Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Ji et al. (2002), Shanghai, China	Cases were permanent Shanghai residents newly diagnosed at ages 30-74 years between 1990 and 1992. 1011 patients with colon cancer and 958 with rectal cancer were eligible. 931 patients with colon cancer (462 men, 469 women) and 874 with rectal cancer (463 men, 411 women); response rates of 92% and 91%.	1552 controls (851 men, 701 women) randomly selected from the general Shanghai population, frequency-matched to the expected age (+/- 5 years) and sex distributions of the cases; personal identification cards filed in the Shanghai Resident Registry were used to select controls.	*Men*				Adjusted for age, income and alcohol consumption (men only)
			Former smokers	0.9 (0.6-1.3)	1.1 (0.7-1.6)		
			Current smokers	0.8 (0.6-1.0)	0.9 (0.7-1.2)		
			Cigarettes smoked/d				
			1-9	0.7 (0.4-1.0)	0.8 (0.6-1.3)		
			10-19	0.9 (0.7-1.3)	0.9 (0.6-1.3)		
			20-29	0.8 (0.6-1.1)	0.9 (0.7-1.3)		
			30+	0.8 (0.5-1.3)	1.3 (0.8-2.1)		
			p for trend	0.17	0.68		
			Age started smoking				
			<20	0.8 (0.5-1.1)	0.9 (0.7-1.3)		
			20-29	0.8 (0.6-1.1)	1.0 (0.8-1.4)		
			30+	0.8 (0.6-1.1)	0.8 (0.5-1.1)		
			p for trend	0.17	0.44		
			Duration (years)				
			0.5-19	0.6 (0.4-0.9)	0.5 (0.3-0.8)		
			20-29	0.8 (0.6-1.2)	0.8 (0.6-1.2)		
			30-39	0.8 (0.6-1.2)	1.1 (0.8-1.6)		
			40+	0.9 (0.6-1.3)	1.2 (0.9-1.7)		
			p for trend	0.44	0.17		
			Pack-years				
			<15	0.8 (0.6-1.2)	0.7 (0.5-1.1)		
			15-34	0.7 (0.5-1.0)	0.9 (0.6-1.2)		
			35-54	1.0 (0.7-1.4)	1.2 (0.8-1.7)		
			55+	0.6 (0.4-1.2)	1.5 (0.9-2.5)		
			p for trend	0.19	0.17		
			Women				
			Former smokers	0.6 (0.3-1.5)	1.4 (0.7-3.0)		
			Current smokers	0.6 (0.4-1.0)	0.9 (0.5-1.3)		
			Cigarettes smoked/d				
			1-9	0.4 (0.2-0.8)	0.8 (0.5-1.4)		
			10-19	0.8 (0.4-1.5)	0.9 (0.4-1.7)		
			20-29	1.1 (0.5-2.5)	1.6 (0.8-3.5)		
			30+	0.28	0.65		
			p for trend				
			Age started smoking				
			<20	0.9 (0.4-1.9)	1.4 (0.7-2.9)		
			20-29	0.6 (0.3-0.9)	0.8 (0.5-1.3)		

