Chapter 5. Comparability and quality of data

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The purpose of *Cancer Incidence in Five Continents* is to present *comparable* incidence rates of cancer from different populations worldwide. The process of selection of data to be included, and the preparation of the data-sets by the editors therefore require careful attention to several aspects related to comparability. As far as the cases registered (numerators of the rates) are concerned, these include:

(a) the definition of an incident case of cancer,
(b) the completeness of enumeration of cases in the population covered,
(c) the accuracy of abstraction and coding of information.

In addition to these, the denominator—person-years at risk for the period under consideration—must be estimated as accurately as possible.

In this chapter, we consider the evaluation of data quality undertaken by the editors for this volume, and introduce the traditional tables of 'Indices of Data Quality' with which users can themselves make judgements on the completeness and validity of the different data-sets.

Details of the standard definitions used by cancer registries to define an incident cancer, and the indices of comparability or validity that are generally applied, may be found in the publication *Comparability and Quality Control in Cancer Registration* (Parkin *et al*., 1994), to which reference will be made in this chapter.

Chapter 6, on Processing of Data, makes it clear that an extensive process of verification of coding, identifying possible duplicate registrations, querying unlikely or impossible combinations of codes, and conversion to a standard format has been carried out, before any tabulations are prepared for editorial evaluation. These steps in validation of the data are part of the routine to which the great majority of data-sets are subjected, and the fact that it has been completed more or less successfully forms part of the editorial evaluation. Five data-sets, for which no morphological data were available, are marked with a special flag (+); see below.

At their formal meetings, the editors had available to them:

(a) a series of tables for each data-set solely for editorial purposes (Tables 5.1–5.3; Figure 5.1),
(b) the tables of site-specific case numbers, and summary rates (crude, cumulative and age-standardized) that comprise the bulk of this volume,
(c) the estimated population at risk, with the method of estimation used,
(d) the questionnaire responses which relate to definitions used by the registry (Table 5.4).

Comparability

Definition of incidence

Particular attention is required in three broad areas:

(a) the distinction between recurrence or extension of an existing cancer and the development of a new primary,
(b) the detection of cancers incidentally, in asymptomatic individuals,
(c) the detection of cancers at autopsy.

Multiple primaries: For the time period considered in this volume (approximately 1993–1997), the international rules used to distinguish new primary cancers from extensions/recurrences were as set out in the IARC/IACR definitions (IARC, 1994; Parkin *et al*., 1994). The questionnaire sent to contributors reproduced these rules, and they were asked whether they had recorded new primary cancers according to this standard. If not, they were requested to either:

(a) recode the data themselves according to these rules, or
(b) state how their own rules differed, so that the data-set provided could be recoded according to the IARC/IACR rules (this required that all cancers in the same individual could be identified).

More recently, a modification to the rules permits those registries that record non-melanoma skin cancers to distinguish between first occurrence of squamous-cell and basal-cell carcinomas (see Fritz *et al*., 2000, pp. 35–37). Those registries that were already using this definition will find that the number of registered non-melanoma skin cancer cases is considerably reduced in the tables in this volume.

As a result of recoding multiple primaries to the international standard, the results in *Cancer Incidence in Five Continents* may not be exactly the same as those published by the cancer registries themselves, using their own definition of multiple primaries (see also Chapter 3). Similarly, it is possible that there are minor divergences in the definitions used between Volumes VII and VIII for certain registries.

The sites likely to be most affected by varying definitions of multiple primaries are shown in Table 5.5, together with the differences in incidence for the SEER registries of the USA, using their own rather generous definition of 'second primary' (SEER, 1998) and the IARC/IACR rules.

Incidental diagnosis: Almost all registries include malignant tumours diagnosed during screening programmes, or histological specimens taken from individuals in whom there were no symptoms, or no clinical suspicion of cancer. These cases will increase incidence rates if the malignant cells so identified would never have resulted in a clinical cancer had they remained undetected.

The incidence of breast cancer appears to have been somewhat increased by the introduction of systematic mammographic screening for cancer. More striking, however, are the effects of such incidental diagnoses on the reported incidence of prostate cancer. The practice of careful histological examination of tissue removed by transurethral prostatectomy for benign prostatic hypotrophy has long been known to identify many small asymptomatic cancers. More recently, during the late 1980s, the introduction of screening with prostate-specific antigen resulted in dramatic increases in the apparent incidence of prostate cancer in several countries, although in many, this increase has slowed, or reversed (Legler *et al*., 1998; Hankey *et al*., 1999; Queen & Babb, 2002; Chirpaz *et al*., 2002).

Fig 5.1 CI5 volume 8 (editorial table 2)

EREWHON (1993-1997)
Age-specific rates graphs for major diagnosis groups

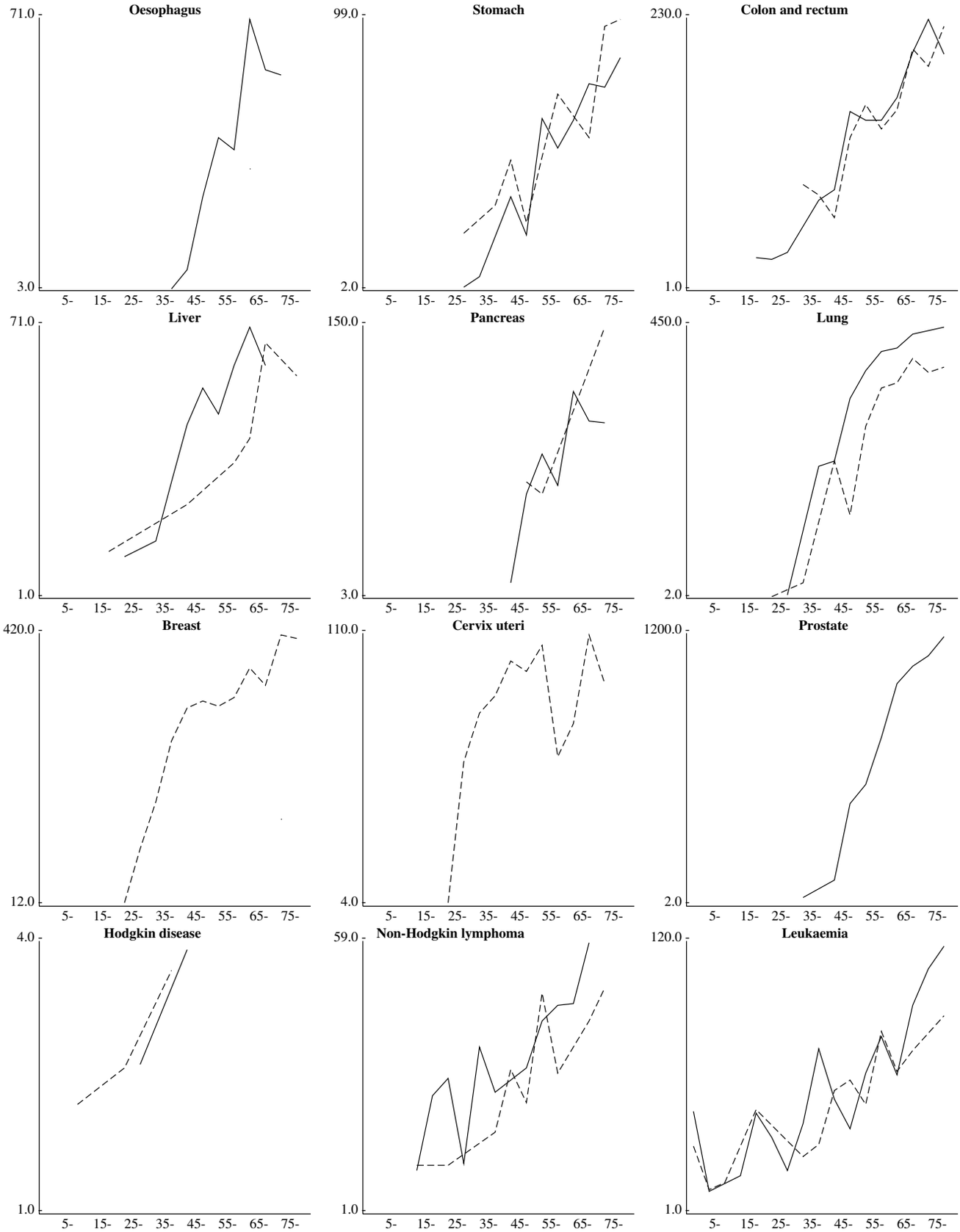

Table 5.1 CI5 volume 8 (editorial table 1)

EREWHON (1993-1997)
Number of cases in major diagnosis groups in single calendar years of observation

