2.1 Description of cohort studies

Information on cohort studies of cancer and alcoholic beverage consumption in general populations and special populations is given in Tables 2.1a and 2.1b, respectively.

2.1.1 *Studies in general populations (Table 2.1a)*

These studies are classified by the country in which the study was conducted.

Table 2.1a. Cohort studies of cancer and alcoholic beverage consumption in general populations

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Asia/Oceania								
Australia								
Melbourne Collaborative Cohort Study	1990–94	Baglietto *et al*. (2005, 2006)	1990–2003	Cohort of 41 528 men and women, aged 27–75 years	Interview	Cases/ deaths	Breast, prostate	
China								
Zoucheng/ Shandong Study	1982	Zhang *et al*. (1997)	1982–94	7809 men and 7994 women from probabilistic sample of general population in three counties, aged ≥20 years	Baseline questionnaire		Lung	No dose–response found for frequency, amount or duration of drinking; lung cancer mortality found in crude analyses
Linxian Nutrition Intervention Trial	1986	Guo *et al*. (1994); Tran *et al*. (2005)	1986–2001	Nested case–control study; a cohort of 29 584 adults in a randomized intervention trial, aged 40–69 years	Structured interview	Cases	Oesophagus, stomach	Drinking alcoholic beverages was relatively uncommon in Lin Xian residents, but was reported by 22% of the cancer patients.

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Shanghai Men's Study	1986–89	Yuan *et al.* (1997)	1986–95	18 244 male residents of Shanghai, aged 45–64 years	Structured interviewed	Deaths	Upper aerodigestive tract, stomach, colon, rectum, liver, lung	Joint effects of alcohol and smoking examined
Jiashan County Screening Study	1989–90	Chen *et al.* (2005a)	1989–2001	31 087 men and 33 256 women screened for colorectal cancer in 1989–90, aged ≥30 years	Interviewer-administered standardized questionnaire	Deaths	Colon, rectum	No differences in risk for men and women; among only one case among former drinkers
Yunnan Tin Corporation Miners Cohort	1992	Lu *et al.* (2000a)	1992–97	7965 miners, aged ≥40 years; 10 years of high-risk professional activity	Interviewer-administered questionnaire		Lung	
Japan								
Japanese Physicians' Study	1965	Kono *et al.* (1985, 1986, 1987)	1965–83	5130 male Japanese physicians, aged 27–89 years	Self-administered questionnaire	Deaths	Upper aerodigestive tract, oesophagus, stomach, large bowel, liver, lung	Joint effects of alcohol and tobacco examined

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Six Prefecture Study	1965	Hirayama (1989, 1992); Kinjo *et al*. (1998)	1966–82	122 261 male and 142 857 female, Japanese adults aged 40–69 years at the baseline of 1965, from 29 public health districts in six prefectures of Japan	Interviewer-administered standardized questionnaire	Deaths	Mouth, pharynx, oesophagus, stomach, proximal colon, rectum, sigmoidcolon, upper and lower digestive tract, liver, prostate	Joint effect of alcohol and tobacco examined
Life Span Study	1979–81	Goodman *et al*. (1997a)	1979–89	Analytical cohort of 22 000 residents of Hiroshima and Nagasaki in 1945 [age range not stated]	Self-administered questionnaire	Cases	Breast	No association in women who drank beer, sake or other alcoholic beverages
Chiba Center Association Study	1984	Murata *et al.* (1996)	1984–93	Nested case–control study; cohort of 17 200 men part of a gastric mass screening survey	Self-administered questionnaire	Cases	Oral cavity, pharynx, oesophagus, stomach, colon, rectum, liver, pancreas, biliary tract, larynx, lung, prostate urinary bladder	The effect of tobacco smoking was examined.

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Aichi Cancer Center Hospital Study	1985	Kato *et al*. (1992a)	1985–89	3 914 subjects who underwent gastroscopic examination	Self-recorded questionnaire, cancer registry and death certificate	Cases	Stomach	Non-significant increase for risk in stomach cancer among past and daily drinkers
Aichi Prefecture Study	1986	Kato *et al*. (1992b)	1986–91	9 753 Japanese men and women, aged ≥40 and ≥30 years, respectively	Baseline survey using a mailed questionnaire; death certificate	Cases	Stomach	Association between alcohol intake and stomach cancer slightly weakened when smoking status, diet and family history of stomach cancer were included in the multivariate analysis.
Japanese Collaborative Cohort Study (JACC)	1988–90	Lin *et al*. (2002, 2005); Sakata *et al*. (2005), Wakai *et al*. (2005); Nishino *et al*. (2006)	1988–99	110 792 (46 465 men, 64 327 women), aged 40–79 years	Self-administered questionnaire	Cases/ deaths	Oesophagus, colon, rectum, breast, pancreas, lung,	Relative risks by smoking status reported

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Hospital-Based Epidemiologic Research Program at the Aichi Chiba Center (HERPACC)	1988–99	Inoue *et al.* (2003)	1988–2000	Nested case–control study of 78 755 hospital patients, aged 32–85 years	Self-administered questionnaire	Cases	Pancreas	Increased risk in men and women, separately; the increased risk in former drinkers may be due to ill-health
Japan Public Health Center Study Cohort I	1990	Sasazuki *et al.* (2002)	1990–99	27 063 men, 27 435 women born in 1930–49, aged 40–59 years at baseline	Self-administered questionnaire, death certificates, cancer registry	Cases	Stomach	Data for women collected but not presented
Takayama City Cohort	1992	Shimizu *et al.* (2003)	1993–2000	Analytic cohort of 13 392 men and 15 695 women, aged ≥35 years	Self-administered standardized questionnaire	Cases	Colon, rectum	Significant dose–response relationship between alcohol consumption and colon cancer in both sexes

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Japan Public Health Center Study Cohort II	1993	Otani *et al.* (2003)	1993–99	42 540 male and 47 464 female Japanese, aged 40–69 years	Self-administered standardized questionnaire	Cases	Colon, rectum	In men, no interaction of smoking with alcoholic beverage consumption for colon, rectal or colorectal cancer; no associations for colorectal cancer in women
North America								
Canada								
Nutrition Canada Survey Cohort	1970–72	Ellison (2000)	1970–93	12 795 respondents to a population survey, aged 50–84 years	Interviews	Cases	Prostate	
National Breast Screening Study	1980–85	Friedenreich *et al*. (1993); Jain *et al.* (2000a,b); Rohan *et al*. (2000); Navarro Silvera *et al.* (2005)	1980–93	Total 89 835 women, aged 40–59 years; 56 837 women, aged 40–59 years	Self -administered lifestyle questionnaire	Cases	Breast, endometrium, thyroïd	

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
USA								
American Registry of Radiologic Technologists	1926–82	Boice *et al*. (1995); Freedman *et al*. (2003)	1926–89	146 022 radiologic technologists, aged 23–90	Self-administered questionnaire	Cases	Melanoma, breast	Nested case–control study
University of Pennsylvania Alumni Study	1931–40	Whittemore *et al*. (1985)	1931–78	13 356 male and 4 076 female students examined at the University of Pennsylvania in 1931–40	College physical examination, questionnaires	Cases/ deaths	Buccal cavity, oesophagus, stomach, small intestine, colon, rectum, liver, biliary tract, pancreas, larynx, trachea, bronchus, lung, melanoma, other skin, breast, urogenital organs, prostate, testis, urinary bladder, kidney, brain, thyroid, Hodgkin disease, non-Hodgkin lymphoma, leukaemia, other cancer	Data on collegiate alcohol consumption limited

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Minnesota Breast Cancer Family Study	1944–52	Vachon *et al*. (2001)	1944–90	Breast cancer patients from the Tumor Clinic of the University of Minnesota; 544 families representing 4418 family members	Telephone interviews (surrogate and self-reported)	Cases	Breast	Higher risk in first-degree relatives for daily versus never drinkers; validation study verified 136 of 138 breast cancers through medical and pathology records
US Army Veterans Study	1944–45	Robinette *et al*. (1979)	1946–74	4401 chronic alcoholic male veterans, hospitalized in 1944–45	Death certificates	Deaths	Buccal cavity, pharynx, nasopharyngitis, oesophagus, stomach, large intestine, rectum, pancreas, larynx, trachea, bronchus, lung, prostate, testis, penis, urinary bladder, kidney, malignant lymphoma, lymphatic and haematopoeitic leukaemia, ureter	Compared with age-matched male veterans hospitalized for nasopharyngitis; no individual exposure data; no information on potential confounders

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Framingham Study (1948) and Framingham Offspring (1971)	1948, 1971	Gordon & Kannel (1984); Zhang *et al*. (1999); Djoussé *et al*. (2002, 2004)	1948–present	In 1948, 5209 subjects, aged 28–62 years at first examination; in 1971, 5124 children of the original cohort participated	Questionnaire, physical examination	Cases	Colon, lung, breast, urinary bladder	
Western Electric Company Cohort Study	1957	Garland *et al.* (1985)	1957–76	1954 men, aged 40–55 years, employed for at least 2 years at the Western Electric Company	28-day diet history and interview	Cases	Colorectal	Compared alcoholic beverage intake reported at initial examination; no information regarding the exposure or relative risk given

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
American Cancer Society Prevention Study I (CPSI)	1959–60	Garfinkel *et al.* (1988); Boffetta & Garfinkel (1990)	1960–72	Analytical cohort of 581 321 women across the USA, aged >30 years; 276 802 white men, aged 40–59 years, volunteers for the American Cancer Society in 25 states	Self-administered questionnaire	Deaths	Buccal cavity, oesophagus, larynx, breast,	Based on mortality only
Tecumseh Community Health Study	1959–60	Simon *et al.* (1991)	1959–87	Analytical cohort of 1954 women, aged >21 years	Interview-administered questionnaire	Cases	Breast	No difference in risk by menopausal status (but low numbers)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Harvard Alumni Study	1962, 1966	Whittemore *et al*. (1985); Sesso *et al*. (2001)	1988–93	7612 male Harvard alumni	Questionnaire	Cases/ deaths	Buccal cavity, oesophagus, stomach, small intestine, colon, rectum, liver, biliary tract, pancreas, larynx, trachea, bronchus, lung, melanoma, other skin, breast, prostate, testis, urogenital organs, urinary bladder, kidney, thyroid, Hodgkin disease, non-Hodgkin lymphoma, leukaemia, brain, other cancer	Relative risk adjusted for smoking.
Kaiser Permanente Medical Care Program Study	1964	Klatsky *et al*. (1981, 1988); Hiatt *et al*. (1988, 1994); Iribarren *et al*. (2001); Efird *et al*. (2004)	1964–88	Original cohort contained 182 357 Kaiser Foundation Health Plan members	Self-administered questionnaire	Deaths/ cases	Colon, rectum, pancreas, prostate, brain, thyroid	

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
American Men of Japanese Ancestry Study/ Honolulu Heart Study	1965–68	Pollack *et al.* (1984); Kato *et al.* (1992c); Nomura *et al.* (1990, 1995); Stemmermann *et al.* (1990); Chyou *et al.* (1993, 1995, 1996)	1965–93	6701 American men of Japanese ancestry, born from 1900–19, and residing on the Hawaiian island of Oahu, 8 006 subjects for the Honolulu Heart Study	Structured interview	Cases	Oral cavity, pharynx, oesophagus, upper aerodigestive tract, stomach, colon, rectum, liver, biliary tract, pancreas, larynx, lung, prostate, urogenital organs, urinary bladder, renal, lymphoma, leukaemia	SEER Registry used as a reference
Lutheran Brotherhood Insurance Study	1966	Hsing *et al.* (1990, 1998a); Kneller *et al.* (1991); Chow *et al.* (1992); Zheng *et al.* (1993)	1966–86	17 633 male white policy holders, aged ≥35 years, of the Lutheran Brotherhood Insurance Society	Questionnaire	Deaths	Stomach, colorectum, pancreas, lung, prostate	Relative risk for total alcoholic beverage consumption and risk for lung cancer not available

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
[name not given] Hawaiian Cohort Study	1968	Le Marchand *et al*. (1994)	1968–89	41 400 persons in the State of Hawaii, (20 316 men), aged >18 years	Lifestyle questionnaire	Cases	Prostate	Data recorded on current drinking status, age when drinking started, amount and frequency of intake of beer, wine, saké and hard liquor.
NHANES I Epidemiologic Follow-up Study	1971–75	Schatzkin *et al*. (1987); Yong *et al*. (1997); Breslow *et al*. (1999); Su & Arab (2004)	1971–93	14 407 men and women, aged 25–74 years, who completed a medical examination	Interviewer-administered questionnaire	Cases	Colon, lung, breast, prostate	Joint effects of tobacco and alcohol examined (Yong *et al*, 1997)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Nurses' Health Study	1976	Willett et al. (1987a,b); Fuchs *et al*. (1995); Garland *et al*. (1999); Colditz & Rosner (2000); Michaud *et al*. (2001); Chen *et al*. (2002a); Wei *et al*. (2004); Lee *et al*. (2006)	1976–2004	121 700 female nurses aged 30-55; cohort size after exclusions: 80 253	Questionnaire	Cases	Colon, rectum, pancreas, breast, renal	Relative risk adjusted for smoking; joint effects of tobacco and alcohol examined
Breast Cancer Detection and Demonstration Project (BCDDP)	1979–81, 1987–89	Flood *et al*. (2002)	1993–98	45 264 women, aged 40–93 years, participated in a breast cancer screening programme	Mailed, self-administered standardized questionnaire	Cases	Colon, rectum	Interaction with smoking where the association of alcoholic beverages with colorectal cancer observed only in nonsmokers
New York State Cohort	1980	Bandera *et al*. (1997)	1980–87	27 544 men and 20 456 women long-term residents of New York State	Mailed questionnaire	Cases	Lung	Relative risk adjusted for smoking