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or p value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Ji et al. (2002), (contd)	Cases were permanent Shanghai residents newly diagnosed at ages 30-74 years between 1990 and 1992. 1011 patients with colon cancer and 958 with rectal cancer were eligible. 931 patients with colon cancer (462 men, 469 women) and 874 with rectal cancer (463 men, 411 women); response rates of 92% and 91%.		30+ p for trend *Duration (years)* 0.5-19 20-29 30-39 40+ p for trend *Pack-years* <15 15-34 35-54 55+ p for trend	0.02 0.8 (0.4-1.5) 0.4 (0.1-1.0) 0.5 (0.2-1.1) 0.9 (0.5-1.9) 0.13 0.5 (0.3-0.9) 0.8 (0.5-1.4) 0.10	0.58 0.8 (0.4-1.7) 1.0 (0.5-2.2) 0.8 (0.4-1.7) 1.3 (0.6-2.6) 0.63 0.7 (0.4-1.3) 1.2 (0.7-2.0) 0.78		Adjusted for age, income and alcohol consumption (men only)
Sharpe et al. (2002), Canada	Between 1979 and 1985 incident, histologically confirmed cancer cases at 21 sites occurring in males aged 35 to 70 years diagnosed at all the large hospitals in metropolitan Montreal were accrued. Data were obtained from 497 (91.9%) colon cancer cases and from 257 (84.5 percent) rectum cancer cases either ba face-to-face interviews of the patients or proxies.	Population controls were selected from electoral lists by random digit dialing (72% response). For the present analysis we used the data from the 500 interviewed controls who were between 35 and 70 years of age on the assigned date of pseudodiagnosis based on the year of the interview. A second cancer control group was	*Proximal colon* Never smoked daily Cigarettes only Cigars only *Distal colon* Never smoked daily Cigarettes only Cigars only *Rectum* Never smoked daily *Cigarettes only* Cigars only *Proximal colon Cigarette smoking* Never smoked cigarettes daily Smoked cigs daily <31.6 pack-years 31.6-54.3 pack yrs >54.3 pack-years p trend			1.0 1.1(0.7-1.9) 2.4(0.6-9.3) 1.0 0.6(0.4-1) 1.7(0.4-6.3) 1.0 1(0.7-1.6) 6.3(2.3-17.4) 1.0 1.1(0.7-1.9) 1(0.6-1.8) 1.3(0.8-2.2) 0.2	Adjusted for age, respondent status, ethnicity, family income, years of education, marital status, alcohol intake

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
	Analysis included 585 cases (176 cancers in the proximal colon, 179 cancers in the distal colon, and 230 rectal cancers)	selected from the pool of all other cancer cases in the overall study. Response rates were between 78 and 85%.	*Distal colon* *Cigarette smoking* Never smoked cigarettes daily Smoked cigs daily <31.6 pack-years 31.6-54.3 pack yrs >54.3 pack-years p trend *Rectum* *Cigarette smoking* Never smoked cigarettes daily Smoked cigs daily <31.6 pack-years 31.6-54.3 pack yrs >54.3 pack-years p trend			1.0 0.9(0.6-1.5) 0.8(0.5-1.4) 0.6(0.3-1) 0.1 1.0 1.1 (0.7-1.6) 1 (0.6-1.6) 0.9(0.5-1.4) 1	
Diergaarde et al. (2003), Netherlands	Population-based case-control study with 176 cases recruited between 1989 and 1993. Cases had to be newly diagnosed with histologically confirmed, first primary incident colon carcinoma. 60% agreed to participate. Colon tumor tissue could not be obtained from 18 cases due to administrative reasons.	249 controls were frequency-matched to the cases by age (5 year intervals), sex, region and degree of urbanization and were randomly recruited by the general practitioners of the cases. Response rate: 57%.	Ever smoked	1.0 (0.6-1.5)			

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Kim et al. (2003), Korea	Cases consisted of 125 patients operated with primary colorectal cancer.	247 community-based controls were recruited from visitors of the health-screening center of Ilsand Paik hospital. Controls had to be of the same age (+/- 5 years) and sex as cases. Response rate: 95%.	Current smokers			1.53 (0.94-2.52)	
Minami and Tateno (2003), Miyagi Prefecture, Japan	Hospital-based case-control study with 324 colon, and 164 rectal cancer cases admitted to a single hospital in Miyagi Prefecture from 1997 to 2001. 94.5% of colon cancer patients and 94,3% of rectum cancer patients agreed to participate.	2444 controls were selected from 2826 non-cancer patients aged 40 and over without a past history of cancer. Response rate: 91.5%.	*Men* Former smokers Current smokers *Women* Former smokers Current smokers	0.92 (0.59-1.42) 0.90 (0.60-1.35) 1.13 (0.38-3.38) 1.16 (0.60-2.23)	1.44 (0.76-2.73) 1.67 (0.93-3.00) 2.12 (0.61-7.34) 1.79 (0.82-3.93)		Adjusted for age, year of survey, alcohol consumption, family history of index cancer in parents and siblings, and occupation.
Slattery et al. (2003), Utah, USA	Population-based case-control study with 952 cases (559 men, 393 women). The participants were recruited from the Kaiser Permanente Medical Care Program of Northern California and the state of	1205 controls (673 men and 532 women) were matched to cases by sex and by 5-year age groups. Controls were randomly selected from membership lists, and in Utah, controls ≥65	*Men* Former smokers Current smokers *Age started smoking* ≤16 yrs 17-20 yrs >20 yrs *Years since stopping* ≥15yrs 5-14 yrs Current (<5 yrs)		1.2 (0.9-1.6) 1.5 (1.1-2.1) 1.2 (0.9-1.7) 1.5 (1.1-2.0) 1.1 (0.8-1.7) 1.2 (0.9-1.6) 1.1 (0.8-1.7) 1.5 (1.1-2.1)		Adjusted for age, physical activity level, alcohol intake, and body size (men only).

