (Kietthubthew et al., 2001; Kietthubthew et al., 2003; Kietthubthew et al., 2005). Betel chewing with or without smokeless tobacco use may induce oral cancers via a p53-independent pathway (Thongsuksai and Boonyaphiphat, 2001). Individuals who have homozygous deletion of the GSTM1 gene have increased risk, which increases further when these individuals are exposed to environmental

Table 2. Age-standardized Population-based Cancer Incidence Data for Mainland South-East Asian Countries - Males

	Thailand					Viet Nam	
	Chiang Mai*	Lampang*	Khon Kaen#	Bangkok#	Songkla*	Hanoi#	Ho Chi Minh#
Lip	0.2	0.3	0.3	0.0	0.2	0.2	0.0
Tongue	2.1	0.9	0.7	2.4	4.4	1.2	2.0
Mouth	2.0	1.3	1.4	2.1	4.6	0.8	1.9
Nasopharynx	3.9	2.5	3.7	7.4	2.7	12.8	8.3
Hypopharynx	1.4	0.5	-	-	2.7	-	-
Oesophagus	2.2	1.6	1.6	4.4	7.8	2.9	4.4
Stomach	5.9	5.3	3.2	4.9	2.7	27.0	18.7
Colon	5.0	7.9	4.8	10.3	5.3	5.5	7.5
Rectum	4.6	3.9	2.7	6.3	4.4	5.2	5.5
Liver	18.4	32.3	88.0	14.4	8.6	20.0	27.1
Gallbladder	1.7	2.9	1.9	1.3	0.8	0.5	1.6
Pancreas	1.4	2.0	1.0	1.8	1.8	1.4	2.4
Larynx	3.0	1.9	1.4	4.1	3.8	1.5	4.6
Trachea, lung	32.6	51.7	18.5	25.7	15.4	34.4	26.9
Penis	1.7	1.6	1.6	0.9	2.2	2.3	1.4
Prostate	5.3	4.9	2.4	6.4	4.6	1.5	3.8
Kidney	1.7	0.8	1.4	2.0	0.7	0.5	1.3
Bladder	5.1	5.6	3.3	6.8	4.4	3.1	3.0
Brain	1.6	1.1	2.7	2.4	1.5	0.7	2.3
Thyroid	1.1	0.8	0.9	1.3	1.7	1.3	1.3
Non-Hodgkin	7.1	6.0	3.7	5.0	5.5	7.2	3.2
Leukemia	4.2	4.1	4.2	3.9	3.2	4.5	3.9
Total	148	166	179	144	109	155	147

*Curado et al., 2007; #Parkin et al., 2002

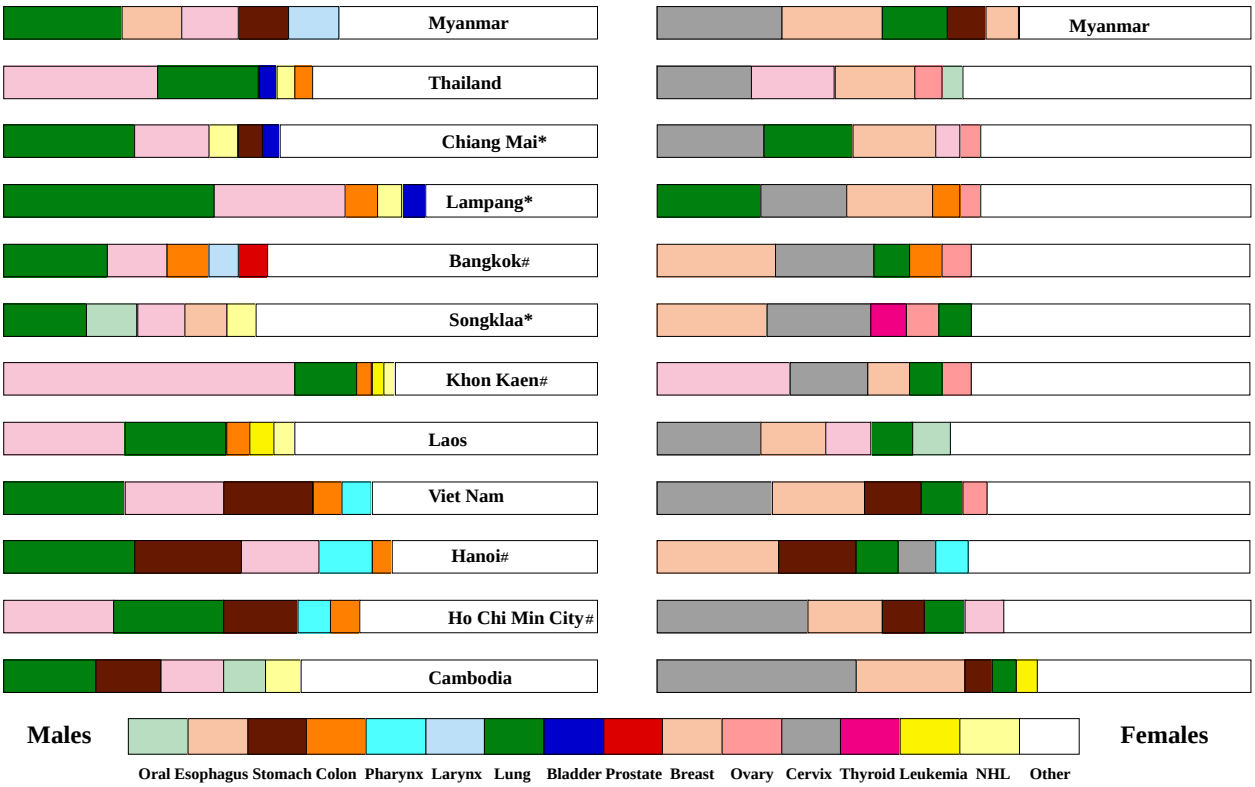

Figure 2. Percentage Data for the Five Most Prevalent Cancers in Countries of Mainland South-East Asia (from Globocan, 2002: Ferlay et al., 2004, *Curado et al., 2007 and #Parkin et al., 2002)