MALE

SITE	1993	1994	1995	1996	1997	Total
Lip, oral cavity and pharynx	13 (9.4)	9 (7.5)	13 (9.4)	13 (7.9)	9 (4.4)	57 (7.4)
Oesophagus	5 (3.6)	2 (1.7)	3 (2.2)	6 (3.6)	2 (1.0)	18 (2.3)
Stomach	3 (2.2)	4 (3.3)	4 (2.9)	4 (2.4)	2 (1.0)	17 (2.2)
Colon, rectum and anal canal	12 (8.7)	4 (3.3)	9 (6.5)	10 (6.1)	9 (4.4)	44 (5.7)
Liver	1 (0.7)	5 (4.2)	2 (1.4)	9 (5.5)	13 (6.3)	30 (3.9)
Pancreas	2 (1.4)	3 (2.5)	0 (0.0)	6 (3.6)	8 (3.9)	19 (2.5)
Larynx	1 (0.7)	1 (0.8)	6 (4.3)	3 (1.8)	0 (0.0)	11 (1.4)
Trachea, bronchus and lung	33 (23.9)	22 (18.3)	36 (25.9)	29 (17.6)	57 (27.8)	177 (23.1)
Melanoma of skin	6 (4.3)	1 (0.8)	5 (3.6)	8 (4.8)	3 (1.5)	23 (3.0)
Other skin	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Kaposi sarcoma	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)	0 (0.0)	1 (0.1)
Breast	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	1 (0.1)
Prostate	32 (23.2)	18 (15.0)	15 (10.8)	22 (13.3)	42 (20.5)	129 (16.8)
Testis	2 (1.4)	4 (3.3)	3 (2.2)	3 (1.8)	2 (1.0)	14 (1.8)
Kidney, etc.	1 (0.7)	2 (1.7)	3 (2.2)	1 (0.6)	2 (1.0)	9 (1.2)
Bladder	2 (1.4)	3 (2.5)	7 (5.0)	3 (1.8)	6 (2.9)	21 (2.7)
Brain, nervous system	3 (2.2)	0 (0.0)	2 (1.4)	5 (3.0)	3 (1.5)	13 (1.7)
Thyroid	4 (2.9)	9 (7.5)	4 (2.9)	6 (3.6)	5 (2.4)	28 (3.7)
Hodgkin disease	1 (0.7)	0 (0.0)	0 (0.0)	1 (0.6)	0 (0.0)	2 (0.3)
Non-Hodgkin lymphoma	4 (2.9)	8 (6.7)	5 (3.6)	4 (2.4)	8 (3.9)	29 (3.8)
Leukaemia	6 (4.3)	7 (5.8)	5 (3.6)	8 (4.8)	9 (4.4)	35 (4.6)
Other and unspecified	7 (5.1)	18 (15.0)	17 (12.2)	23 (13.9)	24 (11.7)	89 (11.6)
All sites	138 (100.0)	120 (100.0)	139 (100.0)	165 (100.0)	205 (100.0)	767 (100.0)

FEMALE

SITE	1993	1994	1995	1996	1997	Total
Lip, oral cavity and pharynx	10 (6.4)	2 (1.2)	6 (3.6)	6 (3.0)	2 (1.0)	26 (2.9)
Oesophagus	1 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)
Stomach	2 (1.3)	5 (3.0)	5 (3.0)	7 (3.5)	4 (1.9)	23 (2.6)
Colon, rectum and anal canal	7 (4.5)	10 (6.1)	6 (3.6)	7 (3.5)	8 (3.8)	38 (4.2)
Liver	1 (0.6)	1 (0.6)	1 (0.6)	4 (2.0)	2 (1.0)	9 (1.0)
Pancreas	1 (0.6)	0 (0.0)	0 (0.0)	3 (1.5)	6 (2.9)	10 (1.1)
Larynx	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	1 (0.1)
Trachea, bronchus and lung	15 (9.6)	17 (10.3)	17 (10.1)	12 (6.0)	15 (7.2)	76 (8.4)
Melanoma of skin	2 (1.3)	3 (1.8)	3 (1.8)	4 (2.0)	2 (1.0)	14 (1.6)
Other skin	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	0 (0.0)	1 (0.1)
Kaposi sarcoma	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Breast	47 (29.9)	37 (22.4)	49 (29.0)	51 (25.4)	56 (26.8)	240 (26.6)
Cervix uteri	16 (10.2)	25 (15.2)	19 (11.2)	22 (10.9)	19 (9.1)	101 (11.2)
Corpus uteri	6 (3.8)	8 (4.8)	7 (4.1)	13 (6.5)	12 (5.7)	46 (5.1)
Uterus unspecified	1 (0.6)	0 (0.0)	1 (0.6)	6 (3.0)	5 (2.4)	13 (1.4)
Ovary	7 (4.5)	5 (3.0)	7 (4.1)	7 (3.5)	5 (2.4)	31 (3.4)
Kidney, etc.	0 (0.0)	3 (1.8)	2 (1.2)	2 (1.0)	0 (0.0)	7 (0.8)
Bladder	1 (0.6)	2 (1.2)	2 (1.2)	1 (0.5)	0 (0.0)	6 (0.7)
Brain, nervous system	5 (3.2)	6 (3.6)	0 (0.0)	1 (0.5)	2 (1.0)	14 (1.6)
Thyroid	23 (14.6)	24 (14.5)	21 (12.4)	30 (14.9)	30 (14.4)	128 (14.2)
Hodgkin disease	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)	1 (0.5)	3 (0.3)
Non-Hodgkin lymphoma	1 (0.6)	5 (3.0)	2 (1.2)	2 (1.0)	3 (1.4)	13 (1.4)
Leukaemia	3 (1.9)	4 (2.4)	3 (1.8)	3 (1.5)	8 (3.8)	21 (2.3)
Other and unspecified	8 (5.1)	8 (4.8)	18 (10.7)	17 (8.5)	28 (13.4)	79 (8.8)
All sites	157 (100.0)	165 (100.0)	169 (100.0)	201 (100.0)	209 (100.0)	901 (100.0)

BOTH SEXES

SITE	1993	1994	1995	1996	1997	Total
Lip, oral cavity and pharynx	23 (7.8)	11 (3.9)	19 (6.2)	19 (5.2)	11 (2.7)	83 (5.0)
Oesophagus	6 (2.0)	2 (0.7)	3 (1.0)	6 (1.6)	2 (0.5)	19 (1.1)
Stomach	5 (1.7)	9 (3.2)	9 (2.9)	11 (3.0)	6 (1.4)	40 (2.4)
Colon, rectum and anal canal	19 (6.4)	14 (4.9)	15 (4.9)	17 (4.6)	17 (4.1)	82 (4.9)
Liver	2 (0.7)	6 (2.1)	3 (1.0)	13 (3.6)	15 (3.6)	39 (2.3)
Pancreas	3 (1.0)	3 (1.1)	0 (0.0)	9 (2.5)	14 (3.4)	29 (1.7)
Larynx	1 (0.3)	1 (0.4)	6 (1.9)	3 (0.8)	1 (0.2)	12 (0.7)
Trachea, bronchus and lung	48 (16.3)	39 (13.7)	53 (17.2)	41 (11.2)	72 (17.4)	253 (15.2)
Melanoma of skin	8 (2.7)	4 (1.4)	8 (2.6)	12 (3.3)	5 (1.2)	37 (2.2)
Other skin	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	1 (0.1)
Kaposi sarcoma	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	1 (0.1)
Breast	47 (15.9)	37 (13.0)	49 (15.9)	51 (13.9)	57 (13.8)	241 (14.4)
Cervix uteri	16 (5.4)	25 (8.8)	19 (6.2)	22 (6.0)	19 (4.6)	101 (6.1)
Corpus uteri	6 (2.0)	8 (2.8)	7 (2.3)	13 (3.6)	12 (2.9)	46 (2.8)
Uterus unspecified	1 (0.3)	0 (0.0)	1 (0.3)	6 (1.6)	5 (1.2)	13 (0.8)
Ovary	7 (2.4)	5 (1.8)	7 (2.3)	7 (1.9)	5 (1.2)	31 (1.9)
Prostate	32 (10.8)	18 (6.3)	15 (4.9)	22 (6.0)	42 (10.1)	129 (7.7)
Testis	2 (0.7)	4 (1.4)	3 (1.0)	3 (0.8)	2 (0.5)	14 (0.8)
Kidney, etc.	1 (0.3)	5 (1.8)	5 (1.6)	3 (0.8)	2 (0.5)	16 (1.0)
Bladder	3 (1.0)	5 (1.8)	9 (2.9)	4 (1.1)	6 (1.4)	27 (1.6)
Brain, nervous system	8 (2.7)	6 (2.1)	2 (0.6)	6 (1.6)	5 (1.2)	27 (1.6)
Thyroid	27 (9.2)	33 (11.6)	25 (8.1)	36 (9.8)	35 (8.5)	156 (9.4)
Hodgkin disease	1 (0.3)	0 (0.0)	0 (0.0)	3 (0.8)	1 (0.2)	5 (0.3)
Non-Hodgkin lymphoma	5 (1.7)	13 (4.6)	7 (2.3)	6 (1.6)	11 (2.7)	42 (2.5)
Leukaemia	9 (3.1)	11 (3.9)	8 (2.6)	11 (3.0)	17 (4.1)	56 (3.4)
Other and unspecified	15 (5.1)	26 (9.1)	35 (11.4)	40 (10.9)	52 (12.6)	168 (10.1)
All sites	295 (100.0)	285 (100.0)	308 (100.0)	366 (100.0)	414 (100.0)	1668 (100.0)

Table 5.2 CI5 volume 8 (editorial table 3)

EREWHON (1993-1997)

