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## RESEARCH COMMUNICATION

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# Social and Geographic Predictors of Cancer Survival: a Role for a Population-based Cancer Registry in Cancer Control

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### Abstract

One of the objectives of a cancer registry is to provide survival information on subsections of the population that have unfavorable outcomes. A cancer control strategy can be planned on the basis of such information. In the present study, the data of the Songkhla Cancer Registry were analyzed to determine if social and geographic parameters can be used to predict cancer survival. A total of 3423 cases identified in the population-based cancer registry of Songkhla Province registered during 1990-1994, were the subjects of this study. The rest were excluded because of unknown primary cancer sites. Eight leading primary cancer sites were focused on: oral cavity, pharynx, esophagus, colorectum, lung, liver, breast, and cervix uteri. Predictors of survival were derived from items recorded in the registry. Age, gender, extent of disease, cultural belief, life-style, and access to medical care were the predictors of interest. Religion, urban environment, and distance to tertiary care centers were proxies for the last three parameters. Kaplan-Meier plots, Cox regression, and log-rank tests were used for analysis of the hazard ratios. The results revealed a significance of disease extent for survival from oral, colorectal, breast, and cervical cancers. Muslim people had poorer survival rates than those of Buddhists for oral, breast, and cervical cancers. Women with breast cancer living in distant from tertiary medical care centers had a poorer prognosis. For the non-aggressive cancers, early detection and pretreatment counseling for the prevention of unnecessary incomplete treatment is recommended for prolonged survival. With aggressive cancers such as lung, liver, and pharyngeal cancers, there were no significant differences with these parameters investigated. Good quality of life provided by palliative care, not prolongation of survival, is the ultimate goal of medical care services to such patients.

**Key Words:** Social factor, geography, predictors of cancer survival, cancer registry, cancer control

*Asian Pacific J Cancer Prev*, 1, 319 -323

### Introduction

Songkhla is one of the most important provinces in southern Thailand. Situated about 1200 km from Bangkok, it borders Malaysia to the south. Prince of Songkla University is located in Hat Yai, the biggest district in Songkhla. The university hospital is the only one in the southern Thailand that provides radiation treatment for cancer patients. Hat Yai, Songkhla, and few private hospitals provide care for cancer patients.

The cancer registry of Songkhla Province was established in 1990 and managed by the Faculty of Medicine, Prince of Songkla University. The cancer incidence in Songkhla in the period of 1990-1994 was reported elsewhere

(Thongsuksai et al., 1997). The age-standardized incidence rate (ASR) for lung cancer in males was 13.9 per 100,000 population. The ASR for liver cancer in males was 7.9, and that of oral cavity, esophagus, and pharynx was 8.0, 6.7, and 6.3 respectively. Cancers of the cervix uteri, breast, and thyroid were the three most common cancers in females with the ASR of 21.5, 14.3, and 6.5 respectively.

Survival analysis is usually used in evaluation of cancer treatment protocol and general patient care. Predictors for survival such as extent of disease and histologic type of cancer are used for selection of treatment protocol. Nutritional and performance statuses are used for general care in cancer patients. New molecular predictors are being investigated for better design of chemotherapeutic agents.

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In cancer control strategy, cancer registries should provide survival information in subsections of the population that have unfavorable outcomes (Jensen and Storm, 1991) and view predictors for survival as problems to be solved in public health services. When extent of disease is a significant predictor for survival from cancer of the cervix uteri, for example, down staging strategy for cervical cancer in the population is essential. Social and geographic parameters are important predictors for cancer survival. The parameters potentially important for public health services are accessibility to special medical services for cancer treatment and transportation facilities, cultural belief, life-style, and physical environment of the community. Though these parameters are not recorded in cancer registries, proxies of them can be derived from registered items.

The objective of this study is to determine if social and geographic parameters have an impact on cancer survival. The selected parameters are viewed as strategic targets for public health services.