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Slattery et al. (2003), (contd)	Utah. Cases were eligible when diagnosed with a first primary tumor in the rectosigmoid junction or rectum in the age of 30 to 79 years between 1997 and 2001. Case eligibility was determined by the Surveillance Epidemiology and End Results Cancer Registries in Northern California and Utah. Trained and certified interviewers collected data. 62.5% of cases agreed to participate.	years were randomly selected from Health Care Financing administration lists, controls <65 years were randomly selected from driver's license lists. Response rate: 65.3%.	*Pack-years*				Adjusted for age, physical activity level, alcohol intake, and body size (men only).
			≤20 yrs		1.0 (0.7-1.3)		
			>20 yrs		1.7 (1.3-2.3)		
			Cigarettes/d				
			<20		1.3 (1.01-1.7)		
			≥20		1.3 (0.9-1.8)		
			Women				
			Former smokers		1.0 (0.7-1.5)		
			Current smokers		1.0 (0.7-1.5)		
			Age started smoking				
			≤16 yrs		1.1 (0.7-1.7)		
			17-20 yrs		1.1 (0.7-1.6)		
			>20 yrs		1.0 (0.6-1.5)		
			Years since stopping				
			≥15 yrs		1.1 (0.7-1.6)		
			5-14 yrs		1.0 (0.6-1.7)		
			Current (< 5 yrs)		1.0 (0.7-1.5)		
			Pack-years				
			≤20 yrs		0.9 (0.6-1.3)		
			>20 yrs		1.2 (0.8-1.7)		
			Cigarettes/d				
			<20		1.0 (0.7-1.4)		
			≥20		1.2 (0.7-2.2)		

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Ho et al. (2004), Hong Kong, China	Hospital-based case-control study conducted from 1998 to 2000. Subjects were ethnic Chinese recruited from the surgical departments of 3 public hospitals. Cases were new patients with histologically confirmed colorectal adenocarcinoma. 822 eligible cases (472 men and 350 women) participated (response rate 82.2%). 452 were colon cancer and 357 were rectal cancer cases.	926 controls (530 men and 396 women) were recruited from hospital inpatients and matched by sex and 5-year age groups. Response rate: 95.5%	Current regular smokers	0.84 (0.58-1.21)	1.44 (1.00-2.06)		Adjusted for sex, age, marital status, geographical distribution, educational level, physical activity level, and analgesia intake, family history of colorectal cancer, drinking habit, and selected nutrient and food group intakes.
			Current smokers *Cigarettes/d*				
			<10	1.0	1.0		
			10-20	1.00 (0.44-2.28)	0.84 (0.40-1.76)		
			>20	2.26 (0.71-7.17)	0.70 (0.23-2.08)		
			p trend	0.50	0.50		
			Smoking duration in tertiles (months)				
			<369.5	1.0	1.0		
			369.5-576	1.08 (0.40-2.86)	2.17 (0.84-5.65)		
			>576	0.66 (0.18-2.41)	1.61 (0.42-6.15)		
			p trend	0.50	0.50		
			Ever smokers *Smoking duration in tertiles (months)*				
			<306	1.0	1.0		
			306-516	0.86 (0.55-1.42)	1.83 (1.04-3.21)		
			>516	0.79 (0.48-1.30)	1.81 (1.08-3.02)		
			p trend	0.35	0.038		
			Former smokers *Duration of smoking abstention in tertiles (months)*				
			<78	1.0	1.0		
			78-235	0.69 (0.69-1.23)	0.83 (0.44-1.57)		
			>235	0.76 (0.44-1.31)	0.52 (0.26-1.04)		
			p trend	0.30	0.07		