Table 3. Age-standardized Population-based Cancer Incidence Data for Mainland South-East Asian Countries - Females

	Thailand					Viet Nam	
	Chiang Mai*	Lampang*	Khon Kaen#	Bangkok#	Songkla*	Hanoi#	Ho Chi Minh#
Lip	0.4	0.5	2.6	0.5	0.4	0.2	0.5
Tongue	0.9	0.8	0.9	0.7	0.7	1.3	0.6
Mouth	1.6	1.7	2.2	1.2	1.5	1.1	1.3
Nasopharynx	1.5	1.5	1.3	2.0	0.9	5.5	2.2
Hypopharynx	0.4	0.2	-	-	0.5	-	-
Oesophagus	0.7	0.6	0.5	1.0	1.7	0.6	0.6
Stomach	4.6	3.3	1.9	3.7	1.2	13.2	8.1
Colon	5.0	7.2	2.8	7.2	3.8	2.9	5.3
Rectum	3.7	2.4	2.1	3.9	3.2	3.7	4.1
Liver	6.7	14.8	35.4	3.9	1.9	5.2	6.4
Gallbladder	2.4	3.7	1.7	1.3	1.2	0.2	1.2
Pancreas	1.2	1.9	0.6	1.2	0.7	0.7	1.4
Larynx	0.6	0.8	0.0	0.2	0.4	0.2	0.4
Trachea, lung	23.6	27.0	6.6	7.8	5.4	7.2	7.5
Breast	21.6	22.0	10.8	25.5	18.2	21.0	13.6
Ovary	5.6	5.4	5.7	6.2	5.6	4.5	4.2
Corpus uteri	3.5	3.1	2.2	4.2	3.0	1.6	3.0
Cervix uteri	28.9	22.4	16.5	20.9	17.8	6.7	28.8
Kidney	0.9	0.4	0.8	1.1	0.6	0.3	0.8
Bladder	2.3	1.6	0.5	1.8	0.7	0.6	0.7
Brain	1.4	2.2	2.5	2.0	1.2	0.5	1.4
Thyroid	4.5	3.7	3.3	3.5	6.2	2.4	2.8
Non-Hodgkin	4.6	4.6	2.7	3.7	4.0	3.1	2.0
Leukemia	3.7	3.5	4.0	2.9	3.2	3.2	3.1
Total	159	154	128	127	98	102	116

*Curado et al., 2007; #Parkin et al., 2002

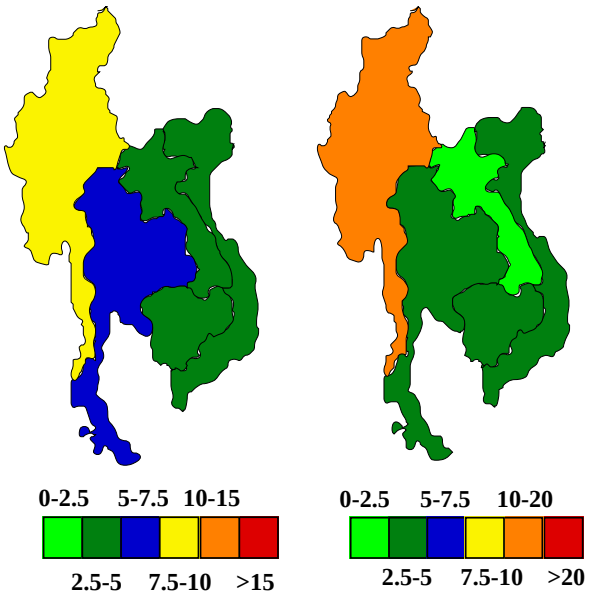

Figure 3. Male Oral (left) and Oesophageal (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

toxicants such as chemicals in cigarette smoke, alcohol, and betel quid (Kietthubthew et al., 2001). More recently, a case-control study suggested a role of radium-contaminated well water as a risk factor for cancer of the upper digestive tract (Hirunwatthanakul et al., 2006). The lower risk of advanced stage oral squamous cell carcinoma associated with ulcerative tumours and those on the floor of the mouth may be due to their being more readily detected by the patients (Kerdpon and Sriplung, 2001).

Nasopharyngeal Cancer

Nasopharyngeal cancer is relatively rare except in Viet Nam. In Thailand it is associated with the GSTM1 null genotype (Tiwawech et al., 2005), which may be a useful genetic marker detectable by PCR (Tiwawech et al., 2008a). The LMP1 subtypes of the Epstein-Barr virus may also be involved in susceptibility to nasopharyngeal carcinoma in Thais (Tiwawech et al., 2008b).

Oesophageal Cancer

Oesophageal cancer is relatively common in Myanmar and the South of Thailand but is infrequent elsewhere (see Figure 3). Alcohol consumption, smoking and chewing betel significantly increase risk (Boonyaphiphat et al., 2002). Mostly the oesophageal cancers are SCCs (see Table 4), found in the mid thoracic portion, at least in Songkhla (Puttawibul et al., 2001).