ANNUAL INCIDENCE PER 100,000 BY AGE GROUP - MALE

SITE	ALL AGES	AGE UNK	0-	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80+	CRUDE RATE	(%)	MV (%)	**ASR (W)**	*CH V7	*ICD (9th)*
Lip	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	**0.0**	0.0	*140*
Tongue	11	1	-	-	-	-	-	-	-	-	-	7.7	-	23.9	15.4	-	19.4	37.2	-	2.0	1.4	91	**3.1**	-1.2	*141*
Salivary gland	1	0	-	-	-	-	-	-	-	-	-	-	-	-	7.7	-	-	-	-	0.2	0.1	100	**0.3**	14.8	*142*
Mouth	8	0	-	-	-	-	-	1.9	-	2.5	-	7.7	4.5	6.0	7.7	-	-	37.2	-	1.4	1.0	100	**1.9**	-15.7	*143-5*
Oropharynx	12	0	-	-	-	-	-	-	2.1	-	6.2	7.7	9.1	6.0	30.7	-	-	-	-	2.1	1.6	100	**2.9**	-3.7	*146*
Nasopharynx	9	0	-	-	-	-	-	-	-	-	6.2	7.7	9.1	6.0	7.7	11.7	-	-	-	1.6	1.2	100	**2.2**	-2.7	*147*
Hypopharynx	4	0	-	-	-	-	-	-	-	-	3.1	-	4.5	12.0	-	-	-	-	-	0.7	0.5	100	**0.9**	**-24.8**	*148*
Pharynx unspecified	12	0	-	-	-	-	-	-	-	2.5	-	-	4.5	6.0	30.7	46.8	19.4	-	-	2.1	1.6	83	**3.6**	10.8	*149*
Oesophagus	18	0	-	-	-	-	-	-	-	-	3.1	3.8	9.1	17.9	15.4	70.2	38.9	37.2	-	3.2	2.3	83	**5.5**	-5.4	*150*
Stomach	17	0	-	-	-	-	-	-	2.1	2.5	-	7.7	4.5	23.9	15.4	23.4	38.9	37.2	56.0	3.0	2.2	88	**4.9**	**-14.6**	*151*
Small intestine	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	11.7	-	-	-	0.2	0.1	100	**0.4**	-4.5	*152*
Colon	28	1	-	-	-	-	2.0	1.9	2.1	-	-	7.7	18.2	17.9	15.4	35.1	58.3	186.2	112.0	5.0	3.7	86	**8.7**	-1.9	*153*
Rectum	16	1	-	-	-	-	-	-	-	-	6.2	-	18.2	12.0	15.4	11.7	58.3	37.2	-	2.9	2.1	100	**4.5**	-11.9	*154*
Liver	30	0	-	-	-	-	-	1.9	-	2.5	6.2	15.3	27.2	17.9	38.4	70.2	38.9	-	-	5.4	3.9	47	**8.1**	-7.3	*155*
Gallbladder etc.	9	0	-	-	-	-	-	-	-	2.5	-	7.7	4.5	-	-	35.1	19.4	37.2	-	1.6	1.2	100	**2.6**	-5.3	*156*
Pancreas	19	1	-	-	-	-	-	-	-	-	-	3.8	13.6	23.9	15.4	58.5	38.9	37.2	-	3.4	2.5	42	**5.7**	5.4	*157*
Nose, sinuses etc.	2	0	-	-	-	-	-	-	-	-	-	-	-	-	7.7	-	-	37.2	-	0.4	0.3	100	**0.7**	-19.4	*160*
Larynx	11	0	-	-	-	-	-	-	-	2.5	3.1	-	9.1	6.0	15.4	23.4	19.4	-	56.0	2.0	1.4	100	**3.3**	**-16.9**	*161*
Bronchus, lung	177	4	-	-	-	-	-	-	2.1	-	27.9	30.6	109.0	185.3	276.7	292.4	388.7	409.7	448.2	31.6	23.1	66	**53.9**	**-6.1**	*162*
Other thoracic organs	5	0	-	-	-	-	-	-	-	-	-	3.8	4.5	6.0	-	11.7	19.4	-	-	0.9	0.7	80	**1.4**	-6.8	*163-4*
Bone	9	0	-	1.5	1.7	3.9	2.0	-	2.1	-	-	-	-	12.0	-	11.7	-	-	-	1.6	1.2	89	**1.8**	-4.9	*170*
Connective tissue	5	0	-	-	-	-	-	-	-	-	3.1	-	-	12.0	-	-	19.4	37.2	-	0.9	0.7	100	**1.4**	-0.5	*171*
Mesothelioma	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.1	100	**0.0**	0.0	*MES*
Kaposi sarcoma	1	0	-	-	-	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	0.2	0.1	100	**0.1**	0.0	*KAP*
Melanoma of skin	23	2	-	-	-	-	-	-	2.1	2.5	3.1	23.0	18.2	12.0	23.1	11.7	-	37.2	56.0	4.1	3.0	100	**6.0**	11.7	*172*
Other skin	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	**0.0**	0.0	*173*
Breast	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.2	-	0.2	0.1	0	**0.4**	-25.7	*175*
Prostate	129	2	-	-	-	-	-	-	-	2.5	-	3.8	22.7	35.9	107.6	374.3	563.7	707.6	1120.4	23.0	16.8	88	**48.8**	**16.0**	*185*
Testis	14	0	3.1	-	-	5.9	-	5.8	6.4	2.5	3.1	3.8	-	-	-	-	-	-	-	2.5	1.8	100	**2.3**	7.2	*186*
Penis	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	**0.0**	0.0	*187.1-.4*
Other male genital	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19.4	-	-	0.2	0.1	100	**0.4**	0.0	*187.5-.9*
Bladder	21	0	-	-	-	-	-	-	-	-	3.1	3.8	-	29.9	53.8	11.7	77.7	-	112.0	3.7	2.7	95	**6.8**	-4.0	*188*
Kidney etc.	9	1	-	-	-	-	-	-	-	2.5	-	-	9.1	12.0	-	11.7	-	37.2	56.0	1.6	1.2	100	**2.7**	-13.5	*189*
Eye	3	0	1.5	-	-	-	-	-	-	-	3.1	-	-	-	-	-	19.4	-	-	0.5	0.4	100	**0.8**	37.6	*190*
Brain, nervous system	13	0	-	1.5	-	2.0	-	-	8.6	5.0	3.1	3.8	-	-	7.7	11.7	-	37.2	-	2.3	1.7	38	**2.6**	-3.4	*191-2*
Thyroid	28	1	-	-	-	-	2.0	1.9	4.3	5.0	3.1	11.5	18.2	23.9	38.4	23.4	19.4	37.2	-	5.0	3.7	96	**6.9**	**18.6**	*193*
Other endocrine	4	0	-	-	-	-	-	-	-	-	-	3.8	4.5	-	7.7	-	-	37.2	-	0.7	0.5	50	**1.1**	7.9	*194*
Hodgkin disease	2	0	-	-	-	-	-	-	2.1	-	-	3.8	-	-	-	-	-	-	-	0.4	0.3	100	**0.4**	-21.1	*201*
Non-Hodgkin lymphoma	29	0	-	-	-	2.0	5.9	7.7	2.1	12.4	6.2	-	9.1	17.9	23.1	23.4	58.3	-	-	5.2	3.8	90	**6.5**	10.7	*200,202*
Multiple myeloma	10	0	-	-	-	-	-	-	-	-	3.1	-	4.5	17.9	7.7	35.1	-	37.2	-	1.8	1.3	80	**2.9**	7.7	*203*
Lymphoid leukaemia	10	0	3.1	-	-	2.0	2.0	-	-	-	6.2	-	4.5	6.0	7.7	-	19.4	-	-	1.8	1.3	100	**2.2**	3.9	*204*
Myeloid leukaemia	24	0	1.5	1.5	-	-	3.9	3.9	2.1	5.0	12.4	7.7	-	6.0	15.4	11.7	19.4	74.5	112.0	4.3	3.1	96	**6.0**	13.7	*205*
Monocytic leukaemia	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	**0.0**	0.0	*206*
Other leukaemia	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	**0.0**	0.0	*207*
Leukaemia unspecified	1	0	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.1	100	**0.2**	**-45.7**	*208*
Other and unspecified	39	1	3.1	1.5	-	-	2.0	-	-	-	3.1	23.0	13.6	12.0	46.1	70.2	77.7	149.0	112.0	7.0	5.1	51	**11.8**	-6.1	*O&U*
All sites	767	16	13.8	6.0	1.7	15.7	19.7	25.1	40.8	52.0	114.6	199.0	354.2	567.8	853.2	1298.2	1652.1	2122.9	2240.9	136.9	100.0	80	**226.7**	-1.9	*ALL*
All sites but 173	767	16	13.8	6.0	1.7	15.7	19.7	25.1	40.8	52.0	114.6	199.0	354.2	567.8	853.2	1298.2	1652.1	2122.9	2240.9	136.9	100.0	80	**226.7**	-1.9	*ALLb*

* Average percentage annual change since volume 7 (1988-1992)
Significant changes (95% confidence level, Miettinen method, page 869 of volume 6) are marked in bold
Age-specific rate 5- is < limit
Age-specific rate 10- is < limit

Table 5.3 CI5 volume 8 (editorial table 4)