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Leisure World Study	1981–83, 1985	Shibata *et al.* (1994)	1982–90	Analytical cohort of 13 976 men and women 65–80 years	Self-administered questionnaire	Cases	Pancreas	
	1981–82	Wu *et al.* (1987)	1981–85	11 888 residents of a retirement community	Mailed, self-administered standardized questionnaire	Cases	Colorectum	For men, results similar for right and left colon, but with lower statistical significance for left colon; for women, association was apparent but not significant for the left colon.
American Cancer Society, Cancer Prevention Study-II (CPS II)	1982	Boffetta *et al.* (1989); Thun *et al.* (1997); Coughlin *et al.* (2000); Feigelson *et al.* (2003)	1982–96	Analytical cohort of 1.2 million men and women, recruited 1982, aged >30 years	Self-administered questionnaire	Cases/ deaths	Mouth, pharynx, oesophagus, colon, rectum, liver, pancreas, larynx, breast, multiple myeloma, lymphatic and/or haematopoietic	Cases not verified, nested case–control design (Boffetta *et al.*, 1989)
Iowa 65+ Rural Health Study	1982	Cerhan *et al.* (1997)	1982-93	3673 residents (1420 men), aged >65 years, from two rural counties in Iowa	Interview	Cases	Prostate	

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Second Cancers Following Oral and Pharyngeal Cancers Study	1984–85	Day *et al.* (1994a)	1984–89	1090 first primary cancers of the oral cavity and pharynx included in a multicentre population-based case–control study from 4 areas of the USA	Interviewer-administered questionnaire	Cases	Oral cavity, pharynx, oesophagus, larynx, lung	Information on alcoholic beverage type and cessation of alcoholic beverage drinking
Iowa Women's Health Study	1985–86	Potter *et al*. (1992); Gapstur *et al*. (1993); Harnack *et al*. (1997, 2002); Chiu *et al*. (1999); Kushi *et al*. (1999); Folsom *et al*. (2003); Kelemen *et al*. (2004)	1986–2001	99 826 randomly selected women, aged 55–69 years, from Iowa driver's licence list	Mailed questionnaire	Cases	Colon, rectum, pancreas, lung, breast, endometrium, ovary, kidney, non-Hodgkin lymphoma, lymphatic/ haematopoietic cancers	Nested case–control study; odds ratio for total alcoholic beverage consumption not available; joint effect of smoking and alcohol examined (Potter *et al.*, 1992)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Cohort of Iowa Men	1986–89	Cantor *et al.* (1998) Putnam *et al.* (2000)	1986–1995	Analytical cohort of 1572 men, aged ≥65 years	Mailed, self-administered standardized questionnaire and supplemental telephone interview	Cases	Prostate, urinary bladder	
Health Professionals Follow-up Study (HPFS)	1986	Giovannucci *et al.* (1995); Michaud *et al.* (2001); Platz *et al.* (2004); Wei *et al.* (2004); Lee *et al.* (2006)	1986–2000	HPFS: 51 529 men, aged 40–75 years	Self-administered standardized questionnaire	Cases	Colon, rectum, pancreas, prostate, renal,	Combined analysis of NHS and HPFS, performed by Lee *et al.* (2006), Wei *et al.* (2004), Michaud *et al.* (2001), relative risk adjusted for smoking.
Study of Osteoporotic Fractures	1986–88	Lucas *et al.* (1998)	1986–89	Analytical cohort of 8015 white women, aged ≥65 years	Self-administered questionnaire	Cases	Breast	No association in women with a positive family history, but few cases (n=20)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
National Health Interview Survey (NHIS)	1987	Breslow *et al.* (2000)	1987–95	Sub-cohort of 20 195 adults, aged 18 years or older, who completed the Cancer Epidemiology Supplement	Cancer Epidemiology Supplement questionnaire (in-home interview)	Cases	Lung	Deaths arising within the first year of follow-up excluded; relative risk adjusted for smoking
The β-Carotene and Retinol Efficacy Trial (CARET)	1988	Omenn *et al.* (1996)	1988–1995	4060 male asbestos workers and 14 254 smokers	Questionnaire	Cases	Lung	Intervention trial
Prostate Lung, Colorectal and Ovarian Cancer Screening Trial (PLCOCST)	1993–2001	Stolzenberg-Solomon *et al.* (2006)	1993–2003	Analytical cohort of 25 400 women, aged 55–74 years	Self-administered questionnaire	Cases	Breast	
California Teachers Study	1995–96	Horn-Ross *et al.* (2004); Chang *et al.* (2007)	1995–2003	Analytical cohort of 103 460 women, aged 21–84 years	Self-administered questionnaire	Cases	Breast, ovary	
Scandinavia								
Denmark								
Copenhagen City Heart Study	1964	Prescott *et al.* (1999); Petri *et al.* (2004)	1964–96	Analytical cohort of 13 074 women, aged 20–91 years	Self-administered questionnaire	Cases	Breast, lung	Relative risk adjusted for smoking (Prescott *et al.*, 1999)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Glostrup Population Study	1964–86	Høyer & Engholm (1992); Petri *et al*. (2004)	1964–90	Analytical cohort of 5207 women; aged 30–80 years	Self-administered questionnaire	Cases	Breast	
Copenhagen Male Study	1970	Gyntelberg (1973); Hein *et al*. (1992); Suadicani *et al*. (1993)	1970–88	Cohort of 5249 men aged 40–59 years	Danish Central Population Register and Quetsionnaire		Colon, rectum, lung	
Danish Diet, Cancer and Health Study	1993–97	Tjønneland *et al*. (2003, 2004)	1993–2000	Analytical cohort of 23 778 women; aged 50–64 years	Self-administered questionnaire	Cases	Breast	
Finland								
α-Tocopherol β Carotene Cancer Prevention (ATBC) Study	1985–88	Glynn *et al*. (1996); Woodson *et al*. (1999); Stolzenberg-Solomon *et al*. (2001); Mahabir *et al*. (2005); Lim *et al*. (2006)	1985–93	29 133 white male smokers, aged 50–69 years in southwestern Finland	Self-administered questionnaire	Cases/ deaths	Colon, rectum, pancreas, lung, renal, non-Hodgkin lymphoma, Hodgkin lymphoma, multiple myeloma	Relative risk by type of alcoholic beverage and by smoking categories reported (Woodson *et al*., 1999; Mahabir *et al.,* 2005)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Norway								
Norwegian Cohort of Waitresses	1932–1978	Kjaerheim & Andersen (1994)	1959–91	5314 waitresses organized in the Restaurant Workers Union	Employers lists from Restaurant Workers Union	Cases	Tongue, mouth, pharynx, oesophagus, stomach, colon, rectum, liver, gall bladder, pancreas, larynx, lung, melanoma, breast, cervix uteri, other female genital, urinary bladder, kidney, brain, leukaemia	No individual exposure data. Estimates not adjusted for smoking.
Norwegian Cohort	1960	Heuch *et al*. (1983)	1960–73	Analytical cohort of 16 713 men and women, aged 45–74 years	Self-administered questionnaire	Cases	Pancreas	Joint effects of tobacco and alcohol examined
	1968	Kjaerheim *et al*. (1998)	1968–92	10 960 men born in 1893–1929	Mailed survey	Cases	Oral cavity, pharynx, oesophagus, larynx	Relative risk adjusted for smoking
	1984–86	Lund Nilsen *et al*. (2000)	1984–96	22 895 men (≥ 40 years) with no history of any cancer	Questionnaire	Cases	Prostate	Relative risks adjusted for smoking

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
HUNT-1 Cohort Study	1984–1986	Sjödahl *et al.* (2007)	1984–2002	69 962 inhabitants of the country of Nord-Trondelag, at least 20 years of age; follow-up by linkage to the Norwegian Cancer Registry and the Norwegian Central Person Registry	Health survey	Cases	Stomach	
Norwegian Women and Cancer Study (NOWAC)	1991–97	Dumeaux *et al.* (2004)	1991–2001	Analytical cohort of 86 948 women, aged 30–70 years	Self-administered questionnaire	Cases	Upperaerodigestive tract, pancreas, breast	Relative risk not adjusted for smoking
Sweden								
Swedish Twin Registry Study	1967	Grönberg *et al.* (1996); Terry *et al.* (1998, 1999); Isaksson *et al.* (2002)	1967–92	Analytical cohort of 21 884 men and women recruited in 1961, aged 36–75 years	Questionnaire	Cases	Stomach, pancreas, endometrium, prostate	No adjustment for smoking (Terry *et al.*, 1999)

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Swedish Mammography Cohort	1987–90	Holmberg *et al*. (1995); Rashidkhani *et al*. (2005); Suzuki *et al*. (2005); Larsson *et al*. (2007)	1987–2004	66 651 Swedish women, aged 40–76 years, living in the counties of Västmanland and Uppsala, who responded to a questionnaire	Self-administered questionnaire	Cases	Stomach, endometrium, breast, renal	Nested case-control design (Holmberg *et al*., 1995)
Malmö Diet and Cancer Cohort	1991–96	Mattisson *et al*. (2004)	1991–2001	Analytical cohort of 11 726 women; aged ≥ 50 years	Interview-administered diet history	Cases	Breast	Relative risk adjusted for smoking
Western Europe								
France								
Supplementation and Vitamins and Minerals Antioxidant Study (SU.VI.MAX)	1994	Hirvonen *et al.* (2006)	1994–2002	Analytical cohort of 4 396 women, aged 35-60 years	Telephone-administered 24-h recalls	Cases	Breast	

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Netherlands								
Netherlands Cohort Study	1986	Goldbohm *et al*. (1994); Schuurman *et al*. (1999); Zeegers *et al*. (2001); Schouten *et al*. (2004); Balder *et al*. (2005); Loerbroks *et al*.(2007)	1986–97	58 279 men and 62 573 women from 204 municipal population registries, aged 55–69 years	Mailed self-administered standardized	Cases	Colon, rectum, lung, endometrium, ovary, prostate, urinary bladder	Case–cohort design; for colon cancer, possible limitation: misclassification of alcohol consumption; no adjustment for smoking (Schuurman *et al*. 1999)
United Kingdom								
British Doctor's Study	1978	Doll *et al*. (1994, 2005)	1978–2001	Male physicians born between 1900 and 1930	Mailed questionnaire	Deaths	Large bowel, rectum, lung, other cancers,	Relative risk for alcohol use on lung cancer mortality not given; no adjustment for smoking
Oxford Vegetarian Study	1980–84	Sanjoaquin *et al*. (2004)	1980–99	10 998 vegetarian and non-vegetarians (4162 men, 6836 women), aged 16–89 years; no personal history of cancer	Self-administered standardized questionnaire	Cases	Colorectum	Association between alcohol partially confounded by smoking

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
General Practitioner Research Database Study	1994	Lindblad *et al.* (2005)	1994–2001	287 oesophageal adenocarcinomas and 10 000 controls, aged 40–84 years	Interview	Cases	Oesophagus, stomach	Nested case–control study
Multi-Country								
European Prospective Investigation into Cancer and Nutrition (Denmark, France, Germany, Greece, Italy, Norway, Spain, Sweden, Netherlands, UK)	1992	Boeing (2002); Rohrmann *et al.* (2006); Tjønneland *et al.* (2007);	1992–2004	521 457 from 10 European countries; most study centres recruited from the general population; other sources of recruitment included members of insurance plans, blood donors, mammographic screening, employees of enterprises, civil servants	Dietary instruments developed specifically for each country	Cases	Oral cavity, pharynx, oesophagus, lung, breast	Relative risks reported by histological type and by smoking status

Table 2.1a (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Multicentric European Study of Second Primary Tumours Italy, Spain, Switzerland	1979–82	Dikshit *et al.* (2005)	1979–2000	A cohort of 928 cases of laryngeal cancer from a multicentric population-based case–control study from, Italy, Spain and Switzerland	Interviewer-administered questionnaire	Cases	Oral cavity, pharynx, oesophagus, lung	

HERPACC, Hospital-based Epidemiologic Program at Aichi Cancer Center; HUNT, Helseundersøkelsen i Nord-Trøndelag; NHANES, National Health and Nutrition Examination Survey; NHS, Nurses Health Study; PLCOCST, Prostate Lung, Colorectal and Ovarian Cancer Screening Trial

(a) Asia/Oceania

(i) *Australia*

Melbourne Collaborative Cohort Study

This cohort was recruited in 1990–94 from the Melbourne metropolitan area, using the electoral rolls, advertisements and community announcements in the local media. The cohort comprised 41 528 people (17 049 men) aged 27–75 years. A structured interview included alcoholic beverage consumption for those who had ever drunk 12 alcoholic drinks in a year. Cancer cases were ascertained from the Victoria Cancer Register through to 31 December 2003 (Baglietto *et al*., 2005, 2006).

