Chapter I

REGISTRY PROCEDURE AND STATISTICAL METHODS

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CHAPTER

1

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Cancer registration in Thailand was established in 1963 as a hospital-based cancer registry by Prof. Okas Blangura, Head of the Department of Surgery, Chiang Mai University. The relative frequency study of cancer in Chiang Mai was reported in the year 1971 (Menakanit *et al.*, 1971). In 1971, the National Cancer Institute (National Cancer Institute, 1973) collected information on cancer patients treated in 53 hospitals throughout the country but the results was unstisfactory and the incidence rates could not be estimated.

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. The first volume of Cancer in Thailand was published in 1993 with co-operation of the registries of Chiang Mai, Khon Kaen, Songkhla, the National Cancer Institute (Bangkok), and the International Agency for Research on Cancer (Vatanasapt *et al.*, 1993). The second (Deerasamee *et al.*, 1999) and the third (Sriplung *et al.*, 2003) volumes were published in series.

Registry methods

The methods specific to each registry are described in the appendix. Briefly, data on cancer cases are collected from hospitals, laboratories and death certificates. The data collected for each cancer patient consists of registry number, name, residential address, date of birth, age, sex, date and method of diagnosis, topographic site, histology and extent of cancer, and vital status of cancer patient. The detailed methods of data collection

differ from one to another registry.

Copies of death certificates are collected from the Chief Medical Officer's Offices. All certificates of death are reviewed and matched with the incident case records of the registries. The cases with no matching record are tracked back to the data sources for relevant information. Cases unable to be traced are registered as diagnosed by death certificate only.

The primary site and histology of cancer are coded according to the ICD-O 3rd edition (Fritz *et al.*, 2000). Second and subsequent primary cancers are also registered. A new registration number is given for each new primary and subsequent cancer as indicated by the 3-digit code as specified in the ICD-O manual.

Cases of carcinoma in situ are registered but not included in the calculation of incidence rates. Those carcinoma in situ cases later become invasive cancers are registered as malignant and included in the calculation of incidence rates. The most valid basis of diagnosis is recorded for all registered cases.

All registered cases are followed up by passive and active procedures. Registered cases are matched with death certificates. For the remaining cases, follow up information was obtained by scrutiny of hospital records, postal enquiries, and through the network of health care system.

Statistical methods

Population denominators

The population denominator used for the calculation of rates were estimated from 1990 and 2000 censuses published by the National Statistical Office (Na-

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tional Statistical Office, 1994; National Statistical Office, 2002) which provide annual estimate by age group and sex for each province in Thailand. Inter-census estimates of the population in 1999 by age group and sex were calculated with the assumption of an exponential change of the population between the two censuses.

The annual populations at risk were calculated for the period 1998-2000 in each registry area. They are shown in the section of each particular registry. The populations of Thailand and the four regions in 1999 were estimated based on the two censuses with the procedure described above.

National estimate

The data from the two northern cancer registries of Chiang Mai and Lampang were first pooled by adding together the cases and the person-years at risk from the two registries. The expected cases of the northern region were calculated by adjustment with the ratio of cancer deaths by sex and age groups of the region to the combined cancer deaths in the two provinces in 2004. This adjustment procedure was chosen based on the assumption that the number of cancer death reported the Ministry of Public Health in 2004 is closed to the true cancer deaths that would have occurred in the province. The same procedure was done in the northeastern region by adding together cases and person-years at risk from Khon Kaen, Udon Thani, and Nakhon Phanom. Rayong and Prachuap Khiri Khan were representatives of the central region while Bangkok was excluded since it differs greatly from the other provinces in the central region.

Songkhla was still the only province having cancer registry in the southern region.

Then the age (five-year age groups) and sex specific rates for the four regions of Thailand excluding Bangkok were calculated. When expected cases for the four regions and the actual cases of Bangkok were combined together, the expected number of cases and estimated ASRs for 1999 by sex and site for the whole Kingdom of Thailand were finally obtained.

Childhood cancer

The data of childhood cancer of the whole country were collected through a web-based registry from 20 treatment centers under a standardized format. The results for cancer in childhood are presented according to the diagnostic groups defined in "International Classification of Childhood Cancer 1996" (Kramarova *et al*., 1996). This was done by simply adding together the cases in age group 0, 1-4, 5-9, and 10-14 as well as person-years at risk and calculating an incidence rate. Results are expressed as a number of cases, relative frequency of different cancer types, age-specific incidence rates, the crude incidence rate and age-standardized and cumulative incidence in the 0-14 year age range as annual rate per million.

Crude incidence rate (CR)

Crude incidence rate is the number of new cancer cases observed during a defined period of population divided by the population at risk in the same period. It is expressed per 100 000 population.

Age-specific incidence rate

Age-specific incidence rate is the incidence rate in a specific age group. So age-specific rates are calculated by dividing the number of cancer cases in each five years age and sex structure of population in that age group and multiplied by 100 000. The rates are expressed per 100 000 population.

$$AR = Ni/Pi \times 100\,000$$

Ni = Number of new cancer occurring in the ith age group

Pi = Population of the ith age group

Age-standardized incidence rate (ASR)

The age-standardized incidence rate is a summary measure of a rate that a population will have if it has a standard age structure. It is calculated first by estimating the age-specific incidence rates and applying these rates to the standard population. The world standard population is used in this book. It is also expressed per 100 000 population. Standardization is necessary when comparing several populations that differ with respect to age because age has powerful influence on the risk of cancer.

Cumulative rate

The cumulative rate is the summation of the age-specific rates over each year of age from birth to a defined upper age limit. As age-specific incidence rates are usually computed for five-year age intervals, the cumulative rate is five times the sum of the age-specific rates calculated over the five-year age groups, assuming the age-specific rates are the same for all ages within the five-year age stratum (Bray, 2002).

Quality control was carried out through the following indices:

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1. Percentage of Morphologically Verified Cases (%MV): The percentage of cases where diagnosis was based on cytology or histology examination of tissue from primary site or from metastatic site, bone marrow, cytology and peripheral blood for leukemia.

2. Percentage of Death Certificate Only Cases (%DCO): The percentage of cases where diagnosis was based on information obtained from a death certificate.

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