EREWHON (1993-1997)
International comparison and M/I ratios

Male

S I T E	Cases	ASR (se)	O/E	MV(%)	DCO(%)	M/I(%)	ICD-9
Oral cavity	57	14.9 (2.04)	0.40	94.7	5.3	59.6	140-9
Oesophagus	18	5.5 (1.32)	0.42	**83.3 <**	16.7	100.0	150
Stomach	17	4.9 (1.27)	0.43	**88.2 <**	11.8	**147.1 >**	151
Colon and rectum	44	**13.2 (2.14) <**	**0.33**	90.9	9.1	52.3	153-4
Liver	30	8.1 (1.52)	0.96	46.7	46.7	196.7	155
Pancreas	19	5.7 (1.37)	1.14	42.1	57.9	152.6	157
Larynx	11	**3.3 (1.06) <**	**0.29**	100.0	-	81.8	161
Lung	177	53.9 (4.26)	1.03	**66.1 <**	32.8	115.8	162
Melanoma of skin	23	6.0 (1.37)	1.23	100.0	-	8.7	172
Prostate	129	48.8 (4.45)	1.04	87.6	10.9	40.3	185
Testis	14	2.3 (0.63)	0.51	100.0	-	-	186
Bladder	21	**6.8 (1.55) <**	**0.31**	95.2	4.8	61.9	188
Kidney etc.	9	**2.7 (1.02) <**	**0.26**	100.0	-	66.7	189
Brain, nervous system	13	**2.6 (0.78) <**	**0.52**	**38.5 <**	23.1	53.8	191-2
Thyroid	28	**6.9 (1.38) >**	**4.73**	96.4	3.6	**3.6 <**	193
Lymphoma	41	9.7 (1.61)	0.66	87.8	12.2	17.1	200-3
Leukaemia	35	8.5 (1.57)	1.22	97.1	2.9	114.3	204-8
All sites but skin	767	226.7 (8.72)	0.65	**79.8 <**	18.3	78.2	140-208b173

Female

S I T E	Cases	ASR (se)	O/E	MV(%)	DCO(%)	M/I(%)	ICD-9
Oral cavity	26	7.2 (1.45)	1.90	**88.5 <**	11.5	**65.4 >**	140-9
Oesophagus	1	0.4 (0.37)	0.31	100.0	-	**200.0 >**	150
Stomach	23	6.2 (1.33)	1.38	82.6	17.4	73.9	151
Colon and rectum	38	**11.4 (1.89) <**	**0.47**	**76.3 <**	15.8	34.2	153-4
Liver	9	2.8 (0.96)	2.23	44.4	55.6	255.6	155
Pancreas	10	2.8 (0.90)	1.06	50.0	50.0	140.0	157
Larynx	1	0.3 (0.27)	0.39	100.0	-	100.0	161
Lung	76	**24.4 (2.88) >**	**4.48**	**76.3 <**	21.1	109.2	162
Melanoma of skin	14	3.7 (1.08)	0.56	100.0	-	-	172
Breast	240	64.7 (4.30)	0.86	**91.3 <**	7.9	43.3	174
Cervix uteri	101	**24.3 (2.50) >**	**2.37**	96.0	2.0	17.8	180
Other uterus	59	16.5 (2.25)	1.43	**88.1 <**	11.9	71.2	179,182
Ovary etc.	33	8.4 (1.54)	0.89	84.8	12.1	57.6	183
Bladder	6	1.8 (0.76)	0.56	100.0	-	50.0	188
Kidney etc.	7	1.7 (0.69)	0.36	100.0	-	71.4	189
Brain, nervous system	14	3.4 (0.95)	0.91	42.9	14.3	57.1	191-2
Thyroid	128	**28.6 (2.67) >**	**6.17**	99.2	0.8	7.8	193
Lymphoma	25	6.8 (1.40)	0.66	96.0	-	8.0	200-3
Leukaemia	21	5.2 (1.22)	1.15	95.2	4.8	100.0	204-8
All sites but skin	900	238.9 (8.30)	1.09	**87.0 <**	10.8	53.3	140-208b173

Data compared with that from x cancer registries somewhere (CI5 Vol.7)

Table 5.4. Registration practices

Registry	Includes incidental prostate cancer	Cancer cases with necropsy (%)	Includes cases diagnosed at necropsy only
Africa			
Algeria, Algiers	Y	NK	Y
France, La Réunion	Y	NK	Y
The Gambia	N	0	N
Mali, Bamako	N	NK	N
Uganda, Kyadondo County	Y	NA	Y
Zimbabwe, Harare	Y	NK	Y
South America			
Argentina, Bahia Blanca	Y	3	Y
Argentina, Concordia	Y	2.6	Y
Brazil, Campinas	Y	< 3	N
Brazil, Goiânia	N	NK	N
Colombia, Cali	N	NK	Y
Costa Rica	Y	<1	Y
Cuba, Villa Clara	Y	NK	N
Ecuador, Quito	Y	0.01	Y
France, La Martinique	Y	NK	N
USA, Puerto Rico	Y	<1	Y
Uruguay, Montevideo	Y	NK	Y
North America			
Canada	Y	NK	Y
Canada, Alberta	Y	2.8	Y
Canada, British Columbia	Y	6	Y
Canada, Manitoba	Y	NK	Y
Canada, New Brunswick	Y	NK	Y
Canada, Newfoundland	Y	NK	Y
Canada, Northwest Territories	Y	0	Y
Canada, Nova Scotia	Y	NK	Y
Canada, Ontario	Y	3.6	Y
Canada, Prince Edward Island	Y	NK	Y
Canada, Quebec	Y	NK	N
Canada, Saskatchewan	Y	2.4	Y
Canada, Yukon	Y	6	Y
USA, California, Los Angeles	Y	NK	Y
USA, California, San Francisco	Y	90	Y
USA, Connecticut	Y	NK	Y
USA, Georgia, Atlanta	Y	NK	Y
USA, Iowa	Y	3	Y
USA, Louisiana	Y	NK	Y
USA, Michigan, Detroit	Y	NK	Y
USA, New Jersey	Y	NA	NA
USA, New Mexico	Y	< 5	Y
USA, New York State	Y	2.9	Y
USA, Utah	Y	< 1	Y
USA, Washington, Seattle	Y	NK	Y
USA, SEER	Y	NK	Y
Asia			
China, Beijing	Y	NK	Y

Table 5.4 (contd). Registration practices

Registry	Includes incidental prostate cancer	Cancer cases with necropsy (%)	Includes cases diagnosed at necropsy only
China, Changle	N	NK	N
China, Cixian	N	NK	N
China, Hong Kong	Y	NK	N
China, Jiashan	Y	NK	N
China, Qidong County	Y	0	N
China, Shanghai	Y	NK	Y
China, Taiwan	Y	0.01	Y
China, Tianjin	Y	< 0.1	Y
China, Wuhan	Y	0.22	Y
India, Ahmedabad	N	NK	N
India, Bangalore	Y	NK	N
India, Chennai (Madras)	Y	NK	NA
India, Delhi	Y	NK	N
India, Karunagappally	Y	0	N
India, Mumbai (Bombay)	N	NK	N
India, Nagpur	N	NK	N
India, Poona	N	NK	N
India, Trivandrum	N	NK	N
Israel	Y	~ 0	Y
Japan, Hiroshima	Y	5	Y
Japan, Miyagi Prefecture	Y	NK	Y
Japan, Nagasaki Prefecture	Y	NK	Y
Japan, Osaka Prefecture	N	6	Y
Japan, Saga Prefecture	Y	2.8	Y
Japan, Yamagata Prefecture	Y	3.6	N
Korea, Busan	Y	0	N
Korea, Daegu	Y	0	Y
Korea, Kangwha County	N	0	N
Korea, Seoul	Y	2.4	N
Kuwait	Y	NK	N
Oman	Y	NK	N
Pakistan, South Karachi	Y	NK	NA
Philippines, Manila	Y	NK	N
Philippines, Rizal	Y	NK	Y
Singapore	Y	NK	Y
Thailand, Bangkok	N	NA	N
Thailand, Chiang Mai	Y	NK	Y
Thailand, Khon Kaen	Y	NK	N
Thailand, Lampang	Y	0	N
Thailand, Songkhla	Y	< 5	Y
Viet Nam, Hanoi	Y	NK	Y
Viet Nam, Ho Chi Minh City	Y	NK	Y
Europe			
Austria, Tyrol	Y	21.2	Y
Austria, Vorarlberg	Y	20	Y
Belarus	Y	NK	Y
Belgium, Flanders	Y	NK	Y
Belgium, Limburg	Y	~ 0	N
Croatia	Y	4	Y

Table 5.4 (contd). Registration practices

Registry	Includes incidental prostate cancer	Cancer cases with necropsy (%)	Includes cases diagnosed at necropsy only
Czech Republic	Y	27	Y
Denmark	Y	10.9	Y
Estonia	Y	20	Y
Finland	Y	NK	Y
France, Bas-Rhin	Y	< 1	Y
France, Calvados (general)	Y	NK	Y
France, Calvados (digestive)	NA	0.2	Y
France, Côte d'Or (digestive)	NA	< 1	Y
France, Côte d'Or (gynaecology)	N	< 0.1	Y
France, Côte d'Or (haematology)	NA	NA	NA
France, Doubs	Y	1.5	Y
France, Haut-Rhin	Y	65	Y
France, Hérault	Y	0.1	Y
France, Isère	Y	0.3	NA
France, Manche	Y	NK	Y
France, Somme	Y	< 1	Y
France, Tarn	Y	0	Y
Germany, Saarland	Y	NK	Y
Iceland	Y	9	Y
Ireland	Y	NK	Y
Italy, Biella Province	Y	< 0.1	Y
Italy, Ferrara Province	Y	~ 2	Y
Italy, Florence	Y	1	Y
Italy, Liguria (Mesothelioma)	NA	NK	Y
Italy, Genoa Province	Y	NK	N
Italy, Lombardy, Varese Province	Y	< 10	NA
Italy, Macerata Province	Y	NK	N
Italy, Modena	Y	NK	Y
Italy, North East	Y	12	Y
Italy, Parma Province	Y	NK	Y
Italy, Ragusa Province	Y	NK	Y
Italy, Romagna	Y	NA	Y
Italy, Sassari	Y	0.7	Y
Italy, Torino	Y	< 1	N
Italy, Umbria	Y	NK	N
Italy, Venetian Region	Y	2	Y
Latvia	Y	5	Y
Lithuania	NA	NA	Y
Malta	Y	0.2	Y
The Netherlands	Y	NK	Y
The Netherlands, Eindhoven	Y	< 3	Y
The Netherlands, Maastricht	Y	NK	Y
Norway	Y	4	Y
Poland, Cracow	Y	NK	Y
Poland, Kielce	Y	NK	Y
Poland, Lower Silesia	Y	2.6	Y
Poland, Warsaw City	Y	0.1–0.2	Y
Portugal, Vila Nova de Gaia	Y	NK	Y
Russia, St Petersburg	Y	~ 45	Y
Slovakia	Y	~ 6	Y