(ii) *China*

Zoucheng/Shandong Study

A 12.5-year prospective cohort study was carried out in a rural area of Zoucheng city. A probabilistic sample from three townships, aged 20 years and older, was identified in 1982 and consisted of 7809 men and 7994 women. An individual case card was created for each of the villagers and their smoking and drinking habits were recorded. Data concerning their death and change in health were collected annually. Mortality follow-up was to 1994 (Zhang *et al*., 1997).

Lin Xian Nutrition Intervention Trial Study

In the frame of an intervention trial for micronutrients, approximately 30 000 residents of the Lin Xian region, aged 40–69 years, were interviewed in 1985 to obtain information on usual dietary intake, tobacco use, alcoholic beverage consumption, family history of cancer and other factors. The cohort was followed-up from 1986 through to May 1991, with little loss to follow-up. Information on cause of death and incidence of cancer was collected from local hospitals or a study medical team. Relative risks were adjusted for potential confounders as well as the vitamin/mineral intervention group (Guo *et al*., 1994; Tran *et al*., 2005).

Shanghai Men's Study

A cohort of 18 244 male residents of four small geographically defined communities from a wide area of Shanghai, aged 45–64 years, were enrolled between January 1986 and September 1989 (80% of eligible subjects). A structured questionnaire was completed at a face-to-face interview. The information obtained included level of education, history of tobacco use and alcoholic beverage consumption, current diet and medical history. Cancer incidence was ascertained through the population-based Shanghai Cancer Registry and vital status was ascertained by inspection of the Shanghai death-certificate records. Only 108 subjects were lost to follow-up, which continued until February 1993 (Yuan *et al*., 1997).

Jiashan County Screening Study

Screening for colorectal cancer was initiated in May 1989–April 1990 when all residents, aged 30 years and over, in 10 small towns in Jiashan County, Zhejiang Province, China, were invited for screening and a face-to-face questionnaire was completed

by professional interviewers including information on alcoholic beverage drinking and smoking habits. Of 75 842 eligible individuals, 31 087 men and 33 256 women responded, about 70% of whom were farmers. Subjects were followed through the Cancer Registration System and a rapid reporting system from the Colorectal Registry, that was documented to be 95% complete. Deaths were ascertained through the Jiashan County Death Registration System through to 2001. Out-migration was estimated to be less than 1% annually (Chen *et al*., 2005a).

Yunnan Tin Corporation Miners Cohort

A cohort of 7965 Yunnan Tin Corporation miners aged 40 years and over was established in 1992. Cumulative radon exposure for each subject was obtained by adding-up the estimated working level months, for each job held at the Yunnan Tin Corporation before baseline screening. A questionnaire was administered by interviewers at baseline which included data on alcoholic beverage consumption. Follow-up continued until 1997 (Lu *et al*., 2000a).

(iii) *Japan*

Japanese Physicians' Study

A survey of smoking habits and alcoholic beverage consumption among physicians in western Japan was carried out using self-administered questionnaires in 1965. From 6815 male respondents in nine prefectures (51% response rate), a cohort of 5477 male physicians was established. Vital status was followed until 1983 and was confirmed by various medical associations. Copies of death certificates were obtained from the District Legal Affairs Bureau and the cause of death was coded with the ICD-8. After exclusions, the analysies were performed on 5130 men. Statistical analysis was performed using the Cox proportional hazards model (Kono *et al*., 1985, 1986, 1987).

Six Prefecture Study

In 1965, 122 261 men and 142 857 women, aged 40–69 years (95% of the census population), in 29 health centre districts from six prefectures in Japan were interviewed. The six prefectures were selected as being representative of the entire country. The one-page questionnaire administered at baseline included questions on smoking, alcoholic beverage consumption and dietary habits, occupation and marital status. A record linkage system was established for the annual follow-up. During the 16-year follow-up period, 8% of the cohort migrated from the original health districts. Deaths among cohort members were monitored by linkage to vital statistics kept at each public health centre (Hirayama, 1989; 1992; Kinjo *et al*., 1998).

Life Span Study

The Life Span Study cohort originally consisted of 100 000 survivors [sex distribution not reported] of the atomic bomb blasts in Hiroshima and Nagasaki. The cohort was expanded in 1968 and 1985 by adding approximately 10 000 survivors each time. The total cohort included approximately 120 000 individuals, of whom approximately 27 000 were non-exposed controls. Information on smoking was obtained from three interview surveys conducted on a subgroup of the entire cohort in 1963–64, 1964–68

and 1968–70, and four postal surveys conducted on various subgroups in 1965, 1969, 1979 and 1980.

The cancer incidence in 61 505 survivors for whom smoking data were available was reported. For 42% of this group, information on smoking was available from at least two surveys. Information on cancer incidence and mortality was obtained from the Radiation Effects Research Foundation tumour registry and mortality database. Poisson regression models were used to fit log-linear relative risk and linear excess relative risk models (Akiba, 1994; Land *et al.*, 1994; Goodman *et al.*, 1995).

Chiba Center Association Study

The Chiba Center Association Study was a nested case–control study based on a cohort population of 17 200 male participants in a mass screening for gastric cancer by the Chiba Cancer Association in Japan in 1984. Cancer cases in cohort members were detected by record linkage to the Chiba Cancer Registry. The participants were followed from 1984 until 1993. For each cancer case, two controls were selected from the cohort population by matching on sex, birth year and area of residence (Murata *et al*., 1996).

Aichi Cancer Center Hospital Study

The relation of atrophic gastritis, other gastric lesions and lifestyle factors to stomach cancer risk was prospectively studied among 3,914 subjects who underwent gastroscopic examination and responded to a questionnaire survey at the Aichi Cancer Center Hospital. During 4.4 years of follow-up on average, 45 incident cases of stomach cancer were identified at least three months after the initial examination. If the baseline endoscopic findings indicated the presence of atrophic gastritis, the risk of developing stomach cancer was increased 5.73-fold, compared with no indication at the baseline. The risk further increased with advancing degree of atrophy and increasing extension of atrophy on the lesser curvature. These trends in the relative risks were statistically significant ($P = 0.027$ and $P = 0.041$, respectively). The risk for stomach cancer was statistically significantly increased among subjects with gastric polyps, but not among those with gastric ulcer. Stomach cancer cases tended to consume more cigarettes, alcohol, rice, pickles and salted fish gut/cod roe and less fruits and vegetables and to have more family histories of stomach cancer than noncases, although these differences were not statistically significant. The results of the present study provide additional evidence on the relation between atrophic gastritis and stomach cancer and suggest a need for intensive follow-up of patients with atrophic gastritis and gastric polyps (Kato *et al.,* 1992a).

Aichi Prefecture Study

Stomach-cancer mortality was prospectively studied among 9753 Japanese men and women who first responded to a mailed questionnaire in 1985 and were then followed through May 31, 1991. During this follow-up period, 57 stomach-cancer deaths were identified. Current smokers had an increased risk of death from stomach cancer compared with never-smokers (relative risk (RR) = 2.29, 95% confidence interval (CI): 1.15-4.56), but there was no dose-response to number of cigarettes smoked.

Daily alcohol drinkers who consumed 50 ml or more of alcohol per day also had a greater risk than nondrinkers (RR = 3.05, 95% CI: 1.35-6.91). There was no association between stomach-cancer mortality and individual food consumption except a positive association with fruit intake. However, frequent use (greater than or equal to 3-4/week) of meat broiling and traditional style Japanese salad preparation in their cooking procedures were positively associated with stomach-cancer mortality. The RR values compared with infrequent use (less than or equal to 1-2/month) were 2.27 (95% CI: 1.06-4.85) and 3.10 (95% CI: 1.40-6.85), respectively. A positive family history of cancer, especially stomach cancer, significantly increased the risk for stomach-cancer death (RR = 2.01, 95% CI: 1.12-3.63). The effects of these variables remained after adjustment for other variables (Kato *et al.,* 1992b).

Japan Collaborative Cohort (JACC) Study for Evaluation of Cancer Risk

A baseline survey was conducted in 45 areas throughout Japan from 1988 through to 1990 by investigators from 25 centres. At the end of 1990, a total of 127 500 (125 760) inhabitants were enrolled in this cohort. Among them, 110 792 subjects (46 465 men, 64 327 women aged between 40 and 79 years at baseline) were followed-up through to the end of 1997 and subsequently to 1999. The baseline data, which included details on alcoholic beverage consumption and tobacco use were collected using a self-administered questionnaire. Population registers were used to identify subjects who had moved out of a study area. The date and cause of death were confirmed annually or biannually by reviewing death certificates with the approval of the Prime Minister's office. In one analysis of 38 600 women participants in the cohort, follow-up was to 31 December 1997 (Lin *et al*., 2002; 2005; Sakata *et. al*., 2005; Wakai *et al*., 2005; Nishino *et al*., 2006).

The Hospital-based Epidemiological Research Program at the Aichi Cancer Center (HERPACC)

A database was established in 1988 in the Aichi Cancer Center that included all outpatients on a first visit who completed a self-administered questionnaire on lifestyle factors which included information on alcoholic beverage consumption. The database was routinely linked with the hospital cancer-registry to identify cases of cancer. Between January 1988 and December 1999, 78 755 subjects were included. Cases were frequency-matched by age to cancer-free subjects, selected at random from the database, and the study was analysed as a nested case–control study (Inoue *et al*., 2003).

The Japan Public Health Center Study Cohorts (I and II)

A population-based cohort of 27 063 men and 27 435 women was established in 1990 from subjects who registered their addresses in 14 administrative districts of four Public Health Center areas. All subjects were born between 1930 and 1949 (40–59 years of age at baseline). Subjects were asked to reply to a lifestyle questionnaire, which included information on alcoholic beverage consumption. A total of 43 149 subjects (20 665 men (76%), 22 484 women (82%)) returned their questionnaires. All subjects were followed from 1 January 1990 to 31 December 1999. All deaths of cohort subjects were based on death certificates from each Public Health Center. Newly diagnosed cases of

cancer were reported by hospitals in and around the study areas when the birth date and residence fulfilled the criteria for inclusion into the cohort. (Sasazuki *et al*., 2002).

A second cohort was established in 1993, and included six Public Health Centers in six prefectures, which comprised all residents aged 40–69 years (except for Osaka, which included other ages and was excluded from this cohort). By combining the first with the second cohort and excluding subjects deemed to be ineligible, a study population of 42 540 men and 47 464 women was defined for analysis. Mortality data were obtained from the Ministry of Health, Labour and Welfare; those who moved to other areas were identified from residential registers; cancer cases were identified through local major hospitals and population-based cancer registries. Follow-up was until 31 December 1999 (Otani *et al.,* 2003).

Takayama City Cohort

A cohort was established in September 1992 among 36 990 residents of Takayama City, aged 35 years or older, who were asked to complete a questionnaire that included data on alcoholic beverage consumption. A total of 34 018 (92%) subjects responded. Details on patients with colon and rectal cancer were obtained from the two major hospitals in Takayama City, which cover about 90% of the colorectal cases in the city. Details of subjects who moved away from the city during the study were obtained from the residential registers. Follow-up was until 31 December 2000. After excluding those with incomplete data and non-melanoma skin cancer, the analysis cohort comprised 13 392 men and 15 659 women (Shimizu *et al*., 2003).

(b) North America

(i) *Canada*

Nutrition Canada Survey Cohort

The Nutrition Canada Survey was conducted beween September 1970 and December 1972, and incorporated 12 795 people from all 10 provinces in Canada who responded to the invitation to participate (a 47% response rate), together with 3295 unsolicited volunteers who participated. A retrospective cohort study was performed by linking the records for those aged 50–84 years to the Canadian Cancer Registry and the Canadian National Mortality Data Base to the end of 1993. Data on alcoholic beverage consumption had been collected at baseline by a 24-hour diet recall and a 1-month food-frequency questionnaire (Ellison, 2000).