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value) Colon cancer	Rectal cancer	Colorectal cancer	Adjustment factors/ comments
Ateş et al. (2005), Turkey	Hospital-based case-control study including patients initially seen as out-patients, conducted from 2001 to 2004. 181 newly diagnosed cancer patients with histologically confirmed colorectal cancer were recruited. Data collection through medical interview.	204 control subjects were selected among healthy people from two hospitals.	Smokers			1.43 (0.94-2.18)	
Chia et al (2006), Seattle, USA	Cases and controls were enrolled in the Seattle Colorectal Cancer Family Registry (Seattle CCFR). Inclusion criteria: residence in Seattle metropolitan area, 20-74 years old and diagnosed with incident colon or rectal cancer between 1997 and 2001. 1792 agreed to participate (response rate 71%).	1501 controls which were randomly selected from the same metropolitan areas to match the distribution of the cases on age and sex. Response rate: 65%	Former smokers Current smokers *Duration (yrs)* >0-20 21-30 31-40 >40 Continuous (per yr) p trend *Pack-years* >0-20 21-40 >40 Continuous (per pack-year) p trend *Tumor MSI status* *MSI-H* Former smokers Current smokers			1.2 (1.1-1.4) 1.7 (1.4-2.1) 1.2 (1.0-1.4) 1.4 (1.1-1.8) 1.6 (1.2-2.0) 1.6 (1.2-2.1) 1.1 (1.0-1.2) 0.007 1.2 (1.0-1.5) 1.4 (1.2-1.8) 1.5 (1.2-1.8) 1.1 (1.0-1.2) 0.113 1.8 (1.3-2.6) 2.6 (1.7-4.1)	OR adjusted for age, sex, PMH use, family history, and screening history

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Chia et al (2006), (contd)	Cases and controls were enrolled in the Seattle Colorectal Cancer Family Registry (Seattle CCFR). Inclusion criteria: residence in Seattle metropolitan area, 20-74 years old and diagnosed with incident colon or rectal cancer between 1997 and 2001. 1792 agreed to participate (response rate 71%).	1501 controls which were randomly selected from the same metropolitan areas to match the distribution of the cases on age and sex. Response rate: 65%	*Duration (yrs)* >0-20 21-30 31-40 >40 Continuous (per yr) p trend *MSI-L/MSS* Former smokers Current smokers *Duration (yrs)* >0-20 21-30 31-40 >40 Continuous (per yr) p trend			1.5 (1.0-2.2) 2.3 (1.4-3.8) 2.6 (1.6-4.4) 2.9 (1.7-4.7) 1.3 (1.1-1.5) 0.007 1.2 (1.0-1.5) 1.5 (1.2-2.0) 1.1 (0.9-1.4) 1.5 (1.2-2.0) 1.4 (1.0-1.9) 1.4 (1.1-2.0) 1.1 (1.0-1.2) 0.109	OR adjusted for age, sex, PMH use, family history, and screening history
Huang et al. (2006) USA	A population-based case-control study of invasive colon cancer conducted from 1996 to 2000 in 33 counties of central North Carolina. Incident cases of colon cancer were identified through a rapid case ascertainment system, in cooperation with the North Carolina Central Cancer Registry. Cases under age 65 who did not have a North Carolina driver's license or	Controls were randomly selected from the North Carolina Department of Motor Vehicle (DMV) registry tapes for cases under the age of 65 and from the health Care Financing Administration for Cases 65 or older. Cases and controls were selected through a variation of randomized recruitment, where race- and	*African Americans* Smoking history Nonsmoker Former Current Total years smoked Nonsmoker ≤20 years >20 years Average cigarettes per day Nonsmoker ≤1 pack >1 pack *Whites* Smoking history Nonsmoker Former Current Total years smoked Nonsmoker ≤20 years >20 years	1.0 1.00(0.67-1.50) 0.82(0.52-1.30) 1.0 0.96(0.61-1.51) 0.91(0.60-1.37) 1.0 0.90(0.62-1.30) 1.09(.60-1.98) 1.0 1.56(1.13-2.16) 1.05(0.67-1.64) 1.0 1.34(0.93-1.93) 1.50 (1.06-2.12)			Adjusted for sex, age, and multiple covariates