## Materials and Methods

Cases included in the study were all individuals with cancers (ICD-O behavior code /3) (WHO, 1990) in Songkhla Province diagnosed during 1990 and 1994. The cases were identified in Songkhla Cancer Registry, a population-based cancer registry of the province. The registry identified and obtained essential data from 1 university hospital (Songklanagarind Hospital), 1 center hospital (Hat Yai Hospital), 1 general hospital (Songkhla Hospital), private hospitals and all community hospitals in Songkhla. The documents of deaths were collected from those hospitals, the Provincial Chief Medical Office, and regional office for population registry, Ministry of Interior. Definition of cases, diagnosis of cancers, and data collection were based on the guideline published by the International Agency for Research on Cancer (Jensen et al., 1991) and were described in detail elsewhere (Deerassamee et al., 1999).

Survival time of each patient was estimated from the date of first diagnosis and the date of last seen by health personnel in the province. Those who had no documentation of death were considered as censored (no information of death) cases at the time of follow-up.

Predictors of survival were derived from items recorded in the registry. Age, gender, extent, and histology of disease were already recorded in the registry. Since social and geographic factors were not usually noted, proxy variables were generated from available data of the cases. The distance from big hospitals equipped for cancer patient care was estimated from the code of residence of the case. Cultural belief was represented by religion and extent of disease. Though the extent of disease is usually considered the aggressive nature of disease in medical practice, the delay in seeking medical care is the major reason for advanced stage at the time of diagnosis. Life-style and community environment were complicated issues. Although not

accurate, it could be indirectly evaluated by the residuals in the statistical model of urban area, determined by resident code, and the distance from cancer care centers.

Survival from common cancers was analyzed by predictors mentioned above, first by Kaplan-Meier method. Cox regression analysis was used in the analysis of the hazard ratio for the predictor variables in multivariate analysis. In case of Cox regression analysis not appropriate, log-rank test was used. Stata version 6.0 was used for all the statistical analysis.

## Results

During 1990 and 1994, there were 4033 cancer cases, 2121 males and 1912 females. A total of 610 cases were excluded because of unknown primary cancer site. Eight major cancer sites in Songkhla (Thongsuksai et al., 1997) were studied (Table 1).

There was no association between all the concerned predictors and survival from cancers of the pharynx, esophagus, liver, and lung (data not shown). All these cancers had short survival. Extent of disease was a common predictor of survival from oral, colorectal, breast, and cervical cancers (Table 2). Religion was another factor predicting survival from oral, breast, and cervical cancers. The predictors of oral cancer survival are religion and extent of disease. These two factors were the representatives of

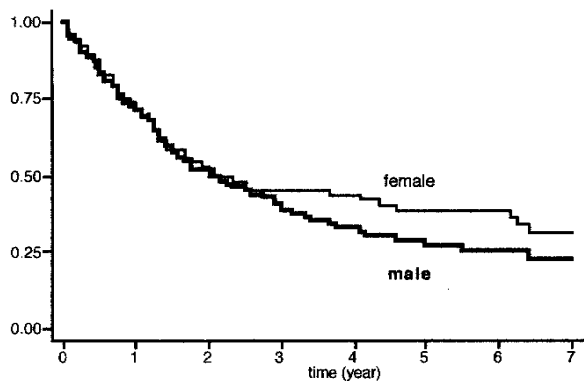
**Table 1 Number of Cases in Eight Major Cancer Sites**

Organ	ICD-O v.2	Male	Female	Total
oral	C00-06	169	82	251
pharynx	C09-10, 12-14	130	14	144
esophagus	C15	134	50	184
colorectum	C18-21	112	88	200
liver	C22	100	19	119
lung	C33-34	223	79	302
breast	C50	3	263	266
cervix uteri	C53	-	389	389