Table 4. Oesophageal Cancer Histopathology: SCC-AC Percentages

	Male			Female		
	SCC	AC	Ratio	SCC	AC	Ratio
Chiang Mai	92.1	5.3	17.4:1	85.5	5.0	17.1:1
Lampang	80.0	8.0	10.0:1	100	0	---
Khon Kaen	?	?	?	?	?	?
Bangkok	?	?	---	?	?	?
Songkhla	94.5	1.1	77.0:1	88.1	9.5	9.3:1
Ho Chi Minh	?	?	?	?	?	?
Hanoi	?	?	?	?	?	?

Stomach Cancer

Stomach cancer is rare except in Viet Nam (see Figure 4) and rates appear steady (Suwanrungruang et al., 2006). Within Thailand there is also some variation, with higher rates in the North and Bangkok, this to some extent corresponding with differences in dietary nitrate, nitrite, and nitrosamine intakes (Mitacek et al., 2008). High intake of salt and fermented foods is associated with an increased risk (Sriamporn et al., 2002). Protective effects have been reported for high intake of fruits and vegetables, while sauces may increase risk (Suwanrungruang et al., 2008). While prevalence of *Helicobacter pyloris* infection in Viet Nam is from 70-75% in both sexes (Hoang et al., 2005), the stomach cancer rate in males is significantly higher, suggesting an influence of other environmental risk factors (Ngoan et al., 2008b).

Colorectal Cancer

Colorectal cancer is not infrequent in Thailand, Cambodia and Viet Nam (see Figure 4) and is on the increase (Sriplung et al., 2006; Suwanrungruang et al., 2008; Khuhaprema and Srivatanakul, 2008). The male:female ratio is generally above or around 1:1 (see Table 5),but there is considerable variation in the colon:rectum ratio. Risk factors include meat consumption and cancer in the family (genetic influence) (Sriamporn et al., 2007). An earlier study pointed to elevated risk for those with a history of bowel polyps, parent's history of colon cancer, anal abscess, chronic colitis, chronic hemorrhoids, a low frequency of stools and some dietary factors like bacon and butter (Lohsoonthorn and Danvivat, 1995). The prevalence in the Central region of Thailand and in Ho Chi Minh City might point to a link with affluence. A colorectal cancer screening programme is now planned for Thailand (Khuhaprema and Srivatanakul, 2008). COX-2 levels in colorectal tumor specimens were significantly correlated with histological differentiation, (Sankhasard et al., 2004).

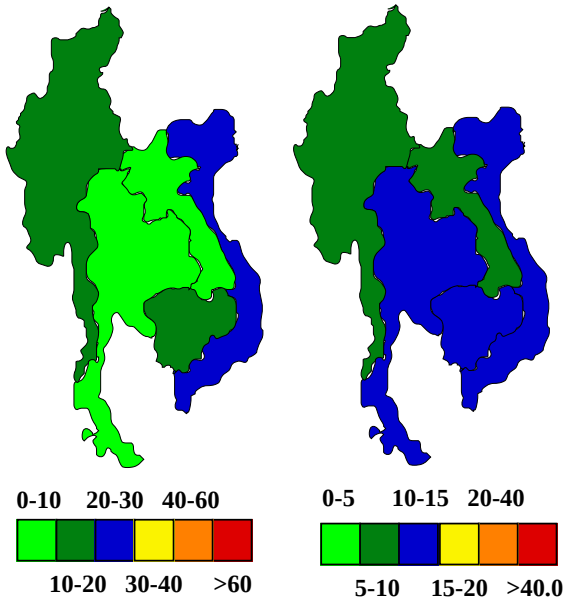

Figure 4. Male Gastric (left) and Colorectal (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

Table 5. Colorectal Cancers: Colon and Rectal Carcinoma Incidences and Ratios

	Male			Female		
	Colon	Rectum	Ratio	Colon	Rectum	Ratio
Chiang Mai	5.0	4.6	1.1:1	5.0	3.7	1.4:1
Lampang	7.9	3.9	2.0:1	7.2	2.4	3.0:1
Khon Kaen	4.8	2.7	1.8:1	2.8	2.1	1.3:1
Bangkok	10.3	6.3	1.6:1	7.2	3.9	1.8:1
Songkhla	5.3	4.4	1.2:1	3.8	3.2	1.2:1
Ho Chi Minh	5.5	5.2	1.1:1	2.9	3.7	0.8:1
Hanoi	7.5	5.5	1.4:1	5.1	4.1	1.2:1

Liver Cancer

The mainland area of South-East Asia is very definitely high risk with regard to liver cancer (see Figure 5). However, the situation is complicated by the more than 12-fold geographic variation in the occurrence of cholangiocarcinoma (CCA), while the frequency of hepatocellular cancer is more or less constant (Srivatanakul et al., 2004). CCA is usually rare (worldwide it accounts for about 15% of liver cancers); the very high incidence in Khon Kaen is the result of infection by the liver fluke (*Opisthorchis viverrini*), acquired through eating raw fish, a common feature of the local diet (Srivatanakul et al., 1991a; IARC, 1994; Chaimuangraj et al 2003; Sriamporn et al., 2004; Srivatanakul et al., 2004; Honjo et al., 2005). Cigarette smoking may act together with the parasite (Mitacek et al., 1999). There may also be roles for carcinogens like aflatoxin and nitrosamines (Srivatanakul et al., 1991a;1991b). In Khon Kaen, 82% of cases are CCA and the proportion is also relatively high in Chiang Mai and Lampang, but lower in Bangkok, where the cases may be mainly in migrants from the northeast, and rare in Songkhla (Sriplung et al, 2003; Sriplung et al, 2005).