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Huang et al. (2006) (contd)	identification card and cases 65 and older who were not registered with the health Care Financing Administration (HCFA) were excluded. Interview response rates were 72% for cases (n=646) and 56% for controls (n=1053). In person interviews were conducted by a trained interviewer were completed at participants' homes. About 86% of cases and 83% of controls agreed to provide a blood sample. A total of 1454 individuals provided a blood sample including 568 cases and 886 controls	age-specific incidence rates from 1991 to 1993 were used to calculate selection probabilities that would result in approx. equal numbers of cases and controls stratified by race, age and sex.	Average cigarettes per day Nonsmoker ≤1 pack >1 pack	1.0 1.33 (0.95-1.86) 1.54 (1.05-2.26)			Adjusted for sex, age, and multiple covariates

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Verla-Tebit et al. (2006), Germany	Population based case-control-study in the South West of Germany. Cases included those with newly diagnosed invasive CRC between 2003 and 2004 in all 22 hospitals that treat such patients in the study region. 540 cases were recruited, about 50% of the expected total number of eligible cases.	614 population controls which were randomly selected from lists of residents of the population registries, matched to cases by sex, county of residence and 5-year age group. Information collection by face-to-face interview. Response rate: 44.1%.	Current smokers Former smokers *Age (yrs)* <16 17-18 19-20 >20 *Cigarettes/d* 1-9 10-19 >20 p trend *Duration (yrs)* 1-9 10-19 20-29 >30 p trend *Pack-years* 1-9 10-19 20-29 30-39 >40 p trend *Years since cessation of active smoking* 2-9 10-19 20-29 30-39 >40 p trend			1.12 (0.75-1.66) 0.98 (0.73-1.30) 0.82 (0.55-1.21) 1.20 (0.81-1.80) 0.76 (0.49-1.18) 1.20 (0.82-1.74) 0.89 (0.63-1.25) 1.01 (0.71-1.43) 1.15 (0.78-1.71) 0.15 0.71 (0.44-1.16) 0.70 (0.46-1.06) 1.15 (0.75-1.76) 1.25 (0.90-1.75) 0.13 0.96 (0.68-1.36) 0.72 (0.47-1.08) 1.10 (0.70-1.72) 1.05 (0.58-1.91) 1.92 (1.13-3.28) 0.02 1.14 (0.55-2.37) 1.46 (0.82-2.59) 0.85 (0.47-1.55) 0.76 (0.41-1.44) 0.46 (0.21-0.98) 0.05	Stratified by 5-year age groups and adjusted for sex, BMI, physical activity, alcohol consumption, fruits and vegetable intake, meat consumption, NSAIDs use, family history of CRC in 1st degree relatives, history of colonoscopy/ sigmoidoscopy and level of education.

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Gao et al. (2007), China	Population based case-control study in Jiangsu Province. 315 colorectal cancer cases (105 colon, 210 rectal) that were histologically diagnosed from 2000 to 2002. Response rate of 97%	439 population-based controls matched for ethnicity, sex and age within 2 years. Response rate: 93%.	Smoking	0.84 (0.49-1.44)	1.08 (0.70-1.67)	1.01 (0.69-1.47)	Adjusted for age, sex, smoking, alcohol drinking and CYP2E1 genotype.
Hu et al. (2007), Canada	1723 newly diagnosed, histologically confirmed colon cancer cases (958 men, 765 women) examined between 1994 and 1997 in seven Canadian provinces for the National Enhanced Cancer Surveillance System (NECSS). Response rate of 59.6% of cases ascertained or 71.5% of patients contacted.	3097 population controls (1635 men, 1462 women) from the NECSS with age and sex distributions similar to that of cases. Response rate of 62.1 % of controls ascertained and 66.8 of controls contacted.	*Ever smoked* *Men* proximal colon distal colon *Women* proximal colon distal colon	1.2 (0.9-1.6) 1.1 (0.9-1.4) 1.2 (0.9-1.5) 1.0 (0.8-1.2)			Adjusted for 10-year age group, province and body mass index, proximal colon cancer and strenuous activity in both sexes; for education, distal colon cancer and physical activity among women.