Table 5.4 (contd). Registration practices

Registry	Includes incidental prostate cancer	Cancer cases with necropsy (%)	Includes cases diagnosed at necropsy only
Slovenia	Y	1.7	Y
Spain, Albacete	Y	< 1	N
Spain, Asturias	Y	NK	Y
Spain, Canary Islands	Y	NK	N
Spain, Cuenca	Y	0.1	N
Spain, Girona	Y	NA	Y
Spain, Granada	Y	<1	Y
Spain, Mallorca	Y	0.01	N
Spain, Murcia	Y	NA	Y
Spain, Navarra	Y	NK	Y
Spain, Tarragona	Y	3	Y
Spain, Zaragoza	Y	NK	N
Sweden	Y	~ 9	Y
Switzerland, Basel	Y	NA	Y
Switzerland, Geneva	Y	19	Y
Switzerland, Graubünden & Glarus	Y	13	Y
Switzerland, Neuchâtel	Y	< 10	Y
Switzerland, St Gall-Appenzell	Y	36	Y
Switzerland, Ticino	Y	1	Y
Switzerland, Valais	Y	NK	Y
Switzerland, Vaud	Y	< 10	Y
Switzerland, Zürich	Y	28	Y
UK, England	NA	NK	Y
UK, England, East Anglia	Y	NK	Y
UK, England, Mersey	Y	NK	Y
UK, England, North Western	Y	NK	Y
UK, England, Oxford	Y	2–3	Y
UK, England, South Thames	Y	4	Y
UK, England, South Western	Y	NK	Y
UK, England, Trent	Y	NK	Y
UK, England, West Midlands	Y	NK	Y
UK, England, Yorkshire	Y	NK	Y
UK, Northern Ireland	Y	0.2	Y
UK, Scotland	Y	~ 4	Y
Yugoslavia, Vojvodina	Y	NK	N
Oceania			
Australian Capital Territory	Y	NK	Y
Australia, New South Wales	Y	NK	Y
Australia, Northern Territory	Y	NK	Y
Australia, Queensland	Y	2	Y
South Australia	Y	1	Y
Australia, Tasmania	Y	1.6	Y
Australia, Victoria	Y	NK	Y
Western Australia	Y	NK	Y
New Zealand	Y	NK	Y
US, Hawaii	Y	NK	Y

NK = not known
NA = response not given

Table 5.5. Percentage difference in incidence rates using multiple primary rules of SEER versus IARC/IACR: SEER registries, 1993–97

Site	Difference (SEER/IACR) (%)			
	Male		Female	
	Crude	ASR	Crude	ASR
Breast	–	–	+ 6.2	+ 5.7
Colon	+ 4.9	+ 4.6	+ 5.0	+ 4.5
Melanoma	+ 4.8	+ 5.2	+ 3.8	+ 4.0
Kidney	+ 1.7	+ 2.1	+ 0.0	+ 2.0
Testis	+ 1.8	+ 2.1	–	–
Lung	+ 1.5	+ 1.6	+ 1.6	+ 1.5
All	+ 0.9	+ 0.9	+ 2.0	+ 1.7

Table 5.4 notes the practice of registries with respect to registration of prostate cancers detected in surgical material; practically all include such 'incidental diagnoses'. The presence of screening programmes in the registry area is noted on the corresponding 'population page'.

Autopsy diagnosis: Most registries include cancers identified in necropsy examinations of subjects in whom cancer was not diagnosed (or perhaps even suspected) during life. The possible influence on incidence rates will depend upon the extent of necropsy examinations in different populations; in general this has been declining in most countries in recent decades. The registries' own appraisal of the percentage of cancer deaths autopsied is summarized in Table 5.4.

Completeness

Completeness of registration is the proportion of all incident cases in the registry population that have been included in the registry database. Completeness should be as close to 100% as possible, so that comparison of incidence rates between registries reflects true differences in cancer risk.

The editors' main concern is with the possibility of incompleteness in the data submitted.

Duplicate registration of the same case should be avoided by careful attention to record linkage during the registration process. Because the case lists submitted do not contain personal identifying information, it is impossible for the editors to check for possible duplicates. However, sometimes the existence of duplicate registration was suspected (e.g., because indices of completeness (see below) were higher than expected) and listings of possible duplicates (based on birthdate, sex, diagnosis and date of incidence) were returned to the registry for checking.

The following indices of completeness are routinely used during the editorial process:

(1) Historic data methods:
  (a) stability of incidence rates over time
  (b) comparison of incidence in different populations
  (c) age-specific incidence curves
  (d) childhood cancer
(2) Proportion of cases morphologically verified,
(3) Mortality:incidence (M:I) ratio,
(4) Death certificate methods

Table 5.6. The regions used for standard values of age-standardized incidence rates, mortality:incidence ratios and proportions of cases morphologically verified

		Registries	Populations
Africa	Sub-Saharan Africa	5	5
	Middle East and North Africa	3	3
Latin America	Latin America	12	12
North America	Canada	12	12
	USA	12	31
Asia	China	4	4
	Japan	6	6
	Other Eastern Asia	4	4
	South-Eastern Asia	5	7
	South-Central Asia	6	6
	Western Asia	2	4
Europe	Eastern Europe	7	7
	Northern Europe	7	7
	Great Britain	11	11
	South-Eastern Europe	4	4
	Italy	13	13
	Spain	9	9
	Western Europe	20	20
	France	8	8
	Switzerland	8	8
Oceania	Oceania	9	14

For several of the quantitative indices, a comparison with 'standard values' was performed. In most cases, the 'standard' represented the values from cancer registries in the same 'region' from Volume VII of *Cancer Incidence in Five Continents*. The use of regional values recognizes that diagnostic practices (especially with respect to histology and cytology) and the accuracy of recording the underlying cause of death on death certificates varies between populations. One might also reasonably assume that the incidence rates for specific cancers tend to be rather similar in data-sets from the same region. In total, 21 'regions' were defined. For each, the mean and variance of values of the site-specific age-standardized incidence, proportion of cases morphologically verified, and M:I ratios were calculated from the contributions to Volume VII. The regions used are shown in Table 5.6.

Stability of incidence over time

Constancy of registrations during the period under review: Editorial Table 1 (Table 5.1) is simply a distribution of cases registered, by site and year. It permits a rapid visual check on the stability of numbers of cases being recorded each year, and signals potential problems in the registration process during the period under review.

Comparison of rates with those in Volume VII: The change in incidence rates (as average percentage annual change) since Volume VII is presented in the column headed CH.V7 in Editorial Table 3 (Table 5.2). Those changes which are statistically significant, based on a comparison of the age-standardized rate in Volume VII, are marked in bold. The statistical test employed is described below. Changes in incidence rates over time which are greater than expected, and which cannot be ascribed to discrepancies in the estimation of person-years at risk, suggest the possibility of changes in the completeness of case ascertainment

Comparison of incidence in different populations

The possibility of incomplete registration is also investigated by comparing the incidence rates observed with an 'expected' value, from registries in the same region (Table 5.6). Editorial Table 4 (Table 5.3) includes the age-standardized incidence rates (and their standard error) for 21 sites (and All Sites) in males and females, with the ratio (O/E) of the observed value relative to the expected. The values are in bold, and flagged (>/<) if the age-standardized rate is significantly different from the standard for the corresponding region. The statistical test used is described below. In addition to the Editorial Table 4, the editors frequently compared *ad hoc* tabulations from registries covering similar (geographically, ethnically) populations. The presence of lower than expected rates for several sites leads to under-registration being considered as an explanation.

Age-specific incidence curves

Age-specific incidence curves for 12 sites in each sex comprise Editorial Table 2 (Figure 5.1). The curves were examined during the editorial process, in order to detect abnormal fluctuations in the anticipated patterns, including any fall-off in the rate of increase in incidence in older subjects (suggestive of under-ascertainment in the oldest age groups). The curves also reveal problems with estimates of population at risk for specific age groups.

Childhood cancer

In general, the incidence of cancer (of all types) in the childhood age group shows much less variability than in adults, although there are well documented differences by geography or ethnicity for specific types of childhood cancer. The possibility of under-enumeration (or duplicate registrations) in this age range was investigated by comparing the observed age-specific rates in the childhood age range with the range of values in Volume VII. The limiting values for the lowest and highest deciles were as shown in Table 5.7

Table 5.7. Values of incidence rates (per million) for upper and lower deciles of childhood cancer

	Boys		Girls	
Age	Lowest	Highest	Lowest	Highest
0–4	<12.3	>24.7	<9.7	>21.4
5–9	<8.5	>15.6	<6.9	>12.0
10–14	<8.5	>15.0	<6.8	>13.6

Values in the lowest and highest deciles, at ages 0–4, 5–9 and 10–14 years were listed at the foot of Editorial Table 3 (Table 5.2).

