

2.16 Cancer of the kidney

Twenty cohort studies that assessed the relationship between alcoholic beverage intake and kidney cancer were identified; six of these were in special populations of heavy alcoholic beverage consumers whose rates of kidney cancer were compared with those of other populations, one was a mortality follow-up of a Japanese population, one was a study among cirrhotic patients and twelve were part of a pooled analysis. Twenty-one case-control studies that included information on alcoholic beverages and kidney cancer were identified.

2.16.1 Cohort studies (Tables 2.78 and 2.79)

Several of the five follow-up studies of heavy alcoholic beverage consumers (Pell & D'Alonzo, 1973; Jensen, 1979; Robinette *et al.*, 1979; Adami *et al.*, 1992a; Tønnesen *et al.*, 1994; Table 2.78) were seriously limited by very small numbers of renal-cell cancer and an inability to control for confounding by smoking. Two of these had approximately 40 cases (Jensen, 1979; Tønnesen *et al.*, 1994); the SIRs were 1.0 and 1.4, respectively.

Recently, a pooled analysis that was part of the Pooling Project of Prospective Studies of Diet and Cancer (Lee *et al.*, 2007; Table 2.79) included 12 cohorts that found at least 25 incident cases of renal-cell carcinoma and consisted of 530 469 women and 229 575 men, with a maximum follow-up time of 7–20 years. Only four of these studies (Nicodemus *et al.* 2004; Mahabir *et al.*, 2005; Rashidkhani *et al.*, 2005; Lee *et al.*, 2006) had previously published findings, which tended to show inverse or null associations between alcoholic beverage intake and the incidence of renal-cell cancer. In most of the other cohorts, the numbers of renal-cell cancers were relatively small and the results may have not been published. A total of 1430 incident cases of renal-cell cancer were identified. Alcoholic beverage consumption was inversely related to risk; compared with non-drinkers, the relative risk was 0.72 (95% CI, 0.60–0.86) for consumption of ≥ 15 g alcohol per day (p for trend < 0.001). Although there was significant heterogeneity among studies, the inverse trends were similar and statistically significant in both men and women.

Table 2.78 Cohort studies of alcoholic beverage consumption and cancer of the kidney in special populations

Reference, location, name of study	Cohort description	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Follow-up studies of heavy drinkers							
Pell & D'Alonzo (1973), USA	Employees of a chemical company: 899 alcoholics identified through company physicians, 921 controls; matched for age, sex, payroll class, geographical location; follow-up, 1965–69; 88.1% of alcoholics and 96.3% of controls still alive in 1969	Kidney (189)	Alcoholics Controls	26 deaths (2 renal) 7 deaths (1 renal)			

Table 2.78 (continued)

Reference, location, name of study	Cohort description	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Jensen (1979), Denmark, Danish Brewery Cohort	14 313 Danish brewery workers employed at least 6 months in 1939–63; followed for cancer incidence and mortality in 1943–73; age not given; workers allowed 2.1 L of free beer/day (77.7 g pure alcohol).	Kidney (189); cases and deaths identified through Cancer Registry, classified with 4-digit code of ICD-7	All cancers Kidney cancer	1303 38	SIR 1.1 (1.0–1.2) 1.0 (0.7–1.4)	Age, sex, area, time trends	Cancer morbidity and mortality compared with those of the general population
Robinette <i>et al.</i> (1979), USA, World War II Veterans Study	4401 US Army service men, hospitalized for chronic alcoholism 1944–45; 4401 service men treated for nasopharyngitis matched to alcoholic subjects by age; follow-up through to 1974	Deaths; kidney (ICD-8, 189)	In 1974 <i>Alcoholics</i> All causes All cancers Cancer of kidney, ureter and other	Deaths 1438 166 1	Mortality rate ratio 1.78 (1.74–2.00) 1.08 (0.96–1.38) ^a 0.27 (0.01–2.09) ^b		^a Based on age- and time-specific US death rates in the USA ^b Ratio of observed/ person–years for alcoholism over nasopharyngitis

Table 2.78 (continued)

Reference, location, name of study	Cohort description	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Adami <i>et al.</i> (1992a), Sweden	9353 individuals (8340 men) with a discharge diagnosis of alcoholism in 1965–83; mean age at entry, 49.4 years; at diagnosis, 60.0–68.1 years; follow-up for through to 1984 (maximum, 19 years; mean, 7.7 years); first year of follow-up excluded	Ascertained through National Swedish Cancer Registry; 94% microscopically confirmed; cases occurring in the first year after entry into the cohort excluded	All cancers	491 deaths	SIR 1.4 (1.3–1.6)		No data on individual alcohol or tobacco use
			Kidney cancer				
			Men	20	1.3 (0.8–2.1)		
			Women	2	2.0 (0.2–7.1)		
Tønnesen <i>et al.</i> (1994), Denmark	15 214 male and 3093 female alcohol abusers who entered an outpatient clinic in Copenhagen during 1954–87; average follow-up, 12.9 years for men and 9.4 years for women	Cases identified by record linkage with the Danish Cancer Registry (95% complete)	All cancers	1623 deaths	1.6 (1.5–1.7)		Most subjects consumed about 200 g alcohol daily; cancer morbidity compared with total Danish population
			Kidney cancer				
			Men	42	1.4 (1.0–1.9)		
			Women	4	1.7 (0.5–4.4)		
			Total		1.4 (1.0–1.9)		

Table 2.78 (continued)

Reference, location, name of study	Cohort description	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Sigvardsson <i>et al.</i> (1996), Sweden, Cohort of Alcoholic Women	15 508 alcoholic women identified from the Temperance Board records; comparison group of 15 508 women individually matched on day of birth, region; follow-up, [1947–77]; case ascertainment, Swedish Cancer Registry	Identified through Cancer Registry (ICD-7)	Alcoholics	20	1.2 (0.6–2.3)	Age, region	Estimates not adjusted for smoking