Liver cancer appears to be increasing, especially in the central and southern regions of Thailand (Amon et al., 2005). The possible role of nitrosamines in Thai food in the aetiology of both types of liver cancer has been stressed

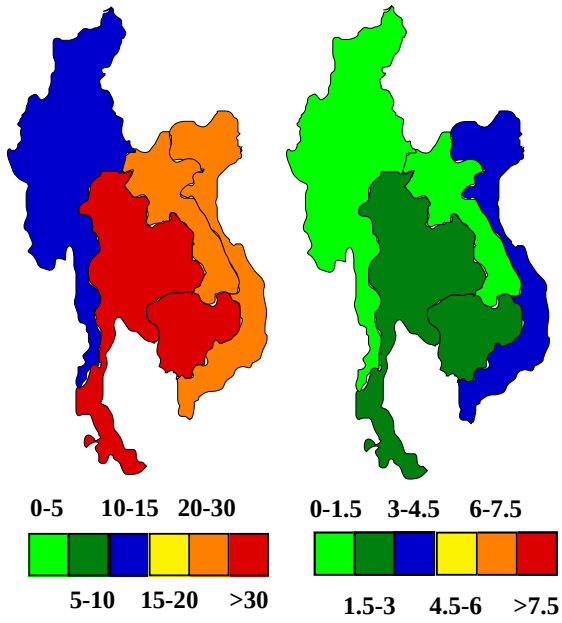

Figure 5. Male Liver (left) and Pancreatic (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

(Srivatanakul et al., 2004). Hepatitis B is the main etiologic factor (Sooklim et al., 2003), with a lesser role for HCV (Tangkijvanich et al., 1999). However, there is a reported high prevalence of hepatitis C in patients with thalassemia and patients with liver diseases in Myanmar (Burma) (Okada et al., 2000).There is a high age-dependent incidence of liver cancer among carriers of HBsAg (+) in Hanoi City (Ngoan and Yoshimura, 2001). HBV and HCV infection are widely spread in rural ethnic populations of northern Thailand (Ishida et al., 2002). Another potential influence is dioxin exposure (Ngoan and Yoshimura, 2001a). Liver cancer was earlier reported to be more frequent in the South of Viet Nam than in the North (Anh et al., 1993; Nguyen et al., 1998; Anh and Duc, 2002).

Control of hepatitis virus infection must emphasize new developments (Poovorawan et al., 2001). The incidence of hepatocellular carcinoma is significantly lower in Thai children who receive hepatitis B vaccine at birth (Wichajarn et al., 2008), although one evaluation of the vaccination programme in Chiang Mai showed a moderate coverage in Thai children (Jutavijittum et al, 2005). However, it was still much lower than the prevalence reported in the same region prior to vaccination (Kozik et al, 2000).

The possibility that the incidence of non-endemic cholangiocarcinoma is increasing should also be investigated as a global increasing trend has been observed worldwide (Patel, 2002). There was no correlation between histologic subtypes and morphological findings, as well as HBV, HCV, and cirrhotic status (Sooklim et al., 2003). Tumor markers have been evaluated for the detection of hepatocellular carcinoma (Taketa et al., 2002) and ultrasound (U/S) for cholangiocarcinoma can be applied for those presenting symptoms and/or OV positive (Mairiang et al., 2006).

Gallbladder Cancer

Gallbladder cancer is relatively rare throughout the region, with the highest incidences of 2.9 in males and 3.7 in females per 100,000 in Lampang.

Pancreatic Cancer

Rates for pancreatic cancer are also low, except in Viet Nam (see Figure 5), being highest in Ho Chi Minh City at 2.4 per 100,000.

Pharyngeal and Laryngeal Cancer

Pharyngeal and laryngeal cancer is also relatively infrequent, except in Myanmar and to a lesser extent Cambodia (see Figure 7), where risk factors are unclear. Elsewhere, highest population-based rates for laryngeal cancer have been observed in Ho Chi Minh City and Bangkok, at 4.6 and 4.1 per 100,000, respectively.

Lung Cancer

Lung cancer is more of a problem (see Figure 10), especially in Viet Nam and the North of Thailand. In males, approximately equal numbers of squamous cell carcinomas (SCCs) and adenocarcinomas are observed, whereas in females the latter clearly predominate (see Table 6). In one series of case in Bangkok, adenocarcinomas were