Histologically verified cancers

Editorial Table 4 (Table 5.3) tabulates, for each site and sex, the percentage of cases for which the diagnosis was based upon 'morphological verification' of a tissue specimen (MV%). This includes, in addition to histological confirmation of diagnosis, diagnoses based upon exfoliative cytology specimens and diagnoses of leukaemia based on haematological examination (without examination of bone marrow).

The MV% figures are presented also in the tables of 'Indices of Data Quality' (pp. 705–771).

The main value of the MV% is as an indicator of the validity of the diagnostic information (Parkin *et al.*, 1994). However, a very high proportion of cases diagnosed by histology or cytology/haematology—higher than might reasonably be expected—suggests over-reliance on the pathology laboratory as source of information and failure to find cases diagnosed by other means.

In Editorial Table 4 (Table 5.3), a value in bold in the 'MV%' column, accompanied by a flag (</>), signifies that the number of cases so diagnosed is significantly greater than (>) or less than (<) the value expected, based on the average from registries in the corresponding region (by sex and site) in *Cancer Incidence in Five Continents*, Volume VII). The test used is described below.

Mortality:incidence ratio

This is an important indicator of completeness, an example of the independent case ascertainment method (Parkin *et al.*, 1994). Registries are asked to provide the mortality data on cancer by sex, age group and site, for the same period as the registered cases, from the local vital statistics office (municipal, provincial, national, etc.). Registry-generated mortality statistics (based on cases in the registry database who die during the period or incorporating corrections to the certified cause of death) are not acceptable, since they do not constitute an independent data source.

When the quality of the mortality data is good, the M:I ratio is related to case fatality (1–survival). However, when mortality statistics are of poorer quality (incomplete certification, inaccurate statements of cause of death), the relationship is less close. Evaluation of the M:I ratio should take this into account. Since both survival and quality of mortality statistics are somewhat related to geographical region (both are poorer in developing countries), the regional location of the registry is important in evaluation of the statistic.

In Editorial Table 4 (Table 5.3), the M:I ratios for a given site are marked as being significantly greater (>) or less (<) than expected, based on the average regional values from *Cancer Incidence in Five Continents*, Volume VII (the regions shown in Table 5.6). The test used is described below.

The tables of indicators of quality (pp. 705–771) show the values of the M:I ratio for registries where official mortality statistics

are available (and where their overall quality is not too hopeless to be used as an indicator of completeness). Thus, only for La Réunion among the African registries can an M:I ratio be calculated.

Death certificate methods

Death certificates provide an important supplementary source of information for cancer registries. As far as incidence statistics are concerned, they function as a means of capturing information on cases that escaped the registration process during life. The means of using statistics on 'death certificate cases' to evaluate quality of cancer registry data still apparently causes confusion, although this has been clearly defined (Parkin & Muir, 1992; Parkin *et al.*, 1994).

Completeness of registration may be evaluated on the basis of the proportion of incident cancers that first come to the registry's attention via a death certificate mentioning cancer (DCN cases). This information is not available to the editors of *Cancer Incidence in Five Continents*, who only know the numbers of DCO cases—that is, the residuum of cases remaining after various follow-back procedures have been carried out on DCN cases (see below). By itself, therefore, the DCO% is NOT an indicator of completeness of registration—a low DCO% may indicate efficient case-finding, but it could equally well result from the efficient traceback of DCN cases. Nevertheless, the DCN% will always be equal to, or greater than, the DCO%, so an elevated DCO% is suggestive of incompleteness. Even this must be interpreted in the light of local circumstances; in some developing countries, the quality of death certificates may be very poor, with a fair number of erroneous cancer deaths, which the registry may have difficulty tracing back to a hospital capable of confirming (or not) the death certificate statement.

Failure to use death certificates, when these are available and can be linked to the registry database (anonymous death certificates, as found in many francophone countries, are useless in this respect), is generally taken to mean that some lack of completeness is likely to be present.

Validity

Validity is defined as the proportion of cases in a data-set with a given characteristic (e.g., site, age) which truly have the attribute.

Cancer Incidence in Five Continents uses five of the common indices of validity (Parkin *et al.*, 1994):

Internal consistency
Histological verification
Death certificate only
Other and unspecified
Age unknown

The use of the IARC-CHECK program to perform consistency checks on the submitted data-sets is described in Chapter 6 on data-processing. Practically all data-sets were submitted to this process, and the cases queried were checked by the registry before incorporation into the database. Only five registries provided data as case lists without histology, so precluding use of IARC-CHECK. These registries are identified by a flag (+) on the corresponding tables.

Histological verification

For most cases, the accuracy of the stated diagnosis is likely to be higher if it is based on histological examination by a pathologist. Previous surveys have shown that many cancer registries code diagnoses based on exfoliative cytology or on haematological examination of peripheral blood in the same category as histological examinations, so that it is impossible to distinguish between them. Partly for this reason, the index of validity used in the editorial tables (Table 5.3) and the tables showing indices of data quality in this volume (pp. 705–771) concern the percentage of cases morphologically verified.

As noted above, values in bold, and the flags (>/<) against the MV% column in Editorial Table 4 indicate whether the number of MV cases is greater than or less than that expected based on the regional standard.

Death certificate only

In this volume, considerable effort has been made to ensure that what is reported as DCO cases in the editorial tables and the tables of Indices of Data Quality does, indeed, refer to such cases. That is, they represent the residuum of cases—after all trace-back manoeuvres have been completed—for which no other information than a death certificate mentioning cancer could be obtained. Inasmuch as the diagnostic information on death certificates is well known to suffer from lack of accuracy or lack of precision, a high proportion of DCO cases implies a lack of validity of the data. It would usually imply a lack of completeness also, as noted earlier.

Because of the many considerations involved in interpretation, and the sensitivity of the DCO% to local circumstances (availability of death certificates, quality of cause-of-death statements, facility to trace back cases), no objective criteria of acceptability of DCO% are applied. However, it will be noticed that no cancer registry has a DCO% (all sites) in excess of 23%, and only four registries (3.6%) in North America, Western Europe, Australia/New Zealand with a DCO% (all sites) in excess of 10% have been included.

Other and unspecified

The content of this category is defined in detail in Chapter 3. A high proportion of cases assigned to these rubrics generally implies poor diagnostic precision (as evidenced by the low HV% observed for this rubric), or failure to specify the site of the primary cancer in cases diagnosed on the basis of tissue obtained from a metastasis.

The percentage of 'Other and Unspecified' cases, by registry, is given in Table 5.8.

Age unknown

The proportion of cases for which age was unknown is reported, by registry, in Table 5.8.

Population

Although it is easy to forget the fact, a 10% error in the estimation of population at risk produces just as much inaccuracy in the calculated incidence rate as a 10% error in enumeration of cases. However, cancer registries are generally not responsible for population estimates, relying upon various departments of central and local government to supply the required information. Registries should, however, inform themselves about the source of the population-at-risk figures that they use, and the methods used to produce estimates and projections. The editors of this volume asked all contributing registries to provide this information, and it is summarized, along with the average annual population at risk for the period covered by the registrations, for each entry.

The population data provided by a registry could rarely be verified by the editors. The shape of the population pyramids and irregularities in the age-specific incidence curves sometimes suggested errors in the estimates, and occasionally the appropriateness of the source of the information provided was queried. For Volume VIII, which mainly concerns periods of time around 1995, census data were not usually available, so that population at risk was based on post-censal (or, more rarely, intercensal) estimates. It has been noticed with previous volumes (e.g., Volume VI) that post-censal estimates sometimes prove to have been inaccurate (or, at least, undergo revision) when later census counts become available.

Potential problems in estimating population at risk are included in the 'Notes' section for each entry. In some cases, likely inaccuracies in estimates of the population at risk contributed to the decision to add an asterisk to the registry's contribution.

Table 5.8 Percentage of other and unspecified site (O&U) and unknown age (Unk), all sites