Table 2.78 (continued)

Reference, location, name of study	Cohort description	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Sørensen <i>et al.</i> (1998), Denmark, Cohort of 1-year Survivors of Cirrhosis	11 605 1-year survivors of cirrhosis identified from Danish National Registry of patients that covered all hospital admissions in Denmark; follow-up, 1977–93; 7165 alcoholic cirrhosis (5079 men, 2086 men); case ascertainment, Danish Cancer Registry (100%)	Identified by linkage with Danish Cancer Registry (almost complete average of country); reports from pathology department and autopsy	Alcoholic cirrhosis	Total Men Women	SIR 2.2 (1.6–3.0) 2.1 ($p>0.05$) 2.5 ($p>0.05$)	Age, sex, calendar period	Estimate not adjusted for smoking; reference, national incidence rates

CI, confidence interval; ICD, International Classification of Diseases; SIR, standardized incidence ratio

2.16.2 Case-control studies (Table 2.80)

The 21 case-control studies generally showed no or inverse associations (some of which were statistically significant), and no significantly positive associations. Four relatively recent, large case-control studies of renal-cell cancer are particularly informative. A multicentre case-control study conducted in Australia, Denmark, Sweden and the USA is notable because of the large number of cases (1185 of renal-cell cancer) and the detailed data collected on potentially confounding factors (Wolk *et al.*, 1996). The relative risk in men for consumption of ≥ 15 drinks per week was 1.0 (95% CI, 0.70–1.4) and that in women for consumption of ≥ 10 drinks per week was 0.5 (95% CI, 0.3–0.8). In a large Italian case-control study of 348 cases, the relative risk was 0.8 (95% CI, 0.5–1.3) for six or more drinks per day (Pelucchi *et al.*, 2002b) and, in a large case-control study from Canada conducted by mailed questionnaire (1279 cases), the relative risks for 18 or more servings of alcoholic beverage per week were 0.7 (95% CI, 0.5–0.9) for men and 0.6 (95% CI, 0.4–1.1) for women with significant inverse trends in both sexes (Hu *et al.*, 2003). A multicentre hospital-based case-control study in eastern Europe (1065 cases) calculated average lifetime alcoholic beverage consumption (Hsu *et al.*, 2007); the relative risk for those who drank more than 137.5 g alcohol per week was 0.83 (95% CI, 0.61–1.12) and that for the top decile of intake was 0.39 (95% CI, 0.24–0.66).

All the large case-control studies and the pooled analysis of cohort studies were limited to renal-cell carcinomas. No studies of alcoholic beverage consumption in relation to cancer of the renal pelvis were identified.

2.16.3 Evidence of a dose-response

The best available evidence on dose-response comes from the pooled analysis of cohort studies (Lee *et al.*, 2007). Relative risks were 0.97 (95% CI, 0.85–1.11) for 0.1–4.9 g/day, 0.82 (95% CI, 0.69–0.96) for 5.0–14.9 g/day and 0.72 (95% CI, 0.60–0.86) for 15 or more g/day (p for trend < 0.001). A non-parametric regression curve was fit to the continuous data from these studies, and significant departure from linearity was suggested ($P=0.02$) with flattening of the curve above approximately 30 g/day.

The participating cohort studies had validated data for alcoholic beverage consumption; therefore, regression calibration was used to correct the observed associations for measurement error in alcoholic beverage intake, and limited this correction to the range of 0–30 g/day (94% of the data) because the relation appeared to be close to linear within this range. The uncorrected relative risk was 0.79 (95% CI, 0.70–0.89) for a 10-g/day increment within this range; after correction for measurement error, the relative risk was 0.81 (95% CI, 0.74–0.90).

The large case-control studies all found relative risks of 1.0 or below for the highest category of alcoholic beverage consumption and were generally consistent with

Table 2.79 Cohort studies of alcoholic beverage consumption and cancer of the kidney in the general population

Reference, location, name of study	Cohort description	Exposure assessment	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Nicodemus <i>et al.</i> (2004), USA, Iowa Women's Health Study Cohort [included in Lee <i>et al.</i> (2007)]	99 826 randomly selected women, aged 55–69 years, from Iowa driver's licence list, sent a questionnaire in January 1986; 41 836 (42%) women responded, 34 637 (98% white) included; follow-up, 15 years	Questionnaire on lifestyle, medical history, reproductive history, food intake, drinking habits, physical activity	Incident primary renal-cell carcinoma ascertained via the State Health Registry of Iowa; all cases histologically confirmed (ICD-9, 189.0)	<i>Alcohol intake (g/day)</i>	117 cases		Age, physical activity, high blood pressure, diuretic use, insulin use, hormone replacement therapy, regularity of menstrual cycles, parity	
				0	79	1.0		
				0.1–2.9	31	1.0 (0.7–1.6)		
				≥3	14	0.4 (0.2–0.8)		
				<i>Beer use</i>				
				No	110	1.0		
				Yes	14	0.6 (0.4–1.1)		
<i>Red wine</i>								
No	110	1.0						
Yes	14	0.5 (0.3–0.8)						
		<i>White wine</i>						
		No		No	106	1.0		
		Yes		Yes	18	0.6 (0.4–1.0)		

Table 2.79 (continued)