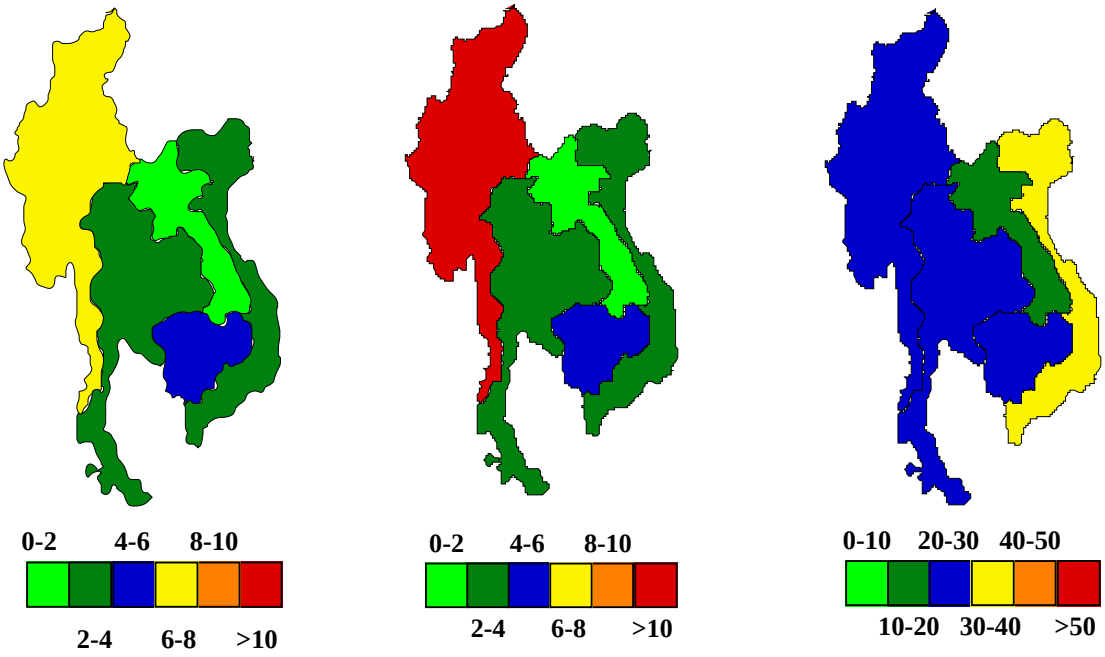

Figure 7. Male Pharyngeal (left) Laryngeal (middle) and Lung (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

prevalent in non-smokers (Limisila et al., 1994). In this context it should be noted that the success of the anti-smoking campaign in Thailand has reduced the prevalence of cigarette smoking among males aged 25-59 years from around 70% in 1986 to 40% in 2004 (Action on Smoking and Health Foundation/Thailand, 2005). In Viet Nam the incidence of lung cancer has reduced with decline in smoking prevalence (Ngoan, 2006c). There is a tendency for more SCCs in Lampang and it should be is noted that there smoking is common, especially of local cigarettes (Khiyo). It has been estimated that 96% of male and 64% of female lung cancers can be explained on this basis (Pisani et al., 2006). Commerical Thai cigarettes are known to be high in nitrosamines (Mitacek et al., 1999). However, polymorphisms in the CYP1A1 gene or deletion of the GSTM1 had no effect on the risk of lung cancer in one study (Pisani et al., 2006) and other factors, like chronic benign respiratory disease caused by the infection of fungi such as *M. canis*, may also be involved in the etiology (Nakachi et al., 1999). Data suggest that mutations in this study group are induced by exposure to substances other than tobacco smoke (Bumroongkit et al., 2008).

Fruit and vegetables appear to be protective, considering consumption patterns in high and low-risk districts of Chiang Mai (Sone et al., 1998).

Table 6. Lung Cancer Histopathology: SCC-AC Percentages

	Male			Female		
	SCC	AC	Ratio	SCC	AC	Ratio
Chiang Mai	34.9	41.2	0.8:1	25.4	48.9	0.5:1
Lampang	27.8	18.5	1.5:1	25.6	39.9	0.6:1
Khon Kaen	?	?	?	?	?	?
Bangkok	?	?	---	?	?	?
Songkhla	38.5	38.9	1.0:1	22.0	59.3	0.4:1
Ho Chi Minh	?	?	?	?	?	?
Hanoi	?	?	?	?	?	?

Kidney Cancer

Renal cancer is low in frequency throughout the region (see Figure 8), with the highest rate of 2 per 100,000 in Bangkok.

Urinary Bladder Cancer

Urinary bladder cancer rates are relatively low at between 3 and 7 per 100,000, with highest incidences inThailand (see Figure 8).

Prostate Cancer

The situation is similar for prostate cancers, with the highest rate found in Bangkok. However, all the countries have the lowest category for the present series of maps. In

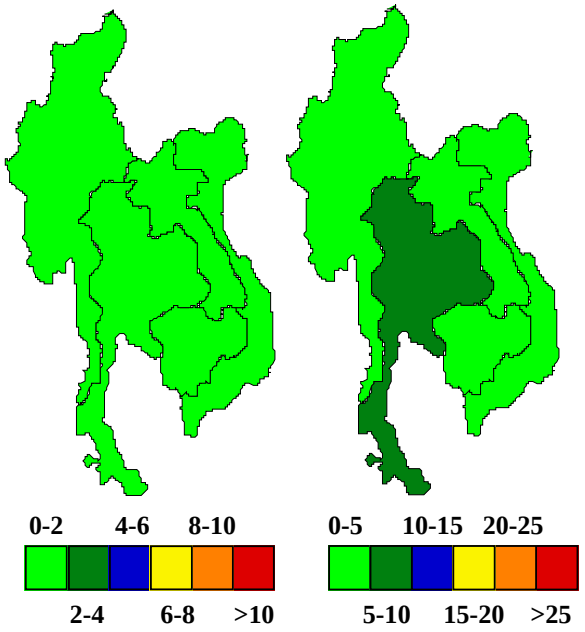

Figure 8. Male Kidney (left) and Urinary Bladder (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

a recent study, PSA testing detected cancers in 4.5% of the target group, mostly symptomatic cases in the capitol city (Srinualnad et al., 2006). Probable underestimation of the actual incidence was earlier stressed (Tantiwong et al., 2002). The test for prostate cancer as applied in Thailand has good sensitivity, and sufficiently good diagnostic properties for screening when compared to digital rectal examination (DRE) (Wiwanitkit, 2004).

Breast Cancer

Breast cancer incidence rates remain relatively low in mainland South-East Asia (see Figure 9), although clearly on the increase, particularly in the Central region of Thailand (Sriplung et al., 2006). Limited studies have been performed in the area of risk factors in the area. An inverse trend between increasing parity and decreasing breast cancer risk was observed, with alcohol as a risk factor, but family history, age at menarche, cumulative lactation, body mass index, and education were not found to demonstrate any significant relation (Nichols et al., 2005). Though it is likely that the great success in family planning policy to reduce the number of children born to married couples will provoke a side effect in increasing breast cancer incidence among Thai women, one study found a reverse evidence (Raksasook, 1985). Hormone replacement therapy was not found to be a risk factor in post-menopausqal women (Ratanawichitrasin et al., 2002).