	MALE		FEMALE	
	O&U	Unk	O&U	Unk
Africa				
Algeria, Algiers	6.0	6.6	3.8	4.9
France, La Reunion	4.0	-	3.9	-
The Gambia	5.8	7.8	5.4	11.1
Mali, Bamako	3.3	-	2.9	-
Uganda, Kyadondo County	4.5	4.2	3.7	2.7
Zimbabwe, Harare: African	2.7	1.4	3.2	1.7
America, Central and South				
Argentina, Bahia Blanca	4.8	0.6	3.9	1.1
Argentina, Concordia	8.5	-	6.0	-
Brazil, Campinas	4.8	0.7	4.5	0.9
Brazil, Goiania	2.3	0.3	2.2	0.1
Colombia, Cali	5.9	4.0	5.5	4.3
Costa Rica	4.2	-	4.3	-
Cuba, Villa Clara	3.3	0.9	3.6	1.3
Ecuador, Quito	4.2	0.8	4.1	0.5
France, Martinique	2.7	-	4.8	-
USA, Puerto Rico	2.6	0.4	3.8	0.3
Uruguay, Montevideo	5.8	0.8	5.5	0.5
America, North				
Canada	3.5	0.0	3.9	0.0
Canada, Alberta	3.5	-	4.3	-
Canada, British Columbia	3.3	-	4.2	-
Canada, Manitoba	2.8	-	3.7	-
Canada, New Brunswick	2.9	-	3.5	-
Canada, Newfoundland	3.4	-	4.1	-
Canada, Northwest Territories	2.5	-	2.9	-
Canada, Nova Scotia	4.3	0.2	4.9	0.2
Canada, Ontario	4.2	0.1	3.9	0.0
Canada, Prince Edward Island	3.4	-	3.1	-
Canada, Quebec	2.9	-	3.6	-
Canada, Saskatchewan	3.2	0.0	4.3	0.0
Canada, Yukon	3.4	-	6.5	-
USA, California, Los Angeles: Non-Hispanic White	2.9	0.1	3.6	0.0
USA, California, Los Angeles: Hispanic White	3.0	0.0	3.3	0.0
USA, California, Los Angeles: Black	3.0	0.0	4.0	0.0
USA, California, Los Angeles: Chinese	2.2	0.1	3.0	0.1
USA, California, Los Angeles: Filipino	2.6	0.1	3.6	-
USA, California, Los Angeles: Japanese	2.4	0.1	2.5	-
USA, California, Los Angeles: Korean	3.0	0.1	3.4	0.1
USA, California, San Francisco: Non-Hispanic White	2.6	-	3.4	-
USA, California, San Francisco: Hispanic White	2.6	-	3.5	-
USA, California, San Francisco: Black	2.5	-	3.7	-
USA, Connecticut: White	2.8	-	3.3	-
USA, Connecticut: Black	2.8	-	3.5	-
USA, Georgia, Atlanta: White	2.6	-	2.7	-
USA, Georgia, Atlanta: Black	3.0	-	4.4	-
USA, Iowa	2.3	-	3.0	-
USA, Louisiana, Central Region: White	3.2	-	3.5	-
USA, Louisiana, Central Region: Black	2.6	-	4.2	-
USA, Louisiana, New Orleans: White	2.8	-	3.3	-
USA, Louisiana, New Orleans: Black	3.4	-	3.5	-
USA, Michigan, Detroit: White	2.1	-	3.0	-
USA, Michigan, Detroit: Black	2.1	-	3.5	-
USA, New Jersey: White	2.5	0.0	3.5	0.0
USA, New Jersey: Black	2.9	0.0	3.7	-
USA, New Mexico: Non-Hispanic White	2.9	-	3.0	-
USA, New Mexico: Hispanic White	3.2	-	3.5	-
USA, New Mexico: American Indian	3.1	-	5.6	-
USA, New York State: White	2.5	-	3.0	-
USA, New York State: Black	2.5	-	3.2	-
USA, Utah	2.5	-	3.3	-
USA, Washington, Seattle	2.0	-	2.7	-
USA, SEER: White	2.4	-	3.1	-
USA, SEER: Black	2.4	-	3.7	-
Asia				
China, Beijing	2.0	-	2.2	-
China, Changle				
China, Cixian				
China, Hong Kong	4.4	0.1	4.5	0.1
China, Jiashan	0.2	0.0	0.2	-
China, Qidong County	0.2	-	0.3	-
China, Shanghai	2.9	-	3.4	-
China, Taiwan	2.5	-	2.5	-
China, Tianjin	3.2	-	3.2	-
China, Wuhan	1.8	-	2.2	-

Table 5.8 (Contd) Percentage of other and unspecified site (O&U) and unknown age (Unk), all sites

	MALE		FEMALE	
	O&U	Unk	O&U	Unk
Asia (contd)				
India, Ahmedabad	14.8	0.7	11.9	0.8
India, Bangalore	12.2	0.3	7.8	0.4
India, Chennai (Madras)	6.4	-	4.5	-
India, Delhi	13.2	0.6	9.1	0.8
India, Karunagappally	17.8	0.9	13.1	0.5
India, Mumbai (Bombay)	6.2	0.1	4.6	0.2
India, Nagpur	15.5	1.4	8.7	1.8
India, Poona	5.9	0.6	4.2	0.6
India, Trivandrum	13.6	0.1	9.4	0.1
Israel: Jews	5.7	-	5.7	-
Israel: Jews born in Israel	3.9	-	2.9	-
Israel: Jews born in Europe or America	5.9	-	6.4	-
Israel: Jews born in Africa or Asia	6.3	-	6.1	-
Israel: Non-Jews	7.9	-	7.3	-
Japan, Hiroshima	1.0	0.0	1.2	0.0
Japan, Miyagi Prefecture	1.9	0.1	2.4	0.1
Japan, Nagasaki Prefecture	1.1	-	1.6	-
Japan, Osaka Prefecture	1.4	0.0	1.9	0.0
Japan, Saga Prefecture	1.3	0.0	1.4	-
Japan, Yamagata Prefecture	1.2	-	1.8	-
Korea, Busan	3.2	-	3.0	-
Korea, Daegu	2.3	-	2.1	-
Korea, Kangwha County	2.7	-	2.5	-
Korea, Seoul	1.9	0.0	2.0	0.0
Kuwait: Kuwaitis	5.6	0.6	4.4	0.1
Kuwait: Non-Kuwaitis	5.8	-	2.7	0.1
Oman: Omani	7.4	-	8.0	-
Pakistan, South Karachi	10.7	-	6.6	-
Philippines, Manila	4.9	0.9	3.7	1.0
Philippines, Rizal	5.7	0.6	4.2	0.7
Singapore: Chinese	2.8	0.0	2.9	0.0
Singapore: Indian	2.5	-	2.5	-
Singapore: Malay	3.6	-	4.3	-
Thailand, Bangkok	14.8	0.5	8.8	0.5
Thailand, Chiang Mai	13.9	-	11.9	-
Thailand, Khon Kaen	11.0	0.3	8.4	0.3
Thailand, Lampang	14.9	-	12.1	-
Thailand, Songkhla	10.0	0.1	5.9	-
Viet Nam, Hanoi	3.4	-	2.9	-
Viet Nam, Ho Chi Minh City	3.2	-	3.1	-
Europe				
Austria, Tyrol	1.3	-	2.4	-
Austria, Vorarlberg	1.8	-	2.4	-
Belarus	2.3	0.0	1.9	0.0
Belgium, Flanders, (excl. Limburg)	3.6	-	4.3	-
Belgium, Limburg	6.2	-	9.8	-
Croatia	4.1	0.8	4.2	0.9
Czech Republic	2.7	-	3.1	-
Denmark	4.1	-	4.5	-
Estonia	2.4	-	1.7	-
Finland	2.2	-	3.0	-
France, Bas-Rhin	3.0	-	3.2	-
France, Calvados	2.5	-	2.3	-
France, Cote d'Or				
France, Doubs	3.0	0.2	2.3	0.2
France, Haut-Rhin	1.6	-	1.2	-
France, Herault	3.1	-	2.1	-
France, Isere	3.4	-	3.1	-
France, Manche	3.3	-	2.9	-
France, Somme	4.6	-	4.2	-
France, Tarn	3.9	-	4.9	-
Germany, Saarland	3.4	-	3.8	-
Iceland	0.4	-	0.8	-
Ireland	4.1	-	4.6	-
Italy, Biella Province	3.0	-	3.8	-
Italy, Ferrara Province	2.5	-	2.8	-
Italy, Florence	2.6	-	2.9	-
Italy, Genoa Province	3.2	-	3.8	-
Italy, Liguria				
Italy, Macerata Province	2.9	-	2.7	0.0
Italy, Modena Province	2.6	-	2.9	-
Italy, North East	2.9	-	3.0	-

Table 5.8 (Contd) Percentage of other and unspecified site (O&U) and unknown age (Unk), all sites