Reference, location, name of study	Cohort description	Exposure assessment	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Mahabir <i>et al.</i> (2005), Finland, 1985–99, Finnish Smokers Cohort Study [included in Lee <i>et al.</i> (2007)]	27 111 men in the α -Tocopherol, β -Carotene Cancer Prevention Study cohort for whom data on alcohol consumption and diet were available	Questionnaire: height, weight, blood pressure, medical history, food frequency during past year, alcohol intake	Incident cases identified via the Finnish Cancer Registry and confirmed with hospital records and reports from pathology; response rate, 93%	<i>Total alcohol (g/day) [median]</i>	195	<i>Multivariate-adjusted</i>	Age, body mass index, supplement group, calories (excluding alcohol sources), blood pressure, years of regular smoking, total number of cigarettes smoked per day, smoking inhalation, and fruits and vegetables	Alcohol use given in quartile groups, with 6774–6782 subjects per group
				0–2.5 [0.4]	56	1.0		
				2.6–11.0 [6.2]	52	0.91 (0.6–1.3)		
				11.1–24.0 [17.3]	53	0.94 (0.6–1.4)		
				24.1–278.5 [39.1]	34	0.53 (0.3–0.8)		
						<i>p</i> -trend=0.005		
				<i>Spirits (g alcohol/day) [median]</i>				
				0–0.4 [0]	62	1.0		
				0.5–5.3 [1.7]	42	0.9 (0.6–1.4)		
				5.4–15.9	56	0.8 (1.6–1.2)		
16.0–160 [22.8]	35	0.6 (0.4–0.9)						
		<i>p</i> -trend=0.02						
<i>Beer (g alcohol/day) [median]</i>								
0 [0]	65	1.0						
0.01–1.9 [1.2]	53	1.2 (0.9–1.8)						
2.0–7.4 [4.0]	45	0.8 (0.6–1.2)						
7.5–242.6 [14.8]	32	0.6 (0.4–0.9)						
		<i>p</i> -trend=0.002						

Table 2.79 (continued)

Reference, location, name of study	Cohort description	Exposure assessment	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Rashidkhani <i>et al.</i> (2005), Sweden, Swedish Mammography Cohort [included in Lee <i>et al.</i> (2007)]	66 561 Swedish women, aged 40–76 years, living in the counties of Västmanland and Uppsala, who responded to a questionnaire in 1987–90 (participation rate, 74%), with follow-up questions in 1997 (rate of response, 70%); average follow-up, 14.2 years	Questionnaire in 1997 on diet (67 food items) during past 6 months, alcohol and tobacco use, education, weight, height, history of hypertension, diabetes	Incident cases of renal-cell carcinoma (ICD-9, 189.0); recorded by matching with Regional Cancer Register, between the return of the questionnaire (1987–90) and 30/06/2004	<i>Alcohol intake (g/day)</i> <2.5 (median 1.1) 2.5–4.3 (median 3.3) >4.3 (median 6.0) <i>All alcoholic beverages (servings/week)</i> <1 ≥1 <i>Wine (servings/week)</i> <1 ≥1 <i>Beer* (servings/month)</i> <1 ≥1 <i>Hard liquor (servings/week)</i> <1 ≥1	132 cases 94 19 19 94 38 120 12 116 16 107 25	Rate ratio <i>All women</i> 1.0 0.66 (0.40–1.09) 0.7 (0.42–1.19) 1.0 0.6 (0.4–0.9) 1.0 0.6 (0.3–1.1) 1.0 0.7 (0.4–1.2) 1.0 0.8 (0.5–1.3)	Age, body mass index	* Includes strong (4.5%) and medium-strong (2.8%) but not light beer

Table 2.79 (continued)

Reference, location, name of study	Cohort description	Exposure assessment	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Rashidkhani et al. (2005) (contd)				<i>Alcohol intake (g/day)</i>			<i>Aged ≥55 years</i>	
				<2.5 (median 1.1)	65	1.0		
				2.5–4.3 (median 3.3)	10	0.8 (0.4–1.5)		
				>4.3 (median 6.0)	3	0.3 (0.1–1.1)		
				<i>All alcoholic beverages (servings/week)</i>				
				<1	69	1.0		
				≥1	9	0.44 (0.22–0.88)		
				<i>Wine (servings/week)</i>				
				<1	76	1.0		
				≥1	2	0.23 (0.06–0.95)		
				<i>Beer* (servings/month)</i>				
				<1	73	1.0		
≥1	5	0.7 (0.3–1.6)						
<i>Hard liquor (servings/week)</i>								
<1	71	1.0						
≥1	7	0.48 (0.22–1.04)						

Table 2.79 (continued)

Reference, location, name of study	Cohort description	Exposure assessment	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Lee <i>et al.</i> (2006), USA, Nurses' Health Study (NHS) and Health Professionals Follow-up Study (HPFS) [included in Lee <i>et al.</i> (2007)]	NHS: 121 700 female registered nurses, aged 30–55 years, returning a mailed questionnaire in 1976; HPFS: 51 529 health professionals (all men), aged 40–75 years, responding to a mailed questionnaire in 1986; follow-up of 88 759 women (NHS) from 1980, 47 828 men (HPFS) from 1986 with follow-up rate >90%; follow-up ended in 2000, on 31/05 for NHS, on 31/01 for HPFS	Semiquantitative food-frequency questionnaires sent in 1980 and 1984 to NHS participants, and in 1986 and every 4 years after to both cohorts; questions on extent and frequency of alcohol use and total intake of fluids (including water)	Renal-cell carcinoma self-reported and then verified by histological data	NHS	132 cases	Pooled multivariate	NHS: body mass index, history of hypertension (yes/no), history of diabetes (yes/no), parity, smoking status, total energy intake; HPFS: body mass index, history of hypertension (yes/no), smoking status, multi-vitamin use, total energy intake *Additionally adjusted for the two other alcoholic beverages	Alcohol use divided into quartile groups
				HPFS	116 cases			
				<i>Total alcohol (g/day)</i>	58	1.0		
				0	88	1.0 (0.7–1.3)		
				0.1–4.9	61	0.9 (0.5–1.6)		
				5.0–14.9	41	0.7 (0.4–1.0)		
				≥15		<i>p</i> -trend=0.07		
				<i>Beer</i>				
				No beer	164	1.0*		
				Beer drinkers	82	0.7* (0.4–1.2)		
				<i>Wine (servings)</i>				
<1/month	93	1.0*						
1/month–<2/week	96	1.2* (0.9–1.6)						
≥2/week	59	1.1* (0.7–1.8)						
<i>Liquor (servings)</i>								
<1/month	129	1.0*						
1/month–<2/week	58	0.9* (0.7–1.2)						
≥2/week	60	0.9 (0.6–1.2)						