National Breast Screening Study

The National Breast Screening Study is a multicentre, randomized controlled trial of mammography screening for breast cancer. Between 1980 and 1985, 89 835 women aged 40–59 years were randomized. In 1982, a semiquantitative diet questionnaire, which included data on alcoholic beverage consumption, was distributed to new attendees and previously enrolled women returning to the screening centres for further screening. A total of 56 837 women returned the dietary questionnaires. Reports on the diet cohort are based mainly on a case–cohort analysis, with a 10% subsample selected

at random from the cohort as controls. The National Breast Screening Study diet cohort is included in the Pooling Project (Friedenreich *et al*., 1993; Jain *et al*., 2000a,b; Rohan *et al*., 2000; Navarro Silvera *et al*., 2005).

(ii) *USA*

American Registry of Radiologic Technologists

The cohort was based upon 143 517 radiological technologists certified by the American Registry of Radiologic Technologists for at least 2 years during 1926–1982. A questionnaire was mailed to 132 519 who were known to be alive and data on cancers diagnosed were obtained from that questionnaire, with 79 016 female respondents. Thus, this study was essentially of factors associated with the prevalence of breast cancer among those still alive at the time of the questionnaire, and was analysed as a nested case–control study (Boice *et al*., 1995; Freedman *et al*., 2003).

University of Pennsylvania Alumni Study

Physical and social characteristics recorded at college physical examination and reported in subsequent questionnaires to alumni in 1962 or 1966 by 50,000 former students from Harvard University and the University of Pennsylvania were reviewed for their relationship to major site-specific cancer occurrence. The records of 1,359 subjects who died with a major site-specific cancer in a 16- to 50-year follow-up period and of 672 subjects who reported such a cancer by mail questionnaire in 1976 or 1977 were compared with those of 8,084 matched classmates who were known to be alive and free of cancer at the time subjects with cancer had died or had been diagnosed. Cigarette smoking, as reported both in student years and years as alumni, predicted increased risk for cancers of the respiratory tract, pancreas, and bladder. Student coffee consumption was associated with elevated risk for leukemia, but it was unrelated to cancers of the pancreas and bladder. Male students with a record of proteinuria at college physical examination experienced increased risk for kidney cancer, and those with a history of tonsillectomy experienced increased risk for prostate cancer. Students who at college entrance reported occasional vague abdominal pain were at elevated risk for pancreatic and colorectal cancers in later years. Increased body weight during college was associated with increased risks for kidney and bladder cancers, whereas for alumni this index was associated only with kidney cancer. Increased weight-for-height during college (but not in 1962 or 1966) predicted increased occurrence of female breast cancer. Jewish students experienced elevated risk for subsequent cancers of the female breast, colon, and combined colorectum. These and other findings are presented as clues deserving further exploration for any etiologic significance that they may hold for the cancer sites studied (Whittemore *et al*., 1985).

Minnesota Breast Cancer Family Study

A family study on breast cancer was initiated between 1944 and 1952, including a total of 544 families and data on 4418 family members. Information was obtained from interviews, medical history questionnaires and death certificates. Follow-up of this cohort was initiated in 1990; families in which the proband was diagnosed with breast

cancer before 1940 were excluded. Telephone interviews were completed with 6194 living women and 2974 surrogates from 426 multigeneration families; after excluding those with missing data, data on 9032 women were available for analysis (Vachon *et al*., 2001).

US Army Veterans Study

A cohort of 4401 US Army service men hospitalized for chronic alcoholism in 1944-45 was drawn as a sample from records of the US Department of Defense and the Veterans' Administration. Of these, 98% were <40 years of age at the time of hospitalization. They were matched for age with an equal number of enlisted men hospitalized for acute nasopharyngitis during the same period. Deaths in these groups were ascertained through the Veterans' Administration Beneficiary Identification and Records Locator Subsystem, and death certificates were obtained to code for cause of death. Follow-up for death was estimated to be 90-98% complete. No information was available on the drinking habits of individual members of the cohort or on average consumption by the cohort members. It was noted that only 7.5% of the chronic alcoholics had been discharged from military service for medical disability, including alcoholism. The mortality experience of the cohort was compared with that of the matched cohort of nasopharyngitis patients, and the mortality of both cohorts was compared with that of US males for selected causes of death. Overall mortality was approximately 80% higher in the alcoholics group than in the nasopharyngitis group (SMR, 1.9) (Robinette *et al.,* 1979).

Framingham Study and Framingham Offspring Study

The Framingham Study began in 1948. The original cohort included 5209 persons (2873 women) aged 28–62 years at the first examination, who were examined biennially thereafter. In 1971, examination was begun on many of the children of the original cohort and their spouses. Of 5124 subjects aged 12–60 years enrolled in the Framingham Offspring Study, 2641 were women, and have been followed at 4-year cycles. Information on alcoholic beverage consumption was obtained at the examinations. Cancer cases have been identified by self reports and, for non-respondents, by linkage with the National Death Index and a cancer registry, with confirmation of diagnosis by searching for medical records. The median follow-up was 34.3 years (range, 0.2–42.5 years) for the original cohort and 19.3 years (range, 0.2–22.6 years) for the offspring cohort (average for the total cohort of 9821 subjects, 27.3 years) (Gordon & Kannel, 1984; Zhang *et al*., 1999; Djoussé *et al*., 2002, 2004).

Western Electric Company Cohort Study

In 1957, 3102 men were randomly selected from the population of 5397 men aged 40-55 years who had been employed for at least 2 years at the Western Electric Company's Hawthorne Works in Chicago; 2080 (67.1%) agreed to participate in a long-term, prospective, epidemiological study (Western Electric Health Study). Another 27 men served as a pilot group, bringing to 2107 the total number initially examined from October, 1957 to December, 1958. Approximately 65% were first and second generation Americans, predominantly of German, Polish, or Bohemian ancestry; most of the

others were descendants of earlier emigrants from the British Isles. The men worked at various occupations associated with the manufacture of telephones and related products (Garland et al., 1985).

American Cancer Society Cancer Prevention Study I (CPS-I)

Between October 1959 and February 1960, volunteers for the American Cancer Society in 25 states recruited more than one million subjects, aged 30 years and over, from among their friends, neighbours and acquaintances. Families were enrolled, with the condition that there be at least one person aged over 45 years in the family. All family members over 30 years of age were requested to fill out a detailed four-page questionnaire. Vital status was checked yearly to 1965 and again in 1971 and 1975. Death certificates of deceased participants were obtained from state health departments. For 581 321 women, deaths were ascertained for 12 years (Garfinkel *et al*., 1988). For 276 802 white men in the cohort aged 40–59 years, enrolled in 1959 and followed for 12 years, 9293 deaths from all cancers were observed and related to alcoholic beverage consumption obtained at baseline (Boffetta & Garfinkel, 1990).

Tecumseh Community Health Study

A community health study was initiated in the town of Tecumseh, MI, through interviews and medical examinations in 1959–60. Information on alcoholic beverage consumption was obtained by trained interviewers. Follow-up was for up to 28 years by mailed questionnaires, with review of death certificates to confirm cause of death. The cohort included in the analysis totalled 1954 women (Simon *et al*., 1991).

Harvard Alumni Study

A cohort of undergraduates who had entered the University of Harvard between the years of 1916 and 1950 was identified when they responded to a health questionnaire sent out in 1962 or 1966. Updated information was obtained from 13 905 cohort members from periodic surveys that assessed lifestyle habits and medical history. The questions asked for information on daily amount of cigarette smoking, age at start and cessation of cigarette smoking, weight, height and physical activity. In surveys conducted in 1988 and 1993, participants were asked whether a cancer had been diagnosed by a physician. Deaths that occurred up to 1992 were traced using information from the alumni office to obtain death certificates. The authors claimed that mortality follow-up was virtually complete (Whittemore *et al.,* 1985; Sesso *et al.,* 2001).

Kaiser Permanente Medical Care Program Study

The first cohort for this study was selected from 87 926 white or black men and women who underwent at least one multi-phasic health check-up within the Kaiser Permanente Medical Care Program from July 1964 and August 1968 and who were followed through to 1976. From data in the baseline questionnaire, four groups were extracted, each of 2015 persons, matched for age, race and cigarette smoking, according to the usual number of alcohol-containing drinks/day (0, ≤2, 3.5 and ≥6). Mortality was ascertained by a search of California death indexes (Klatsky *et al*., 1981).

An expansion of this cohort comprised 94 549 men and 110 425 women, aged 10–89 years at baseline in 1964–73, who underwent at least one multi-phasic health

check-up within the Kaiser Permanente Medical Care Program and were followed through to 1997 (Iribarren *et al*., 2001). Cancer incidence was ascertained from the first health examination through the San Francisco–Oakland Surveillance, Epidemiology and End Result (SEER) programme and the Northern California Kaiser Permanente Medical Care Program. Attrition due to termination of health plan coverage and death was of the order of 2% per year; the median follow-up time was 19.9 years (range, <1–33 years) (Klatsky *et al*., 1981; Iribarren *et al*., 2001).

Between 1978 and 1985, a similar cohort was established, which included 122 894 (for one study 106 203) men and women who received a multi-phasic health examination during 1978–84. Cancer cases were ascertained as for the first cohort (see above). Follow-up was eventually to 31 March 1999 (Klatsky *et al*., 1988; Hiatt *et al*., 1988, 1994; Efird *et al*., 2004).

American Men of Japanese Ancestry Study and Honolulu Heart Study

A cohort of 8006 American men of Japanese ancestry, born during the years 1900–19 and who resided on the Hawaiian island of Oahu, were interviewed and examined clinically from 1965 to 1968. Information obtained at the interview included age, smoking history, usual occupation, type of housing, education and religion. A food-frequency questionnaire and a 24-hour dietary recall was also administered. Newly diagnosed cases of cancer were identified through continuous surveillance of Oahu hospitals and linkage with the Hawaii Tumor Registry through to 1994 (Pollack *et al*., 1984; Nomura *et al*., 1990, 1995; Stemmermann *et al*., 1990; Kato *et al*., 1992c; Chyou *et al*., 1993, 1995, 1996).

Lutheran Brotherhood Insurance Study

A cohort of 26 030 white male life insurance policy holders of the Lutheran Brotherhood Insurance Society was identified in 1966, of whom 17 633 responded to a mailed food-frequency questionnaire and were followed for 20 years. Little difference was observed between responders and non-responders with regard to age, urban or rural residence, policy status and cancer mortality at 11.5 years of follow-up. The questionnaire included questions on tobacco use and the longest held occupation, frequency of consumption of 35 food items and the consumption of coffee, beer and spirits. Death certificates were coded for underlying and contributory causes of death. Person–years were accumulated up to death, loss to follow-up or the end of the study in 1986. The age-adjusted relative risks for cancer mortality resulting from exposure to alcoholic beverages were computed using Poisson regression. Statistical interaction between smoking and other risk factors was also examined. About 23% of the cohort members were lost to follow-up due to maturation or lapse of their policies (Hsing *et al*., 1990, 1998a; Kneller *et al*., 1991; Chow *et al*., 1992; Zheng *et al*., 1993).

Hawaiian Cohort Study

In this study, the consumption of high-fat animal products, raw vegetables, and fresh fruits, as well as obesity, smoking, and drinking was evaluated in relation to subsequent occurrence of prostate cancer. Data from a cohort of 20,316 men of various ethnicities were collected between 1968-1989 in Hawaii. A total of 198 incident

cases with invasive prostate cancer were identified by computer-assisted linkage of this cohort to the statewide Surveillance, Epidemiology, and End Results registry. Weight was not consistently associated with prostate cancer, but there was an association with height. These associations were stronger in men diagnosed before age 72.5 years. The risk estimates for raw vegetable and fresh fruit intakes were close to 1.0. Smoking and alcohol drinking appeared to be unrelated to risk (Le Marchand *et al*., 1994)

The National Health and Nutrition Examination Survey (NHANES) I Epidemiological Follow-up Study

The first NHANES was performed in 1971–75, based on a probability sample of the civilian non-institutionalized population of the USA. Follow-up surveys were conducted and, by the end of 1992, 96% of the cohort was traced, and death certificates were traced for 98% of decedents. The analytical cohort comprised 3968 men and 6100 women aged 25–74 years at baseline (Schatzkin *et al*., 1987; Yong *et al*., 1997; Breslow *et al*., 1999; Su & Arab, 2004).

Nurses' Health Study

In 1976, a cohort of 121 700 female registered nurses was assembled in the USA. At enrolment, the nurses completed a mailed questionnaire on risk factors for cancer and heart disease. Responses to food-frequency questionnaires were also collected in 1980, when 98 462 nurses responded, and in 1984, 1986 and 1990. The response rate to follow-up questionnaires was almost 96% through to 1990. Family members were the main source of information on vital status for non-respondents but the National Death Index was also used. Multiple logistic regression models were used to compute odds ratios, after controlling for age, total energy intake and other potentially confounding variables. A subset of 89 538 women who reported alcoholic beverage consumption in 1980 were assessed by follow-up questionnaires in 1982 and 1984, and cases of cancer were identified (Willett *et al*., 1987a). A subsequent report on 85 709 women who reported alcoholic beverage consumption in 1980 and were followed for 12 years considered mortality related to alcoholic beverage consumption (Fuchs *et al*., 1995). A second cohort of 116 671 women was established from women who completed a more detailed dietary questionnaire in 1989, and were followed by questionnaires every 2 years to 1995 (Garland *et al*., 1999). This study is included as two cohorts (those initially assembled and followed to 1986, and those who completed a more detailed dietary questionnaire in 1986 and were followed subsequently) in the Pooling Project (Willett *et al*., 1987b; Fuchs *et al*., 1995; Garland *et al*., 1999; Colditz & Rosner, 2000; Michaud *et al*., 2001; Chen WY *et al*., 2002a; Wei *et al*., 2004; Lee *et al*., 2006).