	MALE		FEMALE	
	O&U	Unk	O&U	Unk
Europe (contd)				
Italy, Parma Province	1.5	-	2.6	-
Italy, Ragusa Province	2.8	-	3.1	-
Italy, Romagna	1.9	-	2.5	-
Italy, Sassari	3.5	-	3.4	-
Italy, Torino	2.6	-	2.9	-
Italy, Umbria	1.0	-	1.1	-
Italy, Varese Province	2.2	-	3.1	-
Italy, Venetian Region	2.6	-	2.8	-
Latvia	1.5	-	1.3	-
Lithuania	2.3	-	1.8	-
Malta	4.5	0.1	3.9	0.1
The Netherlands	4.2	-	4.2	-
The Netherlands, Eindhoven	3.8	-	3.5	-
The Netherlands, Maastricht	4.8	-	4.7	-
Norway	3.8	-	4.5	-
Poland, Cracow	6.2	-	4.9	-
Poland, Kielce	4.6	-	4.7	-
Poland, Lower Silesia	4.6	-	4.9	-
Poland, Warsaw City	4.6	0.0	4.8	0.0
Portugal, Vila Nova de Gaia	2.8	-	2.9	0.1
Russia, St Petersburg	1.9	-	1.7	-
Slovakia	2.1	-	2.6	-
Slovenia	4.5	-	4.7	-
Spain, Albacete	4.5	0.4	6.0	0.4
Spain, Asturias	6.3	1.2	6.8	1.5
Spain, Canary Islands	4.7	0.3	4.7	0.2
Spain, Cuenca	4.4	0.0	4.6	0.1
Spain, Girona	2.7	0.9	4.0	1.1
Spain, Granada	4.0	-	4.3	-
Spain, Mallorca	3.3	0.9	3.2	1.1
Spain, Murcia	3.8	0.1	3.8	0.1
Spain, Navarra	2.8	0.0	3.6	0.0
Spain, Tarragona	3.7	1.1	3.9	1.6
Spain, Zaragoza	3.2	3.4	4.2	3.3
Sweden	3.6	-	4.6	-
Switzerland, Basel	1.4	-	1.6	-
Switzerland, Geneva	1.8	-	1.8	-
Switzerland, Graubunden and Glarus	2.3	-	1.9	-
Switzerland, Neuchatel	1.8	-	2.1	-
Switzerland, St Gall-Appenzell	2.3	-	2.7	-
Switzerland, Ticino	2.5	-	2.3	-
Switzerland, Valais	2.4	-	3.3	-
Switzerland, Vaud	2.0	-	2.4	-
Switzerland, Zurich	2.4	-	3.5	-
UK, England	5.2	-	6.0	-
UK, England, East Anglia	4.2	-	4.9	-
UK, England, Merseyside and Cheshire	4.9	-	5.7	0.0
UK, England, North Western	5.3	-	6.1	-
UK, England, Oxford Region	3.8	-	4.7	-
UK, England, South Thames	6.9	-	7.8	-
UK, England, South and Western Regions	4.5	-	5.5	-
UK, England, Trent	5.2	-	6.0	-
UK, England, West Midlands Region	6.3	0.0	6.8	0.0
UK, England, Yorkshire	5.5	-	6.3	-
UK, Northern Ireland	4.4	0.0	5.5	0.0
UK, Scotland	4.5	-	5.2	0.0
Yugoslavia, Vojvodina	4.8	-	5.4	-
Oceania				
Australia, Capital Territory	3.7	-	3.4	-
Australia, New South Wales	4.0	-	4.7	-
Australia, Northern Territory	5.7	-	5.1	-
Australia, Queensland	3.7	-	3.9	-
Australia, South	3.6	-	4.5	-
Australia, Tasmania	3.9	-	4.5	-
Australia, Victoria	3.6	-	4.2	-
Australia, Western	3.3	-	3.9	-
New Zealand	4.1	-	5.4	-
USA, Hawaii: White	2.2	-	2.6	-
USA, Hawaii: Chinese	1.8	-	3.2	-
USA, Hawaii: Filipino	2.9	-	2.9	-
USA, Hawaii: Hawaiian	2.8	-	2.6	-
USA, Hawaii: Japanese	1.9	-	2.5	-

Annotations to data-sets

Flagged data-sets (+)

As described above, a few registries were unable to submit their data in the format requested (anonymous case listings with histology). For these data-sets, the internal consistency checks for data quality could not be performed. Two registries declined to verify the list of queries sent to them as part of the editorial process. This group of registries (seven in total) have been marked with a flag (+) as having undergone less rigorous quality control procedures than the majority.

The asterisk (*)

The presence of an asterisk implies that some care is required in interpretation of the numerical results for some or all cancer sites, and the reader should refer to the 'Notes' section of the registry description for the precise reasons.

The principal use of an asterisk is to denote data-sets that the editors considered to have characteristics suggesting questionable quality or completeness of information on cases or the population at risk, or for which they were unable to evaluate the relevant indices, due to deficiencies in the registration process. The criteria used in this judgement were not rigidly defined, the decision being based on examination of all of the indices described in this chapter and knowledge of the circumstances in which the registry operates. The intrinsic interest of the data-set in providing information on little known geographical and ethnic patterns, or continuity with earlier data from the same registry, were also taken into consideration.

For some data-sets, notes also warn readers to be cautious in the use of the results for the study of time trends. Thus, for certain registries, the rates presented may not be comparable with those published in earlier volumes of *Cancer Incidence in Five Continents* because of changes in definitions (for example, with respect to inclusion of *in situ* bladder neoplasms, or more recent information on the population at risk). The use of the asterisk for this purpose is explained in the 'Notes' section of the entry.

Statistical tests

Four comparisons are made for which statistical tests are applied as part of the editorial process. The results of these tests are not published, but are used to flag certain registries as 'unusual', or possibly inconsistent with previously published data, and therefore requiring further investigation. The four tests are:

1. Comparison of the age-standardized incidence rate (ASR) in Volume VIII with that in the previous period, published in Volume VII,
2. Comparison of the registry ASRs for major sites with the values observed in registries in the same region in Volume VII,
3. Comparison of the percentage of cases with morphological verification of diagnosis (MV%) for major sites with the values observed in registries in the same region in Volume VII,
4. Comparison of the mortality to incidence ratio (M:I) for major sites with the values observed in registries in the same region in Volume VII.

Tests 2–4 compare current data with the regional average from Volume VII. These tests need to take into account the fact that the quantities being investigated are similar, but not identical, among registries in the same region. The simplest way to take small regional differences into account is to start with a model in which the region is assumed to be homogeneous, then add an overdispersion parameter that represents extra variation between registries. This approach has been adopted for tests 2–4, and is explained in more detail below.

Comparison of ASRs from Volume VIII with the values from Volume VII

The standard errors of the standardized rates are used to assess the statistical significance of the difference between rates from the two periods. For example, if the standardized rates for a tumour are R_1 in Volume VIII and R_2 in Volume VII and the associated standard errors are S_1 and S_2, an approximate confidence interval for the ratio of the standardized rates may be obtained, using a method due to Miettinen (1972), as

$$(R_1/R_2)^{1\pm z/x}$$

where $x = (R_1 - R_2)\sqrt{(S_1^2 + S_2^2)}$ and $z = 1.96$ for 95% confidence limits or 2.58 for 99% confidence). If this interval includes unity, the standardized rates R_1 and R_2 are not significantly different (at the 5% level if $z = 1.96$).

This comparison between standardized rates may be misleading if the ratios of the age-specific rates in the two periods are not approximately constant in all age-groups, but in practice, this is not likely to be an important consideration.

Comparison of the registry ASRs with values from registries in the same region

The editors retained a procedure used in previous volumes, which was to flag as unusual any ASR that was greater than three times or less than 0.3 times the value in the comparison population. The comparison populations are registries in the same region (Table 5.6). A further test was then performed, to detect significant deviations from the standard ASR that were smaller than this.

We start with a Poisson model for the incidence rate

$$E(D) = \lambda Y$$
$$\text{Var}(D) = \lambda Y$$

where D is the number of cases, Y is the total number of person-years at risk in the population and I is the incidence rate.

The overdispersion model changes this to:

$$E(D) = \lambda Y$$
$$\text{Var}(D) = \phi \lambda Y, \text{ where } \phi > 1$$

The overdispersion parameter ϕ is estimated from data in Volume VII:

Let

y_i = estimated ASR in registry i

s_i = standard error of y_i

$$\bar{y} = \text{regional ASR} = \frac{\sum_{i=1}^{n} y_i}{n}$$

where n is the number of registries in the region. The estimate of f is given by

$$\hat{\phi} = \frac{1}{n-1} \sum_{i=1}^{n} \left(\frac{y_i - \bar{y}}{s_i} \right)^2$$

If $\hat{\phi} < 1$, then take $\hat{\phi} = 1$.

For the registry being tested with data y_j, s_j, the test statistic is

$$Z^2 = \frac{(y_j - \bar{y})^2}{\hat{\phi} s_j^2} \sim \chi^2_1$$

So the registry is flagged as unusual if $Z^2 \geq 3.84$.

Comparison of the registry MV% by site with values from registries in the same region

The comparison populations are registries in the same region (Table 5.6). Using the data from Volume VII, one has registries in the same region indexed by $i = 1,\ldots, n$.

y_i = number of microscopically verified cases in registry i
d_i = total number of cases in registry i

Under the binomial model for y_i

$E(y_i) = pd_i$
$\text{Var}(y_i) = p(1-p)d_i$

where p is the proportion of MV cases.

The overdispersion model changes this to

$\text{Var}(y_i) = \phi\gamma(1-p)d_i$

The parameters are estimated by

$$\hat{p} = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} d_i}$$

$$\hat{\phi} = \frac{1}{n-1} \sum_{i=1}^{n} \frac{(y_i - pd_i)^2}{d_i\, p\,(1-p)}$$

For the registry under test, with data y_j, d_j, the test statistic is

$$Z^2 = \frac{(y_j - \hat{p}d_j)^2}{\hat{\phi}\ \hat{p}(1-\hat{p})d_j} \sim \chi^2_1$$

So the registry is flagged as unusual if $Z^2 \geq 3.84$.

Comparison of the registry M:I ratio, by site with values from registries in the same region

The comparison populations are registries in the same region (Table 5.6). Using the data from Volume VII, one has registries in the same region indexed by $i = 1,\ldots, n$.

d_i = number of cases in registry i
m_i = number of deaths in registry i

We start with a *Poisson* model for m_i d_i in which the ratio of expected values is θ. This model can be converted to a binomial model by conditioning on the total number of cases and deaths $n_i = m_i + d_i$.

Then

$$\hat{\theta} = \frac{\sum_{i=1}^{n} m_i}{\sum_{i=1}^{n} d_i}$$

Define

$$\hat{\phi} = \frac{1}{n-1} \sum_{i=1}^{n} \frac{(m_i - \hat{\theta}d_i)^2}{n_i\,\hat{\theta}}$$

For the registry under test, with cases d_j and deaths m_j, the test statistic is

$$Z^2 = \frac{(m_j - \hat{\theta}d_j)^2}{\hat{\phi}\ n_j\hat{\theta}} \sim \chi^2_1$$

So the registry is flagged as unusual if $Z^2 \geq 3.84$.

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