Table 2.79 (continued)

Reference, location, name of study	Cohort description	Exposure assessment	Case definition (ICD code)	Exposure categories	No. of cases/deaths	Relative risk (95% CI)	Adjustment factors	Comments
Lee <i>et al.</i> (2007), Pooled analysis including 12 cohorts; includes four previously published studies (Nicodemus <i>et al.</i> , 2004; Mahabir <i>et al.</i> , 2005; Rashidkhani <i>et al.</i> , 2005; Lee <i>et al.</i> , 2006)	530 469 women and 229 575 men with maximum follow-up of 7–20 years	Self-administered questionnaires	Cases ascertained by follow-up questionnaires and subsequent review of medical records, linkage to cancer registries, or both; histologically confirmed renal-cell cancer (ICD-0-2, C64.9); 61% renal-cell carcinoma, not otherwise specified (code 8312)	<i>Total alcohol (g/day)</i>	1430 cases (711 women, 719 men)	1.0 0.97 (0.85–1.11) 0.82 (0.69–0.96) 0.72 (0.60–0.86) <i>p</i> -trend<0.001	Age, hypertension, body mass index, smoking, parity, age at first birth, energy intake	Relative risks similar for men and women with significant inverse trends in both sexes
				0		1.0		
				0.1–4.9		0.98 (0.85–1.12)		
				5.0–14.9		0.87 (0.68–1.11)		
				≥15		1.0		
				<i>Beer(g/day)</i>		0.93 (0.79–1.08)		
				0		0.72 (0.59–0.87)		
				1.0–4.9		1.0		
				≥5.0		1.02 (0.88–1.17)		
				<i>Wine(g/day)</i>		0.88 (0.75–1.03)		
0								
1.0–4.9								
≥5.0								
<i>Liquor(g/day)</i>								
0								
1.0–4.9								
≥5.0								

CI, confidence interval; ICD, International Classification of Diseases

Table 2.80 Case-control studies of alcoholic beverage consumption and cancer of the kidney

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Schwartz <i>et al.</i> (1962), France, 1954–58	69 cases of renal cell cancer	69 accident victims); age-matched in 5-year age groups	Interviewed in the hospital on alcohol drinking	Cases, 10.8 cL/day Controls, 12.6 cL/day	NR			Average consumption according to age (5-year age groups) varied from 9.6 to 14.0 cL pure alcohol/day
Williams & Horm (1977), USA, Third National Cancer Survey, 1969–71	101 kidney cancer cases (53 men, 48 women) among 7518 cancer patients		Interviewed to collect data on the amount and the duration of alcohol and tobacco use	<i>Men</i>	11	1.07	Age, race, smoking	Oz-years = units/week × years drinking
				<50 oz-years	14	0.76		
				>50 oz-years				
				<i>Women</i>	6	0.80		
				<50 oz-years	3	0.76		
				>50 oz-years				

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Goodman <i>et al.</i> (1986), USA, 1977–83	267 patients (189 men, 78 women) with newly diagnosed primary adenocarcinoma of the kidney in 18 hospitals in 6 cities, aged 20–80 years; 100% histologically confirmed; refusal rate, 11%	267 patients (189 men, 78 women) with diseases not tobacco-/obesity-related, diagnosed and interviewed ≤ 1 year after the case interview; matched 1:1 on age, sex, race, hospital, time of admission; refusal rate, 12%	Standardized interview on medical history, life-style drinking/smoking habits, demographic information, job history, leisure time and worksite energy expenditure	Men and women				* Alcohol score: years of drinking \times average daily consumption (in alcohol equivalents)
				<i>Alcohol use</i>				
				Never	65	1.0		
				Ever	193	0.6 (0.4–1.0)		
				<i>Alcohol score*</i>				
				1–9	60	0.5 (0.3–0.8)		
				10	69	0.9 (0.5–1.7)		
				<i>Beer</i>				
				Never	134	1.0		
				Ever	133	0.8 (0.5–1.1)		
				<i>Wine</i>				
				Never	129	1.0		
				Ever	138	0.7 (0.5–0.96)		
				<i>Hard liquor</i>				
Never	122	1.0						
Ever	144	0.7 (0.5–1.01)						
Men only								
<i>Former use of beer</i>								
Never	89	1.0						
1–3 years	8	0.3 (0.0–1.1)						
>4 years	5	0.2 (0.0–0.5)						
Yu <i>et al.</i> (1986), USA	6 renal-cell carcinoma; aged <55 years; 100% histologically confirmed	160 population-based; matched by age, sex	Personal interviews using questionnaire					Cases and controls did not differ significantly by consumption of alcoholic beverages (no data given)