Breast Cancer Detection Demonstration Project (BCDDP)

A cohort was established based upon the participants in the US Breast Cancer Detection Demonstration Project, which was established between 1973 and 1980 at 29 screening centres in 27 cities and involved 283 222 women. A follow-up cohort was established in 1979 from a subset of the participants, which included 4275 women who had been diagnosed with breast cancer, 25 114 women who had biopsies indicating benign breast disease, 9628 women who were recommended for biopsy but did not have

the procedure and an additional 25 165 women not recommended for biopsy, matched with the other subjects on age, time of entry into the programme, ethnicity, screening centre and length of participation in the Project and comprised a total of 64 182 women. Between 1979 and 1981, 61 433 of the women completed a baseline food-frequency questionnaire, which included questions related to alcoholic beverage consumption. A follow-up questionnaire was sent between 1993 and 1995 in which self-reports of cancer occurrence were made. Medical records confirmed the diagnosis for 80% of these. Non-respondents were contacted by telephone. Women with prevalent colorectal cancers (reported at baseline) were excluded. The final analytical cohort comprised 45 264 women, of whom 40 865 had complete follow-up through to 1995–98. This cohort is included in the Pooling Project (Flood *et al*., 2002).

The New York State Cohort

A 45-item food-frequency questionnaire was sent to 265 000 residentially stable subjects selected from a private sampling frame in New York State in 1980 and was returned by 57 968 (32 689 men, 25 279 women). Follow-up was passive through to December 1987 from the records of the New York State Department of Health's vital statistics section and cancer registry. A second questionnaire was sent to the subjects who responded in 1980 who were not listed as dead or diagnosed with cancer. Assessment of the validity of follow-up was conducted in a nested case–control study, with each case matched by age, race, gender and country of residence to one control subject randomly selected from a pool of controls alive at the time of diagnosis of the case. The analytical cohort comprised 27 544 men and 20 456 women (Bandera *et al*., 1997).

Leisure World Study

A detailed health questionnaire was mailed to all residents of a retirement community in California in 1981, and to new residents in 1982, 1983 and 1985. A response rate of 62% was achieved overall (11 888 participants initially, and 13 979 later). Almost all of the residents were Caucasians of the upper-middle class, about two-thirds were women, and 80% were aged 65–86 years. Histological diagnosis of cancer was obtained from local hospitals. All participants were sent a follow-up questionnaire every 2 years. The latest follow-up reported (Shibata *et al*., 1994) was to 30 June 1990 (Wu *et al*., 1987; Shibata *et al*., 1994).

American Cancer Society Cancer Prevention Study II (CPS-II)

The CPS-II is a nationwide prospective mortality cohort study of nearly 1.2 million adults, aged 30 years or more, enrolled by volunteers of the American Cancer Society in 1982. As in CPS-I, enrolment was based on families and excluded persons in institutions and military service and others who would be difficult to trace. Each participant completed a four-page postal questionnaire on tobacco and alcoholic beverage use and diet. Deaths were ascertained from the month of enrolment until 31 December 1996 through personal enquiries made by the volunteers in 1984, 1986 and 1988 and later through linkage with the National Death Index. In one analysis (Thun *et al*., 1997), 490 000 men and women were followed from 1982 through to 1991, after

excluding those with unquantified smoking and alcoholic beverage use, those missing all data on wine, beer and spirit consumption, and former drinkers who were non-drinkers. In another analysis, 66 561 postmenopausal women were followed for mortality from 1992 to 1997–98 (Boffetta *et al*., 1989; Thun *et al*., 1997; Coughlin *et al*., 2000; Feigelson *et al*., 2003).

Iowa 65+ Rural Health Study

In late 1981 and 1982, 80 percent of the non-institutionalized residents aged 65 years and older who lived in Iowa and Washington counties, Iowa (US), were enrolled into the Iowa 65+ Rural Health Study (n = 3,673), which was one of the four Established Populations for Epidemiologic Studies of the Elderly (EPESE) sites. These two counties are primarily rural, with several small towns. Of the 1,420 men enrolled into the cohort, only the 1,155 men completing the full-form baseline interview were eligible for inclusion into this report. The full-form baseline interview was conducted in the respondent's home by a trained interviewer, and included data on a variety of demographic, health, and social characteristics (Cerhan *et al.,* 1997).

Second Cancers Following Oral and Pharyngeal Cancers Study

The cohort comprised 1090 first primary cancers of the oral cavity and pharynx included in a multicentre population-based case–control study in four areas of the USA in 1984–85, and followed to 1989. Information on alcoholic beverage consumption and tobacco use was obtained at the time the subjects were originally enrolled, and was updated for 80 cases with second cancers and 189 sex-, study area- and survival-matched cancer patients free of second cancers, with analysis as a nested case–control study (Day *et al*., 1994a).

Iowa Women's Health Study

The Iowa Women's Health Study was conducted on a cohort of women selected randomly from the Iowa Department of Transportation Driver's License list of whom 41 837 completed a postal questionnaire (response rate, 42.7%) sent in 1986. The questionnaire covered information on age, smoking history, physical activity and level of education. The Harvard semiquantitative food-frequency questionnaire was used to assess diet and alcoholic beverage consumption. Incident cases of cancer were ascertained through the Health Registry of Iowa, which is a population-based cancer registry in the SEER Program of the National Cancer Institute. The Iowa Women's Health Study is included in the Pooling Project (Gapstur *et al*., 1992, 1993; Potter *et al*., 1992; Harnack *et al*., 1997, 2002; Chiu *et al*., 1999; Kushi *et al*., 1999; Folsom *et al*., 2003; Kelemen *et al*., 2004).

Cohort of Iowa men

A retrospective cohort was formed from the controls in a population-based case–control study of six cancer sites conducted 1986–89 in Iowa (Cantor *et al*., 1998). These controls were randomly selected from the Iowa population using driver's licence records for men aged 40–64 years and from the files of the US Health Care Financing administration for men aged 65 years and older. Of 1989 men invited, 1601 (81%)

agreed to participate. Follow-up was through to 1995. Incident cases of cancer were identified by linkage with the Iowa State Cancer Registry (Putnam *et al*., 2000).

Health Professionals' Follow-up Study (HPFS)

In 1986, a cohort of 51 529 male dentists, optometrists, osteopaths, podiatrists, pharmacists and veterinarians in the USA were asked to respond to a mailed semi-quantitative food questionnaire. The questionnaire included questions on age, current and past tobacco use, marital status, height and weight, ancestry, medications, disease history, physical activity and diet. Only men who completed the diet questionnaire adequately at baseline and who reported no cancer other than non-melanoma skin cancer were included in the analysis. After all baseline exclusions, 47 931 men, 40–75 years old in 1986 and followed for 6 years comprised the first analysis cohort (Giovannucci *et al*., 1995); subsequently, follow-up was extended to 31 January 1998 (Platz *et al*., 2004). Follow-up questionnaires were sent in 1988, 1990 and 1992 to ascertain new cancer cases. Family members and the National Death Index were the main source of information on vital status of non-respondents. This study is included in the Pooling Project (Giovannucci *et al*., 1995; Michaud *et al*., 2001; Platz *et al*., 2004; Wei *et al*., 2004; Lee *et al*., 2006).

Study of Osteoporotic Fractures

This cohort was based upon a multicentric prospective study of white women aged 65 years and over who were recruited from population-based listings and followed for the occurrence of osteoporotic fractures. One year after the baseline examination, participants completed a questionnaire. Incident cancers were identified by follow-up at year 3, and verified by perusal of medical records. Those who had died were excluded, leaving 8 015 for analysis (Lucas *et al*., 1998) .

National Health Interview Survey (NHIS)

The 1987 National Health Interview Survey included a core questionnaire completed by 47 240 households containing 122 859 persons. One adult, aged 18 years and over, from each household who completed the core questionnaire was randomly selected to complete a cancer-control or cancer-epidemiology supplement, the latter comprising 22 080 individuals. The response rate for the core questionnaire was 95% and that for the cancer epidemiology supplement was 86%. Records from this cohort were linked to the National Death Index to provide a mortality follow-up through to 31 December 1995. Usable data were available for 20 195 participants (Breslow *et al*., 2000).

The β-Carotene and Retinol Efficacy Trial (CARET)

This trial of the potential chemopreventive effects of β-carotene and retinol began as a pilot study of 816 asbestos-exposed male workers and 1029 male and female heavy smokers and became a full-blown efficacy trial in 1988, with a total of 4060 male asbestos-exposed workers and 14 254 smokers (44% women) after 3 years of randomization. The trial was stopped 21 months before the planned cessation of the intervention; detailed results of associations with risk factors ascertained at baseline

(including alcoholic beverage consumption) considered cancers ascertained through to 15 December 1995 (Omenn *et al*., 1996).

Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial

A cohort of 25 400 women participated in a study that investigated the association between dietary folate, alcohol consumption, and postmenopausal breast cancer. Dietary data were collected at study enrollment between 1993 and 2001. Folate content was assigned on the basis of pre-fortification (i.e., pre-1998) databases. Of the 25 400 women participants with a baseline age of 55-74 years and with complete dietary and multivitamin information, 691 developed breast cancer between September 1993 and May 2003. Cox proportional hazard models with age as the underlying time metric were used to generate hazard ratios (HRs) and 95% CIs (Stolzenberg-Solomon et al., 2006).

California Teachers Study

This cohort was established in 1995–96 when 133 479 active and retired female teachers and administrators participating in the California State Retirement System returned a 16-page questionnaire that included data on alcoholic beverage consumption. Women who moved out of state or who died contributed person–months to the analysis up to the date of these events. Incident cancer cases are identified by annual linkage to the California Cancer Registry. Follow up was to January 2001 (Horn-Ross *et al*., 2004; Chang *et al*., 2007).

(c) Scandinavia

(i) *Denmark*

Pooled Copenhagen cohort studies

The data from three cohort studies—the Copenhagen City Heart Study, the Glostrup Population Study and the Copenhagen Male Study—were pooled. The Copenhagen City Heart study was initiated in 1976; participants were selected from 90 000 persons living in a defined area around the University Hospital of Copenhagen. An age-stratified sample of subjects aged 20 years or more was selected at random. Seventy-four per cent of those invited to participate (14 223 subjects) attended, and the subjects were followed-up until 1989. The Glostrup Population Studies Cohort (see above) comprised a total of 10 162 subjects (including men and women). The Copenhagen Male Study followed 5246 men, aged 40–59 years, from 14 large workplaces who were examined four times between 1970 and 1985. The combined study cohort included 18 602 men and 14 662 women. Information on smoking and intake of wine, beer and spirits was collected using self-administered questionnaires. Cancer cases were identified by record linkage to the Danish Cancer Register. Vital status was determined from the national Central Person Register. Cox regression was used to adjust for confounding by cigarette smoking, in a model that included six categories of current smoking and eight 10-year bands of duration of smoking. The cohort was eventually followed through to 1998, when 15 491 men and 13 641 women were included (Grønbaek *et al*., 1998;

Prescott *et al*., 1999; Albertsen & Grønbaek, 2002; Pedersen *et al*., 2003). Details concerning the pooled results from these studies are not provided in the Table.

Glostrup Population Study

The Glostrup Population Study was established primarily to investigate cardiovascular disease, and comprised subjects from several birth cohorts (1897–1962) examined between 1964 and 1992, drawn from a study area Southwest of Copenhagen. A study population of 5207 women aged 30–80 years at baseline was considered for the analysis of breast cancer risk factors. Cases of cancer were identified by linkage to the Danish Cancer Register (Høyer & Engholm, 1992; Petri *et al*., 2004).

Danish Diet, Cancer and Health Study

Between December 1993 and May 1997, 79 729 women aged 50–64 years, who were born in Denmark and living in the greater Copenhagen and Aarhus area, were selected from the Central Population Register and invited to participate in this study. Participants completed a detailed 192-item food-frequency questionnaire that they received by mail before a visit to one of the two study clinics. Information was obtained on alcoholic beverage consumption from the food-frequency questionnaire and on drinking patterns from a lifestyle questionnaire completed at the clinic visit. The study cohort comprised 23 778 women whose records were linked to the Central Population Register for information on vital status and migration and to the Danish Cancer Register for diagnostic details of cancer. Follow-up was to 31 December 2000. This cohort was also included in the EPIC study (Tjønneland *et al*., 2003, 2004).