To increase the quality of patient care in the country, a study on delay in breast cancer care suggested unmarried women as a target for educational programmes and improvement of the referral system (Thongsuksai et al., 2000). Breast cancer susceptibility genes BRCA1 and BRCA2 are involved in Thai familial and isolated early-onset breast and ovarian cancer, consistent with the situation in the Western world (Patmasiriwat et al., 2002). Thai women with a certain XRCC1 diplotype or homozygous for two or three variant alleles of XRCC1, OGG1, and APEX1 are likely to have an increased susceptibility to breast cancer (Sangrajrang et al., 2008). Anxiety and depressive disorders are two common psychiatric disorders in breast cancer, predictors including poor family relationship and functioning, maladaptive problem and conflict solving, and presence of pain and fatigue (Lueboonthavatchai, 2007)

Ovarian Cancer

Ovarian cancer is moderately frequent throughout mainland South-East Asia (see Figure 9). Prophylactic oophorectomy at the time of hysterectomy should not be recommended without complete knowledge of patients' socioeconomic background and propensity to comply with hormone replacement therapy regimens (Charoenkwan et al., 2004).

Corpus uteri

Endometrial cancer is present at a low level, particularly in Myanmar (see Figure 9). Obesity was found to be the only independent factor in young patients in Thailand (Manchana and Khemapech, 2008; Hanprasertpong et al., 2008). Since Tamoxifen significantly increases the risk of developing abnormally thickened endometrium in postmenopausal breast cancer patients, there is a need for gynaecologic surveillance of the affected individuals (Sinawat and Chiyabutra, 2004).

Cervix uteri

Mainland South-East Asia has a relatively high cervical cancer burden (see Figure 10) and there has been little change in the incidence over the last two decades, at least in Thailand (Sriamporn et al., 2003; Sriplung et al., 2006). High-risk HPV is the main cause and two of three of cervical cancer cases in Northeast Thailand are caused by HPV 16 and 18 (Sriamporn et al., 2006). There may be variation in other areas (Sukvirach et al., 2003), both in

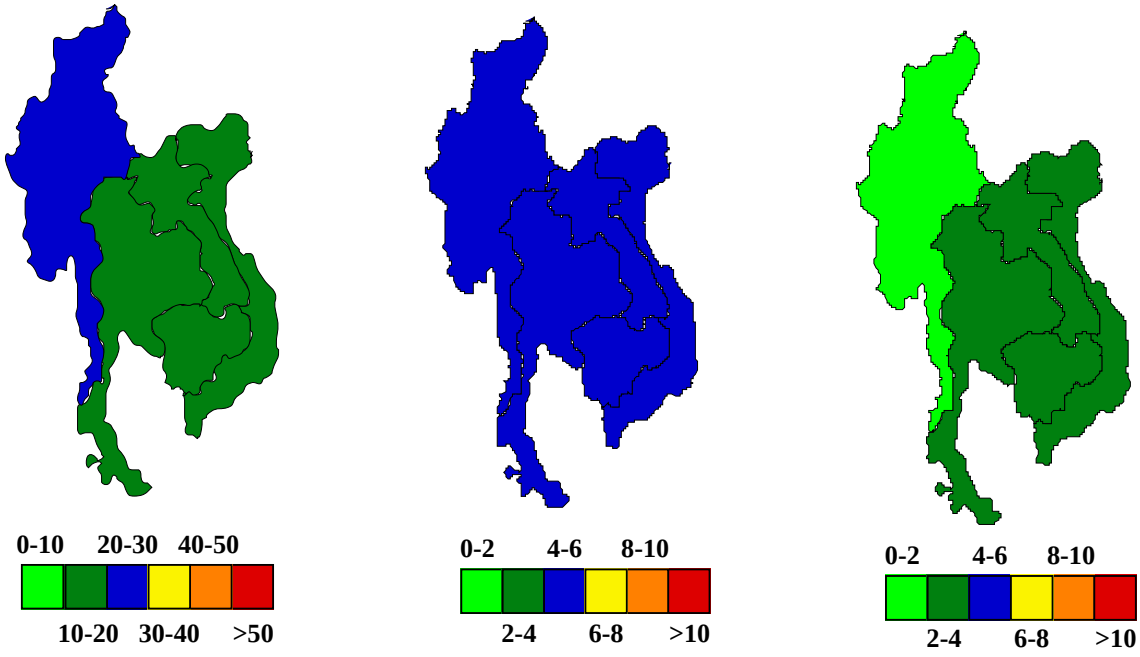

Figure 9. Female Breast (left) Ovarian (middle) and Endometrial (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