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Lüchtenborg et al. (2007), Hawaii	1959 cases (1143 men, 816 women). Eligible cases were all Oahu residents under the age of 85 newly diagnosed between January 1987 and December 1991 (first study) or January 1994 and August 1997 (second study) with a first histologically confirmed primary adenocarcinoma of the colon or rectum. In-person interviews were completed for 63%.	1959 controls (1143 men, 816 women) matched to sex, age (+/- 2.5 years) and ethnicity. Controls for both studies were selected randomly from a list of Oahu residents interviewed by the Hawaii State Department of Health. The second study was also supplemented with controls aged ≥65 years from Health Care Financing Administration participants on Oahu. Response rate: 63%.	Men Former smokers Current smokers *Cigarettes/d* 1-10 11-20 21-30 >30 p trend *Duration (yrs)* 1-10 11-20 21-30 31-40 > 40 p trend *Time since smoking commenced (yrs)* 1-30 31-40 41-50 >50 p trend Women Former smokers Current smokers *Cigarettes/d* 1-5 6-10 11-20 >20 p trend *Duration (yrs)* 1-10 11-20 21-30 31-40 >40 p trend			1.21 (0.97-1.50) 1.32 (0.99-1.76) 0.94 (0.62-1.43) 1.00 (0.67-1.49) 0.89 (0.56-1.42) 1.51 (0.99-2.29) 0.007 1.12 (0.70-1.80) 0.96 (0.63-1.48) 1.24 (0.80-1.91) 1.22 (0.78-1.91) 1.18 (0.71-1.96) 0.39 1.18 (0.61-2.32) 1.14 (0.70-1.87) 1.07 (0.71-1.59) 1.05 (0.68-1.62) 0.86 1.32 (1.02-1.71) 1.17 (0.85-1.62) 1.88 (1.02-3.45) 1.06 (0.58-1.94) 1.68 (0.90-3.15) 1.73 (0.87-3.43) 0.33 1.74 (0.95-3.16) 1.56 (0.80-3.03) 1.76 (0.90-3.43) 1.80 (0.85-3.80) 3.17 (1.40-7.19) 0.06	Matched on age and ethnicity, adjusted for family history of colorectal cancer, BMI 5 years ago (males only), lifetime hours in recreational activities (males only), egg, total calcium, non-starch polysaccharides from vegetables, methionine (females only) and alcohol (males only) intake. Quartiles based on controls who smoked.

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Lüchtenborg et al. (2007), (contd)	1959 cases (1143 men, 816 women). Eligible cases were all Oahu residents under the age of 85 newly diagnosed between January 1987 and December 1991 (first study) or January 1994 and August 1997 (second study) with a first histologically confirmed primary adenocarcinoma of the colon or rectum. In-person interviews were completed for 63%.	1959 controls (1143 men, 816 women) matched to sex, age (+/- 2.5 years) and ethnicity. Controls for both studies were selected randomly from a list of Oahu residents interviewed by the Hawaii State Department of Health. The second study was also supplemented with controls aged ≥65 years from Health Care Financing Administration participants on Oahu. Response rate: 63%.	*Time since smoking commenced (yrs)* 1-30 31-40 41-50 >50 p trend *Quartiles of pack years* *Q 1* *All tobacco* Men Women *Filtered cigarettes* Men Women *Unfiltered cigarettes* Men Women *Q 2* *All tobacco* Men Women *Filtered cigarettes* Men Women *Unfiltered cigarettes* Men Women *Q 3* *All tobacco* Men Women *Filtered cigarettes* Men Women *Unfiltered cigarettes* Men Women	 1.14 (0.87-1.50) 1.20 (0.89-1.62) 0.90 (0.66-1.23) 0.92 (0.70-1.20) 0.87 (0.65-1.16) 0.92 (0.65-1.31) 1.18 (0.90-1.54) 1.08 (0.79-1.46) 1.38 (1.00-1.92)	 1.13 (0.75-1.69) 1.20 (0.89-1.62) 1.55 (0.93-2.56) 1.78 (1.18-2.70) 1.25 (0.80-1.96) 1.57 (0.93-2.65) 1.41 (0.97-2.07) 1.14 (0.74-1.75) 1.37 (0.80-2.34)	1.54 (0.75-3.13) 1.35 (0.74-2.46) 1.23 (0.68-2.24) 1.64 (0.82-3.30) 0.32 1.02 (0.76-1.36) 1.33 (0.91-1.95) 0.95 (0.68-1.32) 1.42 (0.95-2.12) 1.03 (0.75-1.42) 0.79 (0.43-1.49) 1.14 (0.86-1.51) 0.81 (0.54-1.22) 0.91 (0.67-1.26) 0.69 (0.45-1.07) 0.91 (0.65-1.28) 1.06 (0.58-1.92) 1.33 (1.00-1.76) 1.48 (1.03-2.13) 1.11 (0.81-1.51) 1.32 (0.88-1.97) 1.30 (0.96-1.78) 1.33 (0.74-2.42)	Matched on age and ethnicity, adjusted for family history of colorectal cancer, BMI 5 years ago (males only), lifetime hours in recreational activities (males only), egg, total calcium, non-starch polysaccharides from vegetables, methionine (females only) and alcohol (males only) intake. Quartiles based on controls who smoked.