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments		
Asal <i>et al.</i> (1988), USA, 1981–84	315 (209 men, 106 women; 34 non-white) incident renal-cell carcinomas in 29 Oklahoma hospitals; 300 histologically confirmed, 15 radiologically confirmed	313 (208 men, 105 women) patients; psychiatric illnesses or kidney disease excluded; 12% had cancer; matched by age (within 5 years), sex, race, hospital, time of interview; 336 (195 men, 141 women) selected by random-digit dialling from the Oklahoma population; frequency-matched by age (within 10 years), sex	Interviews in hospital, at home or at work on medication, medical history, radiation therapy, main occupation, tobacco/alcohol use, height and weight, family history of disease	Wine (glass/week)						
				<i>Ever</i>						
				Men	85	0.5 (0.4–0.8)	Age, weight, smoking	One alcohol unit = 1 oz (28.4 g) hard liquor, 4 oz (113 g) wine, 8 oz (227 g) beer; ‘ever’ drinkers included subjects who drank unknown amounts (6 cases, 3 controls)		
				Women	30	0.5 (0.3–0.9)	Age, weight			
				<i>Men</i>						
				Never	124	1.0				
				<1	48	0.4 (0.3–0.7)				
				1–4	15	0.7 (0.3–1.9)				
				>4	16	0.7 (0.3–1.6)				
				<i>Women</i>						
Brownson (1988), USA, 1984–86	326 (205 men, 121 women; all white) Missouri residents with primary adenocarcinoma of the kidney, identified via the Missouri Cancer Registry, aged ≥20 years; 100% histologically confirmed	978 (615 men, 363 women) patients in the Registry with cancers of the small intestine colon, rectum, prostate, skin, nervous, reticulo-endothelial and haematopoietic systems and lymph nodes	Information on smoking, alcohol use, job history recorded at the time of diagnosis	<i>Men</i>	NR					
				Never drank		1.0	Age, smoking			
				Ever drank		0.9 (0.6–1.3)	Age, smoking, sex			
				Unknown		1.1 (0.6–2.1)				
				<i>Women</i>						
				Never drank		1.0				
				Ever drank		1.1 (0.6–2.0)				
				Unknown		0.8 (0.3–2.0)				
				<i>Both sexes</i>						
				Never drank		1.0				
Ever drank		1.0 (0.7–1.4)								
Unknown		1.0 (0.6–1.7)								

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Kadamani <i>et al.</i> (1989), USA, 1981–83	210 (142 men, 68 women; 90% white) newly diagnosed renal-cell carcinomas in 23 Oklahoma hospitals, aged ≥ 20 years; 197 histologically confirmed, 13 radiologically confirmed	210 (142 men, 68 women) selected by random-digit dialling from the Oklahoma population; frequency-matched by age (within 5 years), sex; refusal rate, 45%	Interviews on demographics, job history, use of tobacco/alcohol; exposure to hydrocarbons (HC) estimated from job history by industrial hygienists	No HC exposure	NR	Odds ratio	Men: weight, education; women: weight	No CIs given; this study focused primarily on effects of occupational exposure to hydrocarbons on the risk for renal-cell carcinoma.
				<i>Never wine use</i>		<i>Men (women)</i>		
				<i>Ever wine use</i>		1.0 (1.0)		
				Low HC exposure		1.3 (0.8)		
				<i>Never wine use</i>		2.3 (0.5)		
				<i>Ever wine use</i>		0.56 (1.00)		
Maclure & Willett (1990), Massachusetts, USA	203 incident renal adenocarcinomas diagnosed in 37 hospitals in the Boston area, aged ≥ 30 years; 100% histologically confirmed	605 neighbourhood controls; not matched	Questionnaire administered by interviewer on diet, medication, smoking and alcohol, occupational history, physical activity	<i>Wine</i>			Age, sex, drinking	
				Low		1.0		
				Moderate		0.7 (0.4–1.2)		
				High		1.0 (0.3–3.0)		
				<i>Beer</i>				
				Low		1.0		
				Moderate		1.1 (0.7–1.7)		
				High		1.4 (0.8–2.5)		
				<i>Spirits</i>				
				Low		1.0		
Moderate		1.1 (0.7–1.6)						
High		1.1 (0.6–1.9)						

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Talamini <i>et al.</i> (1990b), Italy, 1986–89	240 (150 men, 90 women) renal-cell cancers in hospitals in northern Italy (Veneto, Pordenone, Milan area), aged 20–74 years; 100% histologically confirmed; renal pelvis cancers excluded; refusal rate for interview, 3%	665 (445 men, 220 women) patients in the same hospitals for acute conditions not related to alcohol, tobacco or hormones; matched 3:1 on sex, age (\pm 5 years), area of residence; refusal rate, 4%	Interviews on lifestyle, occupation, medical history (urologic, hormone-related, infectious diseases), socio-demographic factors, smoking, alcohol drinking	<i>Highest category of intake per day:</i> Alcohol, \geq 100 g Wine, \geq 4 drinks Beer, \geq 1 drink Spirits, \geq 1 drink	18 98 53 77	0.7 (0.4–1.3) 0.9 (0.6–1.3) 1.0 (0.7–1.5) 1.2 (0.8–1.7)	Age, sex, education, body mass index, area of residence	
Benhamou <i>et al.</i> (1993), France, 1987–91	196 (138 men, 58 women) renal-cell cancers in 10 French hospitals; mean age, 61.7 and 61.3 years, respectively; 100% histologically confirmed after nephrectomy; refusal rate, 0.5%	347 (235 men, 112 women) hospital patients; mean age, 62.8 and 62.5 years; matched on sex, age at interview (within 5 years), hospital, interviewer; 107 men and 54 women had non-alcohol-related malignancies; refusal rate, 0.5%	Questionnaire and interview on smoking, use of alcohol, coffee drinking, height, weight.	Men Women	NR	0.9 (0.5–1.6) 1.1 (0.5–2.1)		Exposure categories not defined; no trend in association of daily consumption of alcoholic beverages with cancer