(ii) *Finland*

α-Tocopherol β-Carotene (ATBC) Cancer Prevention Study

A cohort of 29 133 white Finnish men, aged 50–69 years, who smoked five or more cigarettes per day and who participated in the ATBC randomized trial, were recruited beween 1985 and 1988 and followed for 5–8 years; 27 101 completed the baseline questionnaire. Incident cancers were identified by linkage with the Finnish Cancer Register. Alcoholic beverage consumption was ascertained through a food-use questionnaire administered before randomization in the trial. Deaths were identified from the Register of Causes of Death in Finland. Trial assignment was available [but does not seem to have been incorporated into the analysis] (Glynn *et al*., 1996; Woodson *et al*., 1999; Stolzenberg-Solomon *et al*., 2001; Mahabir *et al*., 2005; Lim *et al*., 2006).

(iii) *Norway*

Norwegian Cohort of Waitresses

The cohort consisted of 5,314 waitresses organized in the Restaurant Workers' Union between 1932 and 1978. The follow-up period was from 1959 to 1991. The standardized incidence ratio (SIR) for all causes of cancer was 1.0 (95 percent confidence interval [CI] = 0.9-1.1), based on 430 observed cases. Cancers of the tongue, mouth, pharynx, larynx, esophagus, and liver were grouped together as alcohol-associated cancers. SIR for these cancers combined was 1.1 (CI = 0.5-2.2). For lung cancer, SIR

was 2.3 (CI = 1.6-3.1). Cervical cancer was also more frequent than expected, and breast cancer less frequent than expected. The larger excess of lung cancer and cervical cancer appeared in the sub-cohort working in restaurants with a license to serve alcohol. No excess risk of alcohol-associated cancers could be detected in this cohort of Norwegian waitresses (Kjaerheim & Andersen, 1994)

Norwegian Cohort Study

A cohort of Norwegian men born between 1883 and 1929, who completed a self-administered dietary questionnaire in 1967, was followed from 1968 (Heuch *et al*., 1983) through to 1992. The target population was initially drawn from three sources: approximately 19 000 persons randomly drawn from lists of residents of Norway from the 1960 population census, approximately 5200 drawn from four selected counties and approximately 13 000 from a cohort of Norwegians living in Norway who had siblings living in the USA (Kjaerheim *et al*., 1998). The study population for the Heuch *et al*. (1983) analysis comprised 16 713 men and women aged 45–74 years who responded to a questionnaire on dietary habits (which included alcoholic beverage consumption) and were followed to 31 December 1968. The study population for the Kjaerheim *et al*. (1998) analysis comprised 10 960 men who were alive and living in Norway on 1 January 1968, and who had no diagnosis of cancer before that date. Information on cancer incidence in both analyses was obtained through the population-based Norwegian Cancer Register (Heuch *et al*., 1983; Kjaerheim *et al*., 1998; Lund Nilsen *et al*., 2000).

HUNT-1 Cohort Study

All inhabitants of the county of Nord-Trondelag who were at least 20 years of age were invited by mail to participate in a health survey, 'Helseundersokelsen i Nord Trondelag 1' (HUNT-1), in 1984. Of 85 100 adults invited, 75 043 attended and were subsequently followed. Those who attended were examined and completed detailed questionnaires including information on alcoholic beverage consumption and tobacco smoking. After exclusions of persons followed for less than 3 years, 69 962 persons were included in the study. Follow-up to 2002 was by linkage to the Norwegian Cancer Register and the Norwegian Central Person Register (Sjödahl *et al*., 2007).

Norwegian Women and Cancer Study (NOWAC)

Between January 1991 and January 1997, 179 388 women aged 30–70 years, sampled according to birth years from the national population register at Statistics Norway, were invited to participate in a study. Mailing was conducted in 24 sets over 7 years; 102 443 women responded. The questionnaire included detailed information on alcoholic beverage consumption and diet. Cancer incidence was determined by linkage to the Norwegian Cancer Register (Dumeaux *et al*., 2004).

(iv) *Sweden*

Swedish Twin Register Study

A cohort of 12 889 twin pairs of the same sex, identified from the Swedish Twin Register, was asked to complete a questionnaire in 1961; 10 942 responded initially. Zygosity was based on questions of childhood similarity. In 1967, a 107-item

questionnaire regarding lifestyle factors including alcoholic beverage consumption was mailed to registrees. Mortality in twins was followed-up by record linkage to the Swedish Cancer and Death Registers through to 1997. Information from death certificates and hospital records and other data were collected for the period up to 1981; the underlying cause of death was determined according to the ICD 8th revision. For the period after 1981, the underlying cause of death as stated on the death certificate was used (Grönberg *et al*., 1996; Terry *et al*., 1998, 1999; Isaksson *et al*., 2002).

Swedish Mammography Cohort

The Swedish Mammography Cohort was established between 1987 and 1990, when all women who were born between 1914 and 1948 and resided in Uppsala and Vastmanland counties in central Sweden were invited to undergo a mammography and complete a mailed questionnaire on diet (67 items), including alcoholic beverage consumption, weight, height and education. A total of 66 651 women (74% of those approached) who returned the questionnaire formed the cohort. A second 96-item questionnaire was mailed in 1997 and was returned by 39 227 women. Follow-up was by record linkage to the National Swedish Cancer Register, the Regional Cancer Register and the Swedish Death and Population registers at Statistics Sweden. An initial report was conducted as a nested case–control study and included cases detected at the first screen (Holmberg *et al*., 1995). After various exclusions, the final cohort for analysis comprised 61 433 women for the first questionnaire and 36 664 for the second. This cohort was included in the Pooling Project (Holmberg *et al*., 1995; Rashidkhani *et al*., 2005; Suzuki *et al*., 2005; Larsson *et al*., 2007).

Malmö Diet and Cancer Cohort

The population for this cohort was defined in 1991 as all persons who lived in the city of Malmö and were born during 1926–45, and was expanded in May 1995 to include all women born during 1923–50 and all men born during 1923–45. On completion of the baseline examinations in October 1996, 28 098 persons were regarded as the base cohort, with a subsample of 11 726 postmenopausal women. Exposure data on alcoholic beverage consumption were collected by an interview-based modified diet history, including a 7-day menu book that recorded details of alcoholic beverage consumption. Cancer cases were identified by linkage to the National Swedish Cancer Register and the Southern Swedish Tumour Register (Mattisson *et al*., 2004).

(d) Western Europe

(i) *France*

Supplémentation en Vitamines et Minéraux Antioxydants Study

The objective of the study was to evaluate the relation between antioxidant-rich beverages and the incidence of breast cancer. This prospective study consisted of 4396 women without a history of cancer who were participants in the French Supplémentation en Vitamines et Minéraux Antioxydants Study. Beverage consumption was estimated by using three nonconsecutive 24-hour recalls. Incident cancer cases were identified

through clinical examinations performed every other year, including, e.g., a screening mammogram, and through a monthly health questionnaire. Participants were followed for a median 6.6 years (Hirvonen *et al*., 2006).

(ii) *Netherlands*

Netherlands Cohort Study

This cohort was based on 204 municipal population registries throughout the Netherlands, and comprised 58 279 men and 62 573 women, aged 55–69 years in 1986, who completed a self-administered questionnaire at baseline. Follow-up was by record linkage to cancer registries and the Dutch database of pathology reports, initially to 1989, and subsequently to 1992. The cohort was analysed as a case–cohort; a subcohort of 3500 subjects randomly sampled from the cohort after baseline exposure measurement was followed to 1992 to obtain information on vital status and was used as control (Goldbohm *et al*., 1994; Schuurman *et al*., 1999; Zeegers *et al*., 2001; Schouten *et al*., 2004; Balder *et al*., 2005; Loerbroks *et al*., 2007).

(iii) *United Kingdom*

British Doctors' Study

In 1951, a questionnaire was sent to all British doctors included in the Medical Registry; 34 440 men and 6194 women responded, representing 69% and 60%, respectively, of those doctors not known to have died at the time of the inquiry. Further questionnaires were sent in 1957, 1966, 1972, 1978 and 1990 to men and in 1961 and 1973 to women; on each occasion, at least 94% of those alive responded. Reports were published on cause-specific deaths after 10, 20 and 40 years for men and after 10 and 22 years for women; more than 99% of the subjects had been traced. Information on causes of death was obtained principally from the Registrars General of the United Kingdom or from the records of the general Medical Council, the British Medical Association, relatives or friends. Because the subjects in the study were themselves physicians, they were a reasonably uniform socioeconomic group and the causes of death were certified more accurately than might have been the case among a sample of the general population. Data on alcoholic beverage consumption were available for the last 23 years of the study (1978–2001) and, for this period, data by drinking habit, adjusted for smoking (adjusted for 5-year calendar periods), were available, and were considered for 12 321 male doctors who were alive in 1978 (Doll *et al*., 1994, 2005).

Oxford Vegetarian Study

This cohort included 11 140 vegetarians and non-vegetarians recruited in the United Kingdom between 1980 and 1984, who were contacted through the Vegetarian Society of the United Kingdom, media publicity and through other participants. Non-vegetarian participants were nominated by vegetarian participants from among their friends and relatives. Upon entry into the study, participants completed a food-frequency questionnaire and answered questions on other lifestyle factors including information on alcoholic beverage consumption. Participants were followed for information on cancer and

death through the National Health Service central registry to 31 December 1999. The analysis cohort comprised 10 998 participants aged 16–89 years at entry (Sanjoaquin *et al*., 2004). This cohort is included in the European Prospective Investigation of Nutrition and Cancer (EPIC).

General Practitioner Research Database Study

The general practitioner research database contains longitudinal patient records, and totals >35 million patient–years of data on British primary care. The information was recorded by general practitioners during standard medical care, including patients' demographics, medical disorders, diagnoses from hospital referrals and drug prescriptions. Information on alcoholic beverage consumption was included when present in the records, but appears not to have been collected specifically; only information recorded at least 2 years before the index date was considered. The study period was from 1 January 1994 to 31 December 2001. The study was analysed as a nested case–control strudy; the index date was the date of diagnosis for cases, and was randomly selected for the 10 000 controls who were frequency-matched to the cases (Lindblad *et al*., 2005).

(iv) *Multiple countries in Europe*

Multicentric European Study of Second Primary Tumours

A cohort of 928 (876 male, 52 female) cases of laryngeal and hypopharyngeal cancer was identified between 1979 and 1982 from a multicentric population-based case–control study in Italy, Spain and Switzerland that was conducted to study the effects of tobacco, alcoholic beverage consumption, diet and occupation on the development of cancers. The cohort was followed until 2000 for the occurrence of second primary tumours using population, mortality and cancer-registry files. Exposure information was obtained through interviews. Approximately 7% of the cohort was lost to follow-up. Of the 876 men and 52 women, 145 men and six women developed second primary tumours during the follow-up period. The Cox proportional hazard model, adjusted for age, centre, occupation, smoking and site of first cancer, was used to estimate hazard ratios (Dikshit *et al*., 2005).

European Prospective Investigation into Cancer and Nutrition (EPIC)

A cohort of healthy adults was recruited from Denmark, France, Germany, Greece, Italy, Norway, Spain, Sweden, the Netherlands and the United Kingdom to study multiple exposures, including cigarette smoking, vegetable/fruit intake and alcoholic beverage consumption, on risks for various cancers. Recruitment was initiated in 1992, and active and passive follow-up is ongoing. Exposure information was obtained from mailed questionnaires. Relative risks were obtained using the proportional hazard model adjusting for follow-up time, sex, education, body mass index, vegetable and fruit consumption, tobacco smoking and energy intake (Boeing, 2002; Rohrmann *et al*., 2006; Tjønneland *et al*., 2007).

Table 2.1b Cohort studies of cancer and alcoholic beverage consumption in special populations

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
North America								
Canada								
Canadian Alcoholics Study	1951	Schmidt & Popham (1981)	1951–70	9 889 alcoholic men, aged ≥15 years, admitted to the clinical service of the Addiction Research Foundation of Ontario between	Death records	Deaths	Buccal cavity, pharynx, oesophagus, stomach, large intestine, rectum, liver, pancreas, larynx, bronchus, lung, prostate, lymphoma, leukaemia	Local reference population, US veterans used as a reference population, no individual exposure data, no information on potential confounders
United States								
Massachusetts Cohort of Chronic Alcoholics	1930, 1935, 1940	Monson & Lyon (1975)	1930–71	1139 men and 243 women admitted in 1930, 1935 or 1940 to a mental hospital with a diagnosis of chronic alcoholism	Death certificates	Deaths	Buccal cavity, oesophagus, stomach, colon, rectum, large intestine, liver, biliary tract, pancreas, larynx, lung, breast, urogenital organs, prostate, urinary bladder, kidney, brain, leukaemia, other cancer	Compared with US population; half of group lost to follow-up; no individual exposure data; no information on confounders.