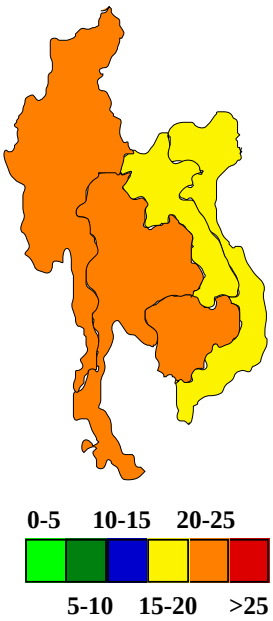

Figure 10. Cervical Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

the types and the percentage of people infected. HR-HPV DNA can be found in all grades of intraepithelial lesions and carcinoma of the cervix uteri, even in the histologically "normal" looking cervix (Tungsinmunkong et al., 2006). Strong evidence of the importance of HPV exposure was provided by the fact that Northern women in Viet Nam whose husbands had served in the military experienced no significant increase in cervical cancer risk if their husbands had been stationed in North Vietnam during the war years, in contrast to those who served in the South (Huynh et al., 2004). HPV DNA was detected among 10.9% of women in Ho Chi Minh City and only 2.0% in Hanoi (Pham et al., 2003). Cervical HPV infection is extremely common among female sex workers and varies by education level, sexual activity, habits of regular partners, and HIV status (Thomas et al., 2001a; 2001c). Factors that may predispose to persistent, oncogenic HPV-16 or -18 infection may include estrogens or progestins in the presence of estrogens, immunosuppression, and smoking, but other factors related to low socioeconomic status also appear to be involved (Thomas et al., 2001b). Cervical cancer among HIV-infected women in Thailand is considered to be high because of their coexisting HPV (Sirivongrangson et al., 2006) and cases should therefore be tested for HIV (Kietpeerakool, 2008).

Risk factors that are associated with risk of both adenocarcinoma/adenosquamous carcinoma histologic types after adjustment for HPV are limited education, increasing number of sexual partners, history of venereal diseases, interval since last Pap smear, and smoking, at least with SCCs (Chichareon et al., 1998). Menarche under 14 years of age and partners smoking history were also factors in another study (Kanjanavirojkul et al., 2006). Increasing intake of foods rich in total vitamin A, and particularly high-retinol foods, may reduce risk of *in-situ* cervical cancer (Shannon et al., 2002). In northeastern Thailand and increased risk for squamous intraepithelial lesions has been observed for age at menarche, age at the first sexual intercourse, number of sexual partners and partners' smoking history (Ishida et al., 2004; Settheetham-Ishida et al., 2004; 2006). In another study, number of pregnancies and age at having first child were associated with the risk of cervical cancer (Sriamporn et al., 2004). It should be noted that initiation of sexual experience may occur at very young ages (Kanato and Saranrittichai, 2006; Saranrittichai et al., 2006).

Efforts are now being made to establish routine cervical cancer screening and one project in Thailandwith Papanicolaou smear plus adequate follow-up diagnosis and therapy has already demonstrated success (Deerasamee et al., 2007), although referral may be a problem in some areas (Chichareon et al., 2005). A follow-up study also pointed to accuracy (Yuenyao et al., 2007). Pap screening in Vietnam also appears to be cost-effective (Suba et al., 2001), although perhaps not a first priority for rural communities with low incidence (Boon et al., 1999). Atypical glandular cells of undetermined significance should be regarded as a risk fact for cancer (Chichareon and Tocharoenvanich, 2006).

Regarding compliance, home visit education and invitation intervention produced only a nominal effect on increasing Pap smear coverage within a 4-month study period (Chalapati and Chumworathayi, 2007). One way to get around the problem is to use self-samping devices (Pengsaa et al., 2003; Sanchaisuriya et al., 2004). An alternative approach is the single-visit with visual inspection-acetic acid and cryotherapy, shown to be safe, acceptable, and feasible in rural Thailand (Gaffikin et al., 2003). A "see and treat" approach appears to be an appropriate strategy in managing women with high-grade squamous intraepithelial lesion cytology (Kietpeerakool et al., 2007). Another alternative is to test for HPV, perhaps to identify women who require more frequent screening (Chandeying et al., 2006). A combination of p16 and HPV detection may have particular advantages (Ekalaksananan et al., 2006).

With cervical conization for *in situ* lesions it has been demonstrated to be very important to check the margin status (Srisomboon et al., 2007). Survival is generally good for early stage cancers, with degree of stromal invasion and size, but not perioperative blood transfusion, as the main independent predictors of prognosis in surgical cases of early stage cervical cancers (Chittithaworn et al., 2007). Stage of disease, hemoglobin level, interval between external- intracavitary radiation and fractionations are factors affecting survival cervical patients treated with radiation (Pomros et al., 2007). Overall 5 year survival may be relatively low, however, with a value of only just over 50% found for one series (Sriamporn et al., 2004). Prophylactic HPV vaccination with the quadrivalent vaccine has already been approved for use in Thailand but no national or government vaccination policy has so far been implemented (Domingo et al., 2008).

Regarding awareness and education, most registered nurses working at Srinagarind Hospital were found to have a moderate level of knowledge regarding cervical cancer and HPV but there are still some major misunderstandings; thus, educational pamphlets, notices and hospital announcements would be useful in increasing their knowledge (Nganwai et al.,2008).

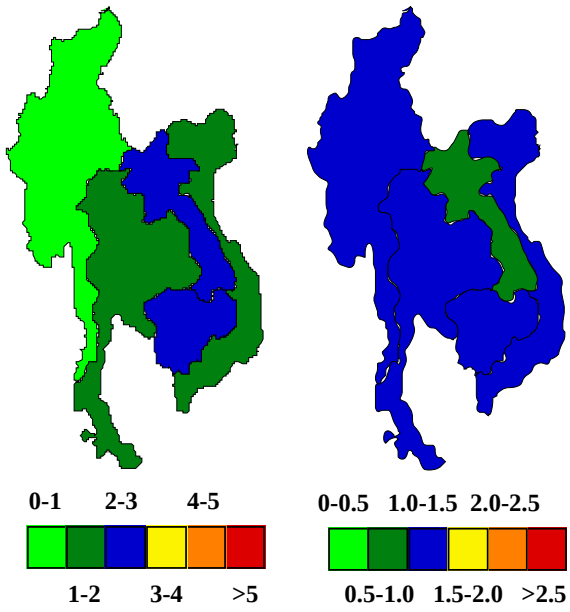

Figure 11. Male Brain (left) and Thyroid (right) Cancer Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

Brain and Nervous Tissue Cancer

Brain tumours appear to be more common in Laos and Cambodia than in the other countries of the region (see Figure 11).