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Matched on age and ethnicity, adjusted for family history of colorectal cancer, BMI 5 years ago (males only), lifetime hours in recreational activities (males only), egg, total calcium, non-starch polysaccharides from vegetables, methionine (females only) and alcohol (males only) intake. Quartiles based on controls who smoked.	1959 cases (1143 men, 816 women). Eligible cases were all Oahu residents under the age of 85 newly diagnosed between January 1987 and December 1991 (first study) or January 1994 and August 1997 (second study) with a first histologically confirmed primary adenocarcinoma of the colon or rectum. In-person interviews were completed for 63%	1959 controls (1143 men, 816 women) matched to sex, age (+/- 2.5 years) and ethnicity. Controls for both studies were selected randomly from a list of Oahu residents interviewed by the Hawaii State Department of Health. The second study was also supplemented with controls aged ≥65 years from Health Care Financing Administration participants on Oahu. Response rate: 63%.	*Q 4* *All tobacco* Men Women *Filtered cigarettes* Men Women *Unfiltered cigarettes* Men Women *p trend* *All tobacco* Men Women *Filtered cigarettes* Men Women *Unfiltered cigarettes* Men Women	1.39 (1.07-1.81) 1.05 (0.79-1.39) 1.59 (1.15-2.21) 0.01 0.98 0.001	2.12 (1.43-3.14) 1.37 (0.88-2.13) 1.84 (1.18-2.86) 0.0003 0.06 0.02	1.48 (1.12-1.96) 1.38 (0.91-1.95) 1.06 (0.79-1.42) 1.17 (0.78-1.76) 1.73 (1.27-2.34) 2.23 (1.25-3.98) 0.002 0.04 0.63 0.35 0.0002 0.004	Matched on age and ethnicity, adjusted for family history of colorectal cancer, BMI 5 years ago (males only), lifetime hours in recreational activities (males only), egg, total calcium, non-starch polysaccharides from vegetables, methionine (females only) and alcohol (males only) intake. Quartiles based on controls who smoked.
Steinmetz et al. (2007), France	Study population underwent colonoscopy after positive fecal occult blood test. 674 colorectal cancer cases.	5456 polyp-free controls:					

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Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Goy et al. (2008) Canada	Population-based case-control study between 1992 and 1994, cancer cases identified through the Ontario Cancer Registry. 78% of eligible colon cancer cases and 77% of eligible rectal cancer cases were contacted. 87% of colon cancer cases and 84% of rectal cancers participated. 592 colon cancer cases and 558 rectal cancer cases aged 25 to 65 years were analyzed.	1549 controls which were matched to age and gender frequencies of the case population through random selection from a database of residential telephone listings. 2118 controls participated (response rate 87%); those aged 25 to 65 were analyzed.	Current smokers Former smokers <10 yrs >10 yrs Per 10 pack years of smoking p trend	0.86 (0.65-1.14) 1.05 (0.78-1.43) 1.18 (0.90-1.53) 1.01 (0.99-1.03) <0.08			Adjusted for age, sex, dietary factors, total energy intake, fiber, protein, and cholesterol intake, obesity. p value shows level of significance for total contribution of all smoking variables to the model calculated via G statistic.