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Seventh-day Adventists study	1976	Mills *et al*. (1994); Singh & Fraser (1998)	1976–82	60 000 Seventh-day Adventists in California identified by census questionnaire, aged >25 years	Lifestyle questionnaire	Cases	Buccal cavity, oesophagus, stomach, large intestine, colon, rectum, biliary passages and liver, pancreas, bronchus, lung, melanoma, breast, cervix, corpus uteri, ovary, urinary bladder,kidney, brain, Hodgkin disease, leukaemias	Study population had a low prevalence of alcohol consumption; joint effect of alcohol and tobacco examined.
Scandinavia								
Denmark								
Danish Brewery Workers Cohort	1939–63	Jensen (1979); Thygesen *et al*. (2005)	1943–99	14 313 Danish brewery workers employed at least 6 months in 1939–63; age not given	Cancer registry database	Case/ deaths	Buccal cavity, pharynx, oesophagus, stomach, colon, rectum, liver, pancreas, nasal cavities, larynx, lung, melanoma, other skin, prostate, testis, penis, urinary bladder, kidney, ureter, brain, nervous system, lymphatic and haematopoeitic leukaemia	Local male population; national mortality rates used for comparison; no individual exposure data; no information on potential confounders

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Danish Alcohol Abusers Study	1954–87	Tønnesen *et al.* (1994)	1954–87	18 307 (15 214 men, 3 093 women) alcoholics from a public outpatient clinic for free treatment	Interview	Cases/ deaths	Lip, tongue, salivary glands, mouth, pharynx, oesophagus, stomach, kidney, colon, rectum, liver, gall bladder, urinary bladder, pancreas, larynx, lung, pleura, melanoma, non-melanoma skin, breast, cervix uteri, corpus uteri, ovary, prostate, testis, brain, endocrine, non-Hodgkin lymphoma, multiple myeloma, haematopoietic and lymphatic leukaemia	Cohort cancer incidence compared with total Danish population; no information on potential confounders; estimates not adjusted for smoking.
Nationwide Study of Patients with Cirrhosis	1977–89	Sørensen *et al.* (1998)	1977–93	11 605 1-year survivors of cirrhosis from the Danish National Registry of Patients	Registry database	Cases	Oral cavity, pharynx, oesophagus, stomach, colon, rectum, liver, gall bladder, biliary tract, pancreas, larynx, lung, melanoma, other skin, breast, cervix uteri, endometrium, ovary, prostate, testis, kidney, urinary bladder, brain, nervous system, thyroid, non-Hodgkin lymphoma, leukaemia	Expected rates from national incidences; estimates not adjusted for smoking

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Finland								
Finnish Alcoholics	1967–70	Hakulinen *et al*. (1974)	1967–70	Approximately 205 000 male alcohol misusers and mean of 4 370 male chronic alcoholics, aged >30 years	Finnish Cancer Registry	Cases	Salivary glands, pharynx, oesophagus, stomach, colon, liver, pancreas, larynx, lung, bone, skin, prostate, urinary organs, eye, nervous system, thyroid, lymphoma, Hodgkin disease, leukaemia	Local reference; no individual exposure data; no data on potential confounders
Norway								
Norwegian Alcoholics Study	1925–39	Sundby (1967)	1925–62	Alcoholics from Oslo psychiatric department, 1722 males, aged 15–70 years	Death certificate	Deaths	Oral cavity, pharynx, oesophagus, stomach, colon, rectum, liver, pancreas, larynx, lung, prostate, testis, penis, urinary bladder, kidney, brain, Hodgkin disease, multiple myeloma, leukaemia	Local reference; Oslo urban mortality data

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
International Organization of Good Templars Cohort	1980	Kjaerheim *et al.* (1993)	1980–89	5332 members of the International Organization of Good Templars, aged ≥10 years	Hospital and laboratory reports	Cases	Oral cavity, pharynx, oesophagus, stomach, colon, rectum, gall bladder, liver, pancreas, larynx, lung, breast, female genital, prostate, male genital, urinary bladder, kidney, brain, haematopoietic cancers	Expected rates from national incidence

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Sweden								
Temperance Boards Study	1947	Sigvardsson *et al.* (1996)	1947–77	15 508 alcoholic women ascertained through the Temperance Boards and 15 508 non-alcoholic women from population, born 1870–1961	Temperance Boards records	Cases	Lip, tongue, salivary glands, mouth, hypopharynx, pharynx, tonsil, oesophagus, stomach, small intestine, duodenum, colon, rectum, liver, gallbladder, bile ducts, pancreas, nose, larynx, bronchus, lung, bone, connective tissue, muscle, breast, malignant melanoma, other skin, uterus, cervix uteri, corpus uteri, ovary, vulva, vagina, other female genital, urinary bladder, kidney, eye, nervous system, thyroid, endocrine glands, non-Hodgkin lymphoma, Hodgkin disease, multiple myeloma, leukaemia, unspecified sites	No adjustment for smoking

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Swedish Brewery Workers Study	1960	Carstensen *et al*. (1990)	1961–79	6230 men employed in the Swedish brewery, aged 20–69 years	Swedish Cancer Registry	Cases	Buccal cavity, pharynx, oesophagus, stomach, colon, rectum, liver, pancreas, larynx, bronchus, lung, melanoma, prostate, male genital organs, urinary bladder, kidney, urinary system, brain, nervous system, leukaemia, lymphatic and haematopoetic cancers	Swedish male population used as a reference group
Swedish Inpatient Register/ Study of Patients with Chronic Pancreatitis	1964–83	Karlson *et al*. (1997); Ye *et al*. (2002)	1964–95	Karlson *et al*. (1997) Analytical cohort of 4043 patients discharged with pancreatitis in association with alcoholism Ye *et al*. (2002) 178 688 male and female patients with hospital discharge of alcoholism, 1964–95	Medical and cancer registry records	Cases	Pancreas	Incidence rates compared with national rates; no individual exposure data; no information on potential confounders; risks not adjusted for smoking

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
National Board of Health and Welfare Hospital Discharge study of Alcoholism	1965	Kuper *et al.* (2000c)	1965–95	Analytical cohort of 36 856 women diagnosed with alcoholism from hospital discharge data	Hospital-discharge records	Cases	Breast	Compared with national incidence rates; no individual exposure information; no adjustment for potential confounders
National Board of Health and Welfare Study of Alcoholic Women	1965–94	Lagiou *et al.* (2001); Weiderpass *et al.* (2001a,b),	1964–95	36 856 women hospitalized for alcoholism	Registry –based linkages		Trachea, bronchus, lung, cervix uteri, endometrium, ovary, vagina, vulva	No adjustment for smoking

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Swedish In-patient Register and National Cancer Register Study	1965–94	Boffetta *et al*. (2001)	1965–95	173 665 patients (138 195 men, 35 470 women) with a hospital discharge diagnosis of alcoholism, aged >20 years	National Cancer Registry	Cases	Lip, tongue, salivary gland, mouth, oral cavity, pharynx, mesopharynx, nasopharynx, hypopharynx, oesophagus, stomach, colon, rectum, liver, biliary tract, pancreas, larynx, lung, melanoma, breast, cervix, corpus uteri, ovary, prostate, testis, urinary bladder, kidney, brain, thyroid, lymphatic, haematopoietic cancers	Compared with incidence in the national population

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Uppsala Alcoholics Study	1965–83	Adami *et al.* (1992a,b)	1964–84	10 350 individuals from Swedish Uppsala Inpatients Register, with discharge diagnosis for alcoholism	Cancer registry	Cases	Lip, tongue, salivary gland, mouth, oral cavity, pharynx, mesopharynx, nasopharynx, hypopharynx, oesophagus, stomach, colon, rectum, liver, biliary tract, pancreas, larynx, lung, melanoma, breast, cervix, corpus uteri, ovary, prostate, testis, urinary bladder, kidney, brain, thyroid, lymphatic, haematopoietic cancers	

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
Western Europe								
Republic of Ireland								
Dublin Brewers Study	1954–73	Dean *et al.* (1979)	1954–73	Deaths between 1954 and 1973 among male blue-collar brewery workers	Death certificates	Deaths	Oesophagus, stomach, colon, rectum, liver, gall bladder, pancreas, lung	Compared with Dublin skilled and unskilled manual workers; no individual exposure data; no information on confounders
United Kingdom								
Study of Patients Hospitalized for Alcohol-related Diseases	1948–1971	Prior (1988)	1948–81	1 110 patients/ hospitalized in the Birmingham region for alcohol-related conditions	Hospital-discharge records	Cases	Mouth, buccal cavity, pharynx, throat, oesophagus, liver, gall bladder, pancreas, digestive system, larynx, lung, respiratory system, skin, breast, cervix uteri, reproductive system, urinary system, lymphatic and haematopoietic systems	Compared with the West Midlands region

Table 2.1b (continued)

Country Name of study	Date of cohort sampling	References	Maximum years of follow-up	Cohort sample and age at beginning of follow-up	Collection of information	Cases/ deaths	Neoplasms analysed	Comments
England and Wales, UK Alcoholics Study	1953–57, 1964	Adelstein & White (1976); Nicholls *et al*. (1974)	1953–74	1 595 male and 475 female alcoholics aged 15–90 years	Hospital-discharge records	Deaths	Pharynx, oesophagus, stomach, intestine, rectum, liver, pancreas, larynx, lung, breast, cervix uteri, prostate	Reference death rates were sex-specific rates of England and Wales for 1972.

2.1.2 *Studies in special populations (Table 2.1b)*

This group of studies is characterized by the assumption that the study subjects have a pattern of consumption of alcoholic beverages that is different from that of the general population, e.g. alcoholics, brewery workers, members of a temperance organization. Because of the availability of national registries of populations, inpatients and cancer, most of these studies were performed in Scandinavian countries. The estimation of risk in these individuals is not based upon a comparison of exposed and unexposed subjects within the cohort, but with the expected rates of cancer in the general population.

(a) North America

(i) *Canada*

Canadian Alcoholics Study

The cohort consisted of 9889 men (79% middle-class; <1% nonwhite) who had been admitted to the main clinical services for alcoholics in Ontario between 1951 and 1970. No information on individual drinking or smoking habits was available, but investigations of samples of the cohort indicated an average daily consumption of 254 mL [~ 200 g] ethanol and that >92% were still drinking ten years after admission. A total of 94% of cohort members were current smokers, who smoked an average of 28 cigarettes per day. Altogether, 1823 deaths occurred before 1972; 960.9 were expected. Vital status could not be determined for 3.5% of cohort members. Cause-specific mortality was compared with that of the Ontario male population. A further comparison was made with US veterans who smoked 21-39 cigarettes per day, in an indirect attempt to control for the effect of tobacco on the risk of alcohol-related cancers. Results were also reported for 1119 women followed up for 14 years, but only a few cancer deaths were observed (Schmidt & Popham, 1981).

(ii) *United States*

Massachusetts Cohort of Chronic Alcoholics

To test the hypothesis that there is a positive association between chronic alcoholism and carcinoma of the pancreas, the mortality experience of 1382 chronic alcoholics was studied. Analysis was limited to a comparison of observed and expected proportional mortality of different causes of death in the 894 whites who were known to have died. For carcinoma of the pancreas, 3 deaths were observed and 5.2 were expected. The observed/expected ratios for other causes of death, including other sites of cancer, were in accordance with prior studies (Monson & Lyon, 1975).

Seventh-day Adventist Study

The study population was identified in 1973 from 437 California Seventh-day Adventists churches. Adventists are a religious group who do not consume tobacco, alcoholic beverages or pork, and half adhere to a lacto-ovo-vegetarian lifestyle. The list of households was computerized in 1974: 63 530 were identified to which a census

questionnaire was sent; 36 850 households returned a questionnaire listing 95 196 persons. Persons under 25 years of age were excluded from all analyses, and the study population analysed comprised 59 090 subjects. In 1976, a lifestyle questionnaire was sent to all living members (57 841); 40 398 participants returned the questionnaire; non-Hispanic whites had a response rate of 75%. Participant data was linked with data from two cancer registries, which were in operation in California. SIRs were calculated. The group of non-Hispanic members of the cohort was compared with an external population of Connecticut (93% whites) (Mills *et al*., 1994; Singh & Fraser, 1998).