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments	
Kreiger <i>et al.</i> (1993), Canada, 1986–87	513 (312 men, 201 women) newly diagnosed renal-cell carcinomas resident in the province of Ontario, aged 25–69 years; 100% histologically confirmed; response rate, 81%	1369 (664 men, 705 women) selected from the 1986–87 Enumeration Composite Records of the Ministry of Revenue; matched 1:1 (men) or 2:1 (women) on age, sex, place of residence; response rate, 72%	Questionnaire on diet habits, socio-demographic data, smoking habits, medical history, job exposures and history, diuretic or analgesic use, hormonal and reproductive information (women only)	Alcohol intake			Age, active cigarette smoking, Quetelet index (combined for two time points: at 25 years of age, and at 5 years prior to the study)	*High = top 10% of the distribution	
				<i>Men</i>	None	43			1.0
				Moderate	173	0.9 (0.6–1.3)			
				High*	36	1.3 (0.7–2.4)			
				<i>Women</i>	None	65			1.0
				Moderate	84	0.7 (0.5–1.0)			
High*	18	0.7 (0.4–1.4)							
Mellempgaard <i>et al.</i> (1994), Denmark, 1989–91	368 (226 men, 142 women) renal-cell carcinomas of 482 diagnosed, born and living in Denmark, identified via the Danish Cancer Registry, aged 20–79 years; 100% histologically confirmed; refusal rate, 6.8%	396 (237 men, 159 women) of 500 identified from Central Population Register via the personal identification number, born and living in Denmark, aged 20–79 years; refusal rate, 14.4%	Questionnaire on education, jobs, height, weight, medical history, family history of cancer, smoking, alcohol use and diet; data recorded for the period ≥ 1 year prior to interview	Weekly intake			Age, socioeconomic status, body mass index, cigarette pack-years		
				<i>Men</i>	Not regularly	43		1.0	
				<75 mL	68	1.0 (0.6–1.8)			
				75–300 mL	68	0.8 (0.5–1.5)			
				>300 mL	45	0.8 (0.4–1.6)			
				<i>Women</i>	Not regularly	89		1.0	
				<40 mL	31	1.0 (0.5–1.8)			
				40–100 mL	12	0.5 (0.2–1.2)			
				>100 mL	9	0.4 (0.2–0.9)			

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments			
Muscat <i>et al.</i> (1995), USA, 1977–93	788 (543 men, 245 women; >90% white) newly diagnosed renal-cell cancers in 7 hospitals; 100% histologically confirmed; mean age, 58.7 years for men, 59.3 years for women	779 (529 men, 250 women; >90% white) patients hospitalized for non-tobacco-related conditions: 52% histologically confirmed cancers (excluding kidney, lung, upper aerodigestive tract, stomach, bladder and pancreas), 7% benign prostatic hypertrophy; excluding emphysema, hepatitis, cirrhosis, bronchitis, stroke and heart disease patients; frequency-matched by age (\pm 5 years), race, year of diagnosis	Interview with questionnaire on demographics, tobacco/alcohol consumption, medical history, occupational exposures	<i>Wine (oz/day)*</i>							
				Never/occasionally	510	1.0	Age, education, years of smoking	*Alcohol intake expressed in oz of whisky equivalents: 8 oz beer = 4 oz wine = 1 oz hard liquor			
				1–<4	27	0.9 (0.5–1.7)					
				>4	6	0.9 (0.8–1.0)					
				<i>Beer (oz/day)</i>							
				Never/occasionally	409	1.0					
				1–<4	87	0.9 (0.6–1.2)					
				4–7	19	0.8 (0.4–1.5)					
				>7	27	1.1 (0.6–2.0)					
				<i>Hard liquor (oz/day)</i>							
				Never/occasionally	428	1.0					
				1–<4	73	1.0 (0.7–1.4)					
				4–7	22	1.9 (0.9–4.3)					
>7	20	0.6 (0.3–1.1)									
<i>Wine (oz/day)</i>											
Never/occasionally	219	1.0									
1–<4	23	1.2 (0.6–2.3)									
<i>Beer (oz/day)</i>											
Never/occasionally	237	1.0									
1–<4	8	0.6 (0.2–1.4)									
<i>Hard liquor (oz/day)</i>											
Never/occasionally	227	1.0									
1–<4	18	1.1 (0.6–2.2)									

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Wolk <i>et al.</i> (1996), multi-centre, Australia, Denmark, Sweden, USA, 1989–91	1185 incident renal-cell adenocarcinomas newly diagnosed identified in cancer registries in Sidney, Denmark, Uppsala and Minnesota; mean age, 62 years (men), 63 years (women); 100% histologically confirmed	1526 selected from population registers (Denmark, Uppsala, electoral rolls (Sidney), Health Care beneficiary lists (Minnesota, 65–79-year age group) or by random-digit dialling (Minnesota, 20–64-year age group) chosen from the same area as cases; mean age, 62 years (men), 63 years (women); frequency-matched on sex, 5-year age group	Personal interview on use of tobacco, diuretics, analgesics, diet pills, anti-hypertension drugs, hormones and alcohol, height, weight, physical activity, reproductive and medical history, family history of cancer, job history; dietary intake assessed in a questionnaire (part of interview in Uppsala)	Total alcohol (drinks/week)	NR		Age, sex, study centre, body-mass index, smoking, total calories	* Sweden not included due to lack of data on specific alcoholic beverages; data for beer, port/sherry and spirit included
				<i>Men</i>	<1	1.0		
				1–3	1.1 (0.8–1.5)			
				4–7	1.0 (0.7–1.3)			
				8–14	0.9 (0.6–1.3)			
				≥15	1.0 (0.7–1.4)			
				<i>Women</i>	<1	1.0		
				1–2	0.8 (0.5–1.4)			
				2–4	0.6 (0.4–0.9)			
				5–9	0.5 (0.3–0.9)			
				≥10	0.5 (0.3–0.8)			
				Wine (glass/week)*				
				<i>Men</i>	0	1.0		
				<0.5	0.7 (0.5–1.2)			
0.5–0.6	0.8 (0.6–1.1)							
0.7–1.2	0.5 (0.3–1.0)							
≥1.3	0.8 (0.5–1.3)							
<i>Women</i>	0	1.0						
<0.5	0.5 (0.3–0.8)							
0.5–0.6	0.7 (0.5–1.1)							
0.7–2.9	0.3 (0.1–0.6)							
≥3.0	0.2 (0.1–0.4)							