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Saebø et al. (2008), Norway	The cohort in the KAM (Kolorektal Cancer, Arv og Miljo/CRC Inheritance and Environment) molecular epidemiological study is based on the screening group of the Norwegian Colorectal Cancer Prevention study (The NORCAPP study) in the county of Telemark. In Addition, patients diagnosed with CRC operated on at Telemark Hospital (Skien) and Ulleval University Hospital (Oslo) were included. All of the participants completed a questionnaire. 198 cases were drawn from the KAM cohort	Control group of 222 individuals were drawn from NORCAPP	Smoking parameters Never smoked Ever smoked Cig years <260 Cig years ≥260 Never smoked or stopped >10 yrs ago Current smoker or stopped ≤10 yrs ago Never smoked Ever smoked Cig years <260 Cig years ≥260 Never smoked or stopped >10 yrs ago Current smoker or stopped ≤10 yrs ago			1.0 1.61(0.9-2.89) 1.41(0.69-2.89) 1.66(0.83-3.31) 1.0 2.37(1.29-4.38) ***Low risk adenomas*** 1.0 2.48(1.48-4.17) 2.25(1.21-4.19) 2.79(1.49-4.89) 1.0 4.83(2.79-8.35)	Adjusted for age and gender

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
Wei et al. (2009), China	A hospital-based case-control study conducted from 2002 to 2008 in Guangzhou city. 706 cases (437 men, 269 women). Response rate about 95%.	723 sex and age (within 5 years) matched cancer-free controls. Controls were randomly selected from about 10000 individuals in Guangzhou City with a response rate of about 85%. Interview after structured questionnaire.	Former smokers Current smokers			0.78 (0.49-1.23) 1.01 (0.69-1.48)	Adjusted for age, sex, smoking status, alcohol drinking, family history of cancer, BMI.
Wu et al. (2009b) Taiwan	Hospital-based case-control study with 258 patients diagnosed with pathologically proven colorectal cancer (153 men, 105 women). Cases were recruited from two hospitals in southern Taiwan.	533 age and gender-matched cancer-free controls from same hospitals. Interviews using a standardized questionnaire.	*Smokers* Overall Men Women *Ex-smokers* Overall Men Women *Current smokers* Overall Men Women p interaction *Starting age* ≥26 yrs Overall Men Women *<26 yrs* Overall Men Women			1.6 (1.1-2.3) 1.6 (1.0-2.5) 2.7 (0.8-8.8) 1.5 (0.9-2.5) 1.7 (0.9-3.0) 2.2 (0.5-10.3) 1.7 (1.1-2.6) 1.7 (0.9-2.8) 3.5 (0.6-19.8) 0.994 2.3 (1.1-4.8) 2.6 (1.1-6.0) 1.4 (0.2-8.0) 1.5 (1.1-2.2) 1.5 (0.9-2.4) 4.8 (0.9-23.1)	Adjusted for age, education level, ethnicity and consumption of vegetables and fruits; interaction between gender and smoking was assessed with likelihood ratio tests for cross-product terms based on a multiplicative model.

Table 2.44. Case-control studies on smoking and colorectal cancer

Reference, location, name of study	Characteristics of cases	Characteristics of controls	Smoking categories	Relative risks (95%CI or *p* value)			Adjustment factors/ comments
				Colon cancer	Rectal cancer	Colorectal cancer	
			Consumption (yrs)				
			1-20				
			Overall			2.1 (1.0-4.4)	
			Men			1.8 (0.8-4.2)	
			Women			3.5 (0.6-19.3)	
			>20				
			Overall			1.5 (1.1-2.2)	
			Men			1.6 (0.9-2.5)	
			Women			2.2 (0.5-10.6)	
			p trend				
			Overall			0.014	
			Men			0.046	
			Women			0.106	
			Cigarettes/d				
			1-20				
			Overall			1.4 (0.9-2.0)	
			Men			1.3 (0.8-2.1)	
			Women			2.8 (0.9-9.5)	
			>20				
			Overall			3.0 (1.6-5.7)	
			Men			3.2 (1.6-6.4)	
			p trend				
			Men			0.002	
			Overall			0.001	
			Pack-years				
			1-20				
			Overall			1.5 (0.9-2.6)	
			Men			1.4 (0.7-2.6)	
			Women			2.5 (0.6-10.2)	
			>20				
			Overall			1.7 (1.1-2.5)	
			Men			1.7 (1.0-2.8)	
			Women			3.1 (0.4-23.3)	
			p trend				
			Overall			0.013	
			Men			0.043	
			Women			0.103	