(b) Scandinavia

(i) *Denmark*

Danish Brewery Workers Cohort

A total of 14 313 male members of the Danish Brewery Workers' Union who had been employed for six or more months in a brewery during the period 1939-63 were enrolled in this retrospective cohort study. The brewery workers had the right to consume six bottles (2.1 L) of light pilsener (lager) beer (alcohol content, 3.7 g [~ 78 g ethanol] per 100 mL) on the premises of the brewery per working day; 1063 members of the cohort worked in a mineral-water factory, with no free ration of beer. No information was available on alcohol consumption or smoking habits of individual members of the cohort; but, on the basis of comparisons with alcohol statistics and population surveys, it was estimated that cohort members with employment in a brewery had a four times higher average beer consumption than the general population. Vital status was ascertained for 99.4% of the cohort members. There were 3550 deaths (SMR, 1.1) in the cohort, and 1303 incident cases of cancer were identified during the period 1943-72 by record linkage with the Danish Cancer Registry. Expected numbers of cancer cases and deaths were computed on the basis of age-, sex-, residence- and time-specific rates (Jensen 1979, 1980).

Danish Alcohol Abusers Study

The study was based on 18 307 alcoholics from Copenhagen who entered a public outpatient clinic for free treatment for alcoholism from 1954 to 1987. From 1968, cohort members had population identification numbers. Prior to that date, the 5969 cohort members without a number were sought by computer linkages with municipal and Danish population registries. The resultant cohort consisted of 15 214 men who were observed for 12.9 years on average and 3093 women who were observed for an average of 9.4 years. The records of these cohort members were linked to the Danish Cancer Register to obtain information on cancer morbidity through to December 1987. The observed cancer incidence was compared with that expected in the Danish population (Tønnesen *et al*., 1994).

Nationwide Study of Patients with Cirrhosis

In a study based upon the Danish National Register of Patients, persons who were registered between 1977 and 1989 were enrolled if they had been discharged with

alcoholic cirrhosis (ICD-8 571.09), primary biliary cirrhosis (571.90), non-specified cirrhosis (571.92), chronic hepatitis (571.93) or 'other types of cirrhosis, alcoholism not indicated' (571.99). Cirrhosis was considered as a whole, but also as four separate types, largely following the ICD-8 codes given above, except that 'non-specified cirrhosis' and 'cirrhosis, alcoholism not indicated', were merged into one group termed 'nonspecified cirrhosis' (571.92 and 571.99). All members of the study cohort were linked through their personal identification number to the nationwide Danish Cancer Register and followed-up through to 1993. The cohort for this analysis consisted of 11 605 subjects (5079 men and 2086 women with alcoholic cirrhosis) who had survived for 1 year after registration. Expected numbers were computed from the rates in the Danish Cancer Register and compared with those observed (Sørensen *et al*., 1998).

(ii) *Finland*

Finnish Alcoholics

Between 1944 and 1959, male 'alcohol misusers' were registered by the Finnish State Alcohol Monopoly on the basis of conviction for drunkenness, sanctions imposed by the municipal social welfare boards, and various breaches against the regulations governing alcohol usage. No information was available on the amount of alcohol consumed by the cohort members, nor on types of beverage or smoking habits. The numbers of incident cases of cancer of the oesophagus, of the liver and of the colon among an estimated 205 000 men born 1881-1932 and alive in 1965-68 were obtained by a manual match between the files of the Finnish Cancer Register for these years and the files of the Alcohol Misusers Registry. Person-years at risk during the period 1965-68 were estimated from samples, and these formed the basis for computing expected numbers of cases. Lung cancer risk was determined in a similar fashion, but for only one-third of the group in 1968.

A second group of men more than 30 years of age, who in 1967-70 had been listed as chronic alcoholics by the Social Welfare Office of Helsinki, were also studied. The mean annual number of such men was estimated to be 4370. No information was available on type or amount of alcoholic beverages drunk or on tobacco smoking, but the persons in the group of chronic alcoholics were heavy alcohol drinkers, most of whom drank cheap, strong beverages, wines and denatured alcohols. Incident cases of cancer occurring during 1967-70 were identified by record linkage with the Finnish Cancer Register, and expected numbers were derived on the basis of national incidence rates and computed person-years (Hakulinen *et al.,* 1974).

(iii) *Norway*

Norwegian Alcoholics Study

A total of 1 722 men discharged during 1925-39 from the Psychiatric Department of an Oslo hospital with a diagnosis of alcoholism were enrolled in the study and observed until the end of 1962. No information was available on drinking and smoking habits of individual cohort members or of the cohort as a whole, 408 were considered

to be vagrant alcoholics. Evidence of persistent alcoholism was available for about 75% of the vagrants and for 50% of the remaining group. Follow-up was virtually complete, with 1 061 deaths. Death certificates were located for 1 028 of these, and information on cause of death was available for another 28 persons. The observed numbers of deaths were compared with expected numbers based on causes of deaths for all of Norway (496.9) and for Oslo (629.0). (Sundby, 1967).

International Organization of Good Templars Cohort

A cohort of 5332 members, aged 10 years and over, from the 200 larger and active lodges of the International Organization of Good Templars was followed for 10 years from 1980. Members of the Organization sign a statement that they will not drink alcoholic beverages. Cancer incidence and cause-specific mortality of the cohort was determined by linkage to the Cancer Register of Norway and was compared with that of the total Norwegian population (Kjaerheim *et al*., 1993).

(iv) *Sweden*

Temperance Boards Study

This cohort study comprised 15 508 Swedish women with a history of heavy alcoholic beverage consumption and 15 508 matched comparison subjects. The excessive alcoholic beverage users were ascertained through a review of the records of all Temperance Boards of Sweden, which operated between 1917 and 1977. During this time, 21 757 women were registered. Before 1947, personal identification numbers did not exist, so the cohort was limited to records after 1947. Linkages were made with the Swedish Cancer Register, which started in 1958 (Sigvardsson *et al*., 1996).

The Swedish Brewery Workers Study

This study was based upon the Cancer–Environment Register that links cancer incidence data from the Swedish Cancer Register for the period 1961–1979 with information on occupation, occupational status, industry and residence obtained in the 1960 population census. A group of 6230 men who were, according to the census, employed in the Swedish brewery industry in 1960, aged 20–69 years, was followed-up in 1961–79 by linkage to the Swedish Cancer Register. Person–years were computed by linkage with the Swedish Population Register. Relative risks were computed using all Swedish men as the reference group (Carstensen *et al*., 1990).

Swedish In-patient Register Study of Patients with Chronic Pancreatitis

This cohort was also based on the Swedish In-patient Register, and a very similar methodology to that of Boffetta *et al*. (2001) was used. Records of all patients with a diagnosis of acute, chronic or unspecified pancreatitis were identified, and linked to the Registries of Population, Death and Emigration held by Statistics Sweden. After exclusions of those who could not be identified in these registers and those with pancreatic or other cancers diagnosed at the index hospitalization, 29 530 subjects were included in the cohort. Incident cancers were identified by linkage with the [Swedish] National Cancer Register up to 31 December 1989 (Karlson *et al*., 1997). In a more recent report using the same database as above (Karlson *et al*., 1997; Boffetta *et al*., 2001),

five cohorts were considered: 178 688 subjects admitted to hospital for alcoholism, 3500 admitted for chronic alcoholic pancreatitis, 4952 admitted for chronic non-alcoholic pancreatitis, 13 553 admitted for alcoholic liver cirrhosis and 7057 admitted for non-alcoholic liver cirrhosis. Follow-up was through to 1995 by linkage with national registers. Standardized incidence ratios (SIRs) were computed taking the Swedish population as a reference (Ye *et al*., 2002).

National Board of Health and Welfare Hospital Discharge Study of Alcoholism

From 1965 onwards, the National Board of Health and Welfare started collecting data on individual hospital discharges in the Inpatient Register. From 1987, the register attained complete nationwide coverage. All patients recorded in the Inpatient Register with a discharge diagnosis of alcoholism were initially selected for inclusion in the study. A total of 196 803 individually unique national registration numbers, assigned to all Swedish residents, were registered at least once with a diagnosis of alcoholism between 1965 and 1994. December 31, 1995 was the end of the observation period. Record linkage of the study cohort to the nationwide Registers of Causes of Death, Emigration and Cancer allowed the calculation of follow-up time, in person-years, of eligible persons at risk as described previously in detail (Adami et al, 1992a, b). From the total cohort 7790 records were excluded because of erroneous or incomplete national registration numbers, a further 3405 patients were excluded because they had prevalent cancers at the time observation began and another 2941 patients because of inconsistencies uncovered during record linkage. Thus a total of 182 667 patients with alcoholism remained eligible, and of these 36 856 were women (Kuper *et al.,* 2000c).

National Board of Health and Welfare Study of Alcoholic Women

This study was essentially on the same female cohort as that considered by Boffetta *et al*. (2001). A total of 36 856 Swedish women (mean age, 42.7 years), who were hospitalized at least once in 1965–94 with a diagnosis of alcoholism and were residents in Sweden, were included in the study. SIRs were calculated by multiplying the number of person–years within 5-year age groups and calendar-year strata by the cancer incidence rates in Swedish women. Exclusions from observed and expected groups were secondary cancers and cancers found incidentally at autopsy. The person–time and events during the first year of follow-up were excluded to avoid increased likelihood of diagnosis of one disease following hospitalization for alcoholism in the presence of a yet undetected malignancy. The authors took co-morbidities into account (i.e. factors in the hospitalization record other than alcohol dependence) and assessed person–time within each co-morbidity stratum (Lagiou *et al*., 2001; Weiderpass *et al*., 2001a,b).

Swedish In-patient Register and the National Cancer Register Study

This cohort was based on the Swedish In-patient Register, a database provided by the National Board of Health and Welfare since 1964 that contains complete nationwide records since 1987, and is an expansion of the study of Adami *et al*. (1992a,b). Using the national identification number, which is a unique identifier for each citizen, the cohort was linked to the Registers of Population, Death and Emigration, and the National Cancer Register. The 196 803 persons aged ≥20 years who were identified had

a hospital discharge-diagnosis of alcoholism during 1965–94 and a unique national registration number. After exclusions for various reasons, 173 665 persons were included in the analytical cohort (138 195 men, 35 470 women). Incident cancers after discharge were identified by linkage with the National Cancer Register up to 31 December 1995 (Boffetta *et al*., 2001).

Uppsala Alcoholics Study

A cohort of 10 350 individuals was selected from the Uppsala Inpatient Register (Sweden), with a discharge diagnosis that contained a diagnostic code for alcoholism (International Classification of Diseases [ICD] 7: 307, 322; ICD 8: 291, 303) during 1965–83. After exclusion of those who had an inconsistent registry number, 9353 (8340 men, 1013 women) patients were entered into the study. Follow-up was by record linkage to the nationwide Register of Causes of Death and the National Swedish Cancer Register through to 1984. Expected numbers of cancers were computed from cancer incidence in the Uppsala health-care region to compare with the observed cases (Adami *et al*., 1992a).

The Uppsala Alcoholics cohort, identified at the same time and followed for the same period, was also analysed as three population-based cohorts with mutually exclusive hospital discharge-diagnoses of alcoholism, cirrhosis or both. It comprised 8517 patients with a diagnosis of alcoholism, 3589 subjects with cirrhosis and 836 subjects with both diagnoses (Adami *et al*., 1992b).

(c) Western Europe

(i) *Republic of Ireland*

Dublin Brewers Study

A list of 1628 deaths during the period 1954-73 was provided by a large brewery in Dublin, Ireland. On the basis of death certificates for all but two of these men and of statistics for the population of employees and pensioners in 1957, 1960, 1967 and 1970, relative risks for specific causes of death were estimated employing both national and regional rates. The expected number of deaths was 1675.8 (regional rates). It was estimated from previous research that ethanol intake among the brewery workers was 58 g per day, compared with 16-33 g per day for other groups of the Irish population. Beer (stout) was consumed on the premises. No information was available on individual consumption of alcohol or tobacco; smoking was forbidden at the brewery for many years. [The Working Group noted that the cohort at risk was estimated indirectly as 2000-3000 men at any one time during follow-up, and no individual follow-up of cohort members was performed.] (Dean *et al.,* 1979)

(ii) *United Kingdom*

Study of Patients Hospitalized for Alcohol-related Diseases

A series of 1110 patients seen at hospitals in the Birmingham Region between 1948 and 1971 for alcohol-related conditions were followed to 1981. By means of cohort analysis, the incidence of cancer in the series was compared with that in the West

Midlands Region. In men the cancer risk was increased 1.7-fold: individual sites at risk were liver (8-fold), buccal cavity and throat (27-fold), respiratory system (2.4-fold), and oesophagus (4-fold). No excess of colorectal cancers was observed. Although in women there was no overall excess of cancers, the risk was high in the biliary system (15-fold) and was moderately increased for *cervix uteri* (4-fold) (Prior, 1988).

A total of 935 patients who had been discharged from four mental hospitals in or near London, UK, during the years 1953-57, or who had died during the key hospitalization and who had been given a primary or secondary diagnosis implicating abnormal drinking, were followed for 10-15 years. Of the total sample, 70 (7.5%) remained untraced and 233 men (34.4%) and 76 women (29.6%) had died; a total of 112.7 deaths was expected. The study was extended to all of England and Wales 1953-64 by Adelstein and White (1976), who covered a total of 1595 men and 475 women (Nicholls et al., 1974)