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Lindblad <i>et al.</i> (1997), Sweden, 1989–91	379 of 542 eligible newly diagnosed renal-cell cancers among individuals born in Sweden and residing in any of eight counties in central Sweden between 1/6/89 and 31/12/91, identified via Regional Cancer Registries, aged, 20–79 years; mean age, 63.6 years (men), 64.4 years (women); 100% histologically confirmed; refusal rate, 12%	353 of 493 selected from the register of the same population; mean age, 62.7 years (men), 63.4 years (women); frequency-matched by sex, age (within 5 years); refusal rate, 26%	Interview with questionnaire on usual diet (63 items) prior to 1987, alcohol use, demographics, height, weight, physical activity, medical history, reproductive history, occupation and smoking; specific data collected on dietary habits 20 years ago	<i>Alcohol intake (g/day)*</i> <0.23 0.23 1.60 2.75	84 117 90 87	1.0 1.4 (0.8–2.3) 1.1 (0.6–2.0) 1.0 (0.6–1.7)	Age, sex, body mass index, smoking, level of education, total energy intake	*Alcohol intake defined in quartiles

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Mattioli <i>et al.</i> (2002), Italy, 1986–94	219 renal-cell carcinomas, registered in 1987–94 at the University Hospital of Bologna; 100% histologically confirmed; response rate, 67.6%	219 patients in the same hospital, admitted in 1991 with any disease but renal-cell carcinoma; matched on sex, age (within 5 years), birthplace, residence area; response rate, 67.6%	Questionnaire interview by telephone on height, weight, lifelong use of tobacco, alcohol, coffee and meat; job history	Alcohol intake (g/day)			Age, gender, birthplace, residence	
				<i>Men</i>				
				0	22	1.0		
				1–12	43	4.0 (1.1–14.8)		
				13–24	56	3.4 (1.1–10.3)		
				25–36	19	7.3 (1.2–44.6)		
				37–48	9	0.5 (0.1–2.5)		
				>48	16	1.0 (0.3–4.0)		
<i>Women</i>								
0	20	1.0						
1–12	17	2.2 (0.3–16.1)						
>12	15	4.2 (0.3–53.5)						

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Parker <i>et al.</i> (2002), Iowa, USA	406 of 463 (261 men, 145 women) residents of Iowa with incident renal-cell carcinoma identified via the Iowa Cancer Registry, aged 40–85 years; 100% histo-logically confirmed; response rate, 88%	2429 controls (1598 men, 831 women); aged <65 years selected from Iowa driver's licence records; aged ≥65 years randomly selected from listings of Health Care Financing; matched by sex, 5-year age group; those with a history of cancer excluded; response rates, 82% (<65 years) and 79% (≥65 years)	Mailed questionnaire followed by telephone inter-view on demo-graphics, height and weight at various times in life, smoking history and status, medical history, job history, physical activity, family history of cancer; usual use of alcohol over all adult years ascertained in a food-frequency questionnaire	<i>Alcohol intake</i>		<i>Men</i>		Men: age, pack-years of smoking, family history of kidney cancer, history of hypertension, history of bladder infection, exercise, intake of red meat and fruit; women: age, pack-years of smoking, family history of kidney cancer, body mass index, history of hypertension, intake of red meat, vegetables and fruit
				Never	98	1.0		
				Ever	163	1.0 (0.7–1.5)		
				<i>Servings/week</i>				
				0	98	1.0		
				≤3	80	1.2 (0.8–1.8)		
				>3	83	0.9 (0.6–1.3)		
				<i>Ethanol (g/week)</i>				
				0	98	1.0		
				≤35	77	1.3 (0.9–1.9)		
				>35	86	0.9 (0.6–1.3)		
				<i>Wine (units/week)</i>				
				0	197	1.0		
				≤0.5	32	0.8 (0.5–1.3)		
>0.5	32	1.2 (0.7–2.0)						
<i>Beer (units/week)</i>								
0	127	1.0						
≤1	56	1.4 (0.9–2.0)						
>1	78	1.0 (0.7–1.4)						
<i>Liquor (units/week)</i>								
0	153	1.0						
≤1	57	1.4 (1.0–2.1)						
>1	51	1.1 (0.7–1.6)						