Thyroid Cancer

From Globocan data, thyroid cancers are observed at medium levels throughout the region, but are somewhat less common in Laos (see Figure 11).

Leukemias and Lymphomas

In both sexes, Non-Hodgkins lymphomas and leukemias appear more common in Cambodia and Viet Nam than elsewhere (see Figure 12).

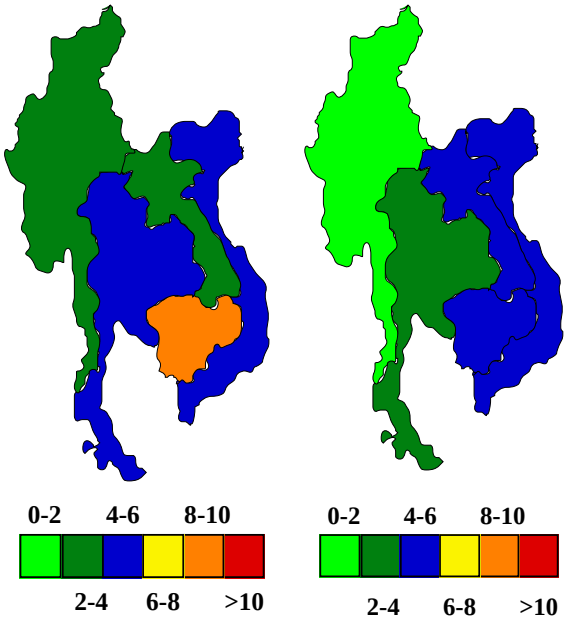

Figure 12. Male Non-Hodgkins Lymphoma (left) and Leukemia (right) Incidences/100,000 (Globocan, 2002: Ferlay et al., 2004)

Childhood cancers

Reviews of childhood cancers has been published for Thailand (Wiangnon et al., 2003) and Viet Nam (Nguyen et al., 2000) and an increasing trend for leukemia has been documented (Kamsa-aed et al., 2006). An influence of exogenous chemicals is indicated by the link seen for acute lymphobastic leukemia with the GSTM1 null phenotype (Pakakasama et al., 2005). While another study showed no effects of GST-P1 genotypes, possible involvement in relapse was indicated (Gatedee et al., 2007).

Future Perspectives

Clearly there is a need to increase the capacity for cancer registration, especially in those countries without population-based registries at present. The National Cancer Institute in Thailand is trying to increase their number to cover at least 20% of the Thai population and there are also plans to improve the situation in Viet Nam. The National Health Security Office, NCI, and the Thai Network of Cancer Registries are focusing on making use of hospital cancer registry data for planning better cancer patient care in the country. The question of how to integrate all of the individual hospital-based registries is also of obvious interest. Research in various areas such as etiologic and risk factors, diagnostic procedures, cancer treatment and patient care, and socio-economic burden are essential to push forward the health policy of all of the countries in the region in cancer control. Advantage could be taken of the variation between and within the countries of mainland South-East Asia in this regard, using the local cancer registries as research resources and also focusing on other related chronic illnesses like diabetes and circulatory disease, which are now very common (Aekplakorn et al., 2003; InterASIA Collaborative Group, 2003; Minh et al., 2003; Le Nguyen et al., 2003; King et al., 2005). The fact of inter-community variation in levels of diabetes and associated disorders, for example in villages in Cambodia (King et al., 2005), is of interest in this regard.

Local registration could also be coordinated with community-based efforts to develop networks of volunteers to transfer information to rural communities (Wiangnon et al., 2007), focusing on the steps necessary to develop trust between researcher and subjects, the actual conditions of the people involved and their problems (Senarak et al., 2006). Research in psychosocial influences, for example impacting on sexual behaviour (Saranrittichai et al., 2006) also need to be performed at the local level.

Thailand has undergone social and economic transitions during the past three decades and is approaching a post-demographic transitional period featuring obesity among children and adolescents (Kosulwat, 2002). The nutrition status is clearly very important and variation again needs to be assessed, especially in relation to change in cancer incidence like increases in breast and colorectal tumours. The number of papers on food frequency or other approaches is limited although a start has been made (Ngoan et al., 2008a). While advances have been made in the area of tobacco control, the health and economic impact of smoking, for example in Thailand, continue to be

substantial (Leartsakulpanitch et al., 2007). Furthermore, there is the issue of pollution. It has been indicated that children living in a mega city such as Bangkok may have an increased health risk of the development of certain diseases due to exposure to genotoxic substances in air pollution compared to children living in suburban/rural areas (Ruchirawat et al., 2007). High risk occupation for exposure to benzene are police (Wiwanitkit et al., 2005) s were found to be those which have direct contact with benzene in environmental ambient air, with petroleum fuel as the common source (Wiwanitkit, 2006).

In conclusion, building on cancer control efforts in the past (Vatanasapt et al., 2002; Anh and Duc, 2002), from the present overview it appears that more emphasis needs to be placed on research into the Western lifestyle-related cancers of the colon and breast, while continuing to concentrate attention on reducing cervical cancer by screening and liver cancer by education. The burden of other chronic disease is also on the increase and a coordinated approach to prevention would target the causes of well over half of the mortality in the region.

Acknowledgment

Malcolm Moore thanks the Japanese Foundation for the Promotion of Cancer Research for financial support during the drafting of this review.

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