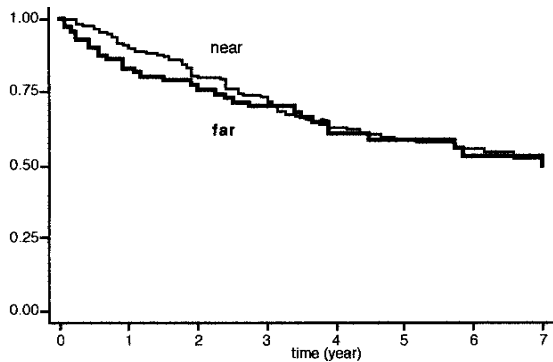
**Table 2 Significant Hazard Ratio of Predicting Factors by Cancer Site.**

Organ	Factor	Hazard ratio	95%CI	p-value
oral	Muslim	1.63	1.06 - 2.51	0.026
	extent*	1.43	1.01 - 2.03	0.042
colorectum	extent*	2.18	1.45 - 3.28	0.000
	female	0.60	0.33 - 1.08	0.092
breast	extent*	1.93	1.30 - 2.87	0.001
	Muslim	1.57	1.10 - 2.24	0.013
	accessibility	1.43	1.01 - 2.03	0.042
cervix	extent*	1.93	1.37 - 2.71	0.000
	Muslim	1.45	1.12 - 1.88	0.005

\*Extent categorised as: localised, regional involvement, distant metastasis



**Figure 1. Kaplan-Meier Survival Estimates for Colorectal Cancer, by Sex**



**Figure 2. Kaplan-Meier Survival Estimates for Breast Cancer, by Accessibility to Health Care**

cultural belief. Survival from the disease in Muslim population was significantly poorer than that in the Buddhists and aggressive disease correlated with a poor prognosis (Table 2). Extent of disease clearly associated with survival from colorectal cancer (Table 2). Females had a trend of better survival than males after the second year of disease (Figure 1).

Factors related to survival from cancers of the sex organs such as breast and cervix uteri were the extent of disease and religious belief (table 2). Advanced stage and Muslim correlated with the poorer prognosis. The accessibility to health care showed an association with survival from breast cancer, especially in the first 3 years after diagnosis (Figure 2).

## Discussion

Patients with cancers of the lung, liver, pharynx, and esophagus usually come in late stages and the masses are usually unresectable. Social and geographic factors seem to have no influence on prognosis. In the view of public health, palliative care, not a curative treatment strategy, should be systematically provided to the patients in all levels of medical and public health services.

The association between social and geographic predictors and survival was found in non-aggressive cancers, such as those of the breast, cervix uteri, colorectum, and oral cavity.

Not only a good quality of life but also prolonged overall survival by early detection of cases can be achieved in these cancers.

Screening and early detection have long been known to be successful for cervical cancer. Down staging of breast cancer can successfully prolong the overall survival. A community-based screening trial for oral cancer with visual inspection technique in India has shown a fairly satisfactory preliminary result (Sankaranarayanan et al, 2000). For colorectal cancer, there is no low cost technique for community-based screening. However, treatment of such cancers, especially in the early stage, is favorable if the patients can complete the treatment protocol. Social and geographic predictors should be considered for counseling and follow-up systems to lower the rate of incomplete treatment.

Extent of disease and religion were independent predictors of survival from oral cancer in the present study. The finding reflects a strong effect of cultural belief on survival from the cancer. Not only health education but also early detection programs should be considered in the southern Thailand where the incidence of oral cancer is higher than other regions (Deerasamee et al, 1999). Scrutiny of the cultural beliefs underlying religion as a proxy indicator is required for generalization of the findings to the whole population. A study in Songkhla revealed an association of the use of herbal medication and advanced oral cancer. This reflects belief and way of life in a rural area. However, in a practical way, pretreatment counseling should be emphasized among Muslim patients and those with advanced stage disease.