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Parker <i>et al.</i> (2002) (contd)				<i>Alcohol intake</i>		<i>Women</i>		
				Never	93	1.0		
				Ever	52	0.8 (0.5–1.2)		
				<i>Servings/week</i>				
				0	93	1.0		
				≤3	43	1.0 (0.6–1.5)		
				>3	9	0.4 (0.2–1.0)		
							<i>p</i> for trend 0.04	
				<i>Ethanol (g/week)</i>				
				0	93	1.0		
≤35	41	1.0 (0.6–1.5)						
>35	11	0.4 (0.2–0.9)						
			<i>p</i> for trend 0.04					
Pelucchi <i>et al.</i> (2002b), Italy, 1985–92	348 (236 men, 112 women) renal-cell cancers in general hospitals and university clinics in Milan and the Pordenone province, aged 25–77 years (median, 60 years); 100% histologically confirmed; refusal rate for interview, 4%	1048 (753 men, 295 women) patients admitted to the same hospitals and clinics for acute, non-neoplastic, non-urolological and non-genital problems, aged 23–79 years (median, 60 years); refusal rate for interview, 4%	Questionnaire on personal characteristics, socio-demographic and lifestyle details (smoking, coffee drinking), intake of selected food items, medical history, alcohol intake	<i>Alcohol (drinks/day)</i>			Age, sex, study centre, education, body mass index, history of bladder infection, cigarette smoking, intake of vegetables, meat and fruit	Among women, 69% of the cases and 72% of the controls were drinkers; among men, these percentages were 88% and 91%, respectively.
				Never	64	1.0		
				Ever	284	0.8 (0.6–1.2)		
				<3	101	0.8 (0.5–1.1)		
				3–5	98	1.0 (0.6–1.5)		
				≥6	85	0.8 (0.5–1.3)		
				<i>Duration (years)</i>				
				<30	53	0.5 (0.3–0.7)		
				≥30	229	1.0 (0.7–1.5)		
				<i>Wine (drinks/day)</i>				
				0	68	1.0		
				<3	109	0.9 (0.6–1.3)		
				3–5	105	0.9 (0.6–1.4)		
				≥6	66	0.9 (0.6–1.5)		
<i>Beer</i>								
Never	270	1.0						
Ever	99	1.0 (0.7–1.4)						
<i>Spirits</i>								
Never	249	1.0						
Ever	99	1.1 (0.8–1.4)						

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments			
Hu <i>et al.</i> (2003), Canada, 1994–97	1279 (691 men, 588 women) incident renal-cell cancers in 8 provinces; 100% histologically confirmed; response rate, 79.9% of those contacted	5370 population, age-stratified; response rate, 71.3% of those contacted	Mailed questionnaire on socio-economic status, job history, residential history, height, weight, smoking history, physical activity, alcohol use, dietary history, food-frequency questionnaire	<i>Alcohol (servings/week)</i>				Age, province, education, smoking (not body mass index)			
				Never	217	1.0	<i>Men</i>				
				1–6	253	0.8 (0.6–1.0)					
				7–17	116	0.7 (0.5–0.9)					
				≥18	104	0.7 (0.5–0.9)	<i>p</i> -trend=0.006				
											<i>Women</i>
				Never	342	1.0					
				1–6	191	0.7 (0.6–0.9)					
				7–17	36	0.6 (0.4–0.8)					
				≥18	19	0.6 (0.4–1.1)	<i>p</i> -trend=0.0003				

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Bravi <i>et al.</i> (2007), Italy, 1992–2004	767 (494 men, 273 women) renal-cell carcinomas admitted to major hospitals, aged 24–79 years; median age, 62 years; 100% histologically confirmed; cancers of renal pelvis and ureter not included; refusal rate, <5%	1534 (988 men, 546 women) patients admitted to the same hospitals for acute non-neoplastic conditions, aged 22–79 years; (median age, 62 years; matched 2:1 by study centre, sex, age (5-year groups); refusal rate, <5%	Hospital-based interview with questionnaire on anthropometric measures, socio-demographic and lifestyle details, use of alcohol, tobacco, coffee, medical history, family history of cancer in first-degree relatives; food-frequency questionnaire on 78 items	<i>Drinks per week</i> Never <21 ≥21 Former drinkers*	131 361 212 63	1.0 0.88 0.80 0.97	None	*Former drinkers had not had a drink for ≥1 year

Table 2.80 (continued)

Reference, study location, period	Characteristics of cases	Characteristics of controls	Exposure assessment	Exposure categories	No. of exposed cases	Relative risk (95% CI)	Adjustment factors	Comments
Hsu <i>et al.</i> (2007), multicentre, eastern Europe, 1999–2003	1065 newly diagnosed renal-cell cancers, aged, 20–79 years; 100% histologically confirmed; response rate, 90–98.6% across centres	1509 patients admitted to the same hospitals as cases with diagnoses unrelated to smoking or genitourinary disorders; frequency-matched on age, response rate, 90.3–96.1% across centres	In-person interview on usual weekly alcohol consumption during five periods of life; average lifetime consumption was calculated	<i>Intake (g/alcohol/week)</i>			Age, country, gender, tobacco use, education, body mass index, hypertension, medication, consumption of vegetables, white meat, red meat	Data for wine, beer and liquor separately also presented in article
				None	274	1.0		
				<36.5	310	1.18 (0.93–1.49)		
				36.5–137.5	290	1.15 (0.88–1.48)		
				137.5	191	0.83 (0.61–1.12)		
				Top decile of alcohol intake	27	0.39 (0.24–0.66)		

CI, confidence interval; NR, not reported

the results of the pooled analysis, although no formal meta-analysis of these studies is available.

2.16.4 *Type of alcohol*

In the Pooling Project of cohort studies (Lee *et al.*, 2007), inverse trends were seen for beer, wine and liquor, but only the trend for wine was statistically significant. However, the relative risks for different beverages did not differ significantly from each other.

The data from the case–control studies also did not provide clear evidence that the inverse association with kidney cancer was limited to a specific beverage.

2.16.5 *Interactions*

The associations between alcoholic beverage intake and kidney cancer did not vary appreciably by body mass index, history of hypertension, smoking status or age at diagnosis.