There were no social and geographic predictors associated with colorectal cancer. Though advanced stages were linked with poor survival, those with early stage but poor compliance to treatment would also have unfavorable survival. Since the registry did not collect the data of compliance to treatment, we could not demonstrate this finding. There was no early detection protocol suitable in community level. Studies showing good results were done in high risk people or hospital setting (Sasco, 2000; Towler et al., 2000). The finding that females had better survival than males after the second year of disease may be physiologic and independent (Esaleh et al., 2000). If it is the case, the survival outcome might not be modified by public health strategy.

In our study, survival from breast cancer associated with extent of disease, religion, and accessibility to medical care. When a disease is common and an earlier stage has an obviously better prognosis, early detection of the cancer is an appropriate way of controlling the disease. In developed countries, mammography demonstrated a reduction in breast cancer mortality for women over 50. However, there is still controversy regarding routine mammographic screening and the optimal screening interval for women under 50 (Pisano and McLelland, 1991). Breast self examination is a reasonable screening method in developing countries where the cost of mammography is high and the facility is limited (Sing et al., 1999). However, it is evident that self breast

examination is not effective in reduction of death from breast cancer (Semiglazov et al., 1999). In the situation of Songkhla where the incidence of breast cancer is low (Deerassamee et al., 1999; Thongsuksai et al., 1997), we consider no good protocol for early detection of breast cancer in population level.

Muslim patients demonstrated a poorer survival than Buddhists with cancers of sex organs such as the breast and cervix uteri. This reflects the difference in social culture rather than the religion itself. Some Muslims in the southern Thailand speak Yawi, a dialect of Bahasa Malaysia, as their mother tongue and might not understand Thai well. Further studies on this finding may be required to elucidate the true underlying factors. However, religion is the simplest factor among cultural predictors to be measured in public health. Practically, Muslim patients should be among the targets for intensive counseling and follow-up.

The finding of accessibility to medical care that determines survival from breast cancer is of interest. The fact that patients living far from the tertiary medical centers had unfavorable survival in the first 3 years of disease (figure 2) suggests poor compliance to the treatment protocol during the intensive follow-up period. Pretreatment counseling should consider these factors. The hospitals providing treatment for breast cancer may offer facilities, such as low cost accommodation or transportation, for patients and relatives during the treatment course.

Disease extent and cultural factor affected the survival for cervical cancer. To down stage the cancer, effective screening program in the population is to be considered. In Denmark, an organized screening by Pap smear technique could reduce both the incidence and the mortality (Lynge et al., 1989). Visual inspection of the uterine cervix is not promising either as a preselection procedure for cytology or a low-technology measure for cervical cancer screening in developing countries (Wesley et al., 1997). There is evidence that visual inspection with acetic acid (VIA) technique has performance similar to cytology in detecting moderate dysplasia or more severe lesions and may be an alternative screening test in low-resource settings. A national cancer control program has recently been planned in Thailand (NCCC, 1999). Our results suggest that the screening program not only reduces the incidence of cervical cancer but also improves the survival of the patients.

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**Personal Profile: Teerapon Muangpaisan**

Born: 1971 in Nakhon Sri Thammarat, a province in the south of Thailand  
1994 Doctor of Medicine - Prince of Songkla University  
1994-1995 Internship in Hat Yai Hospital  
1996-1998 Director of Krasae Sin Hospital, a 10-bed community hospital in Songkhla  
1998- Training in the Department of Internal Medicine, Prince of Songkla University.



Now he is also studying the fields of palliative care, cancer registration, and cancer prevention. He should receive the Certificate of Proficiency in Internal Medicine next year.

**Personal Profile; Hutchia Sriplung**

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1983 Doctor of Medicine - Mahadol University  
1987 Certificate of Proficiency in Anatomical Pathology - Ramathibodi Hospital  
1993 Attendee in the International Course of Epidemiology - Epidemiology Unit, Prince of Songkla University  
1996 Certificate of Attendance in Workshop on Molecular Epidemiology - International Agency for Research on Cancer - in Shanghai



Work:  
1985- Staff of the Anatomical Pathology Unit, Department of Pathology, Faculty of Medicine, Prince of Songkla University  
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