

Table 2.40. Cohort studies on smoking and risk of pancreas cancer

Reference, location, name of study	Cohort description	Smoking categories	No. of subjects		Relative risks (95%CI or <i>p</i> value)			Adjustment factors/ comments
			Men	Women	Men and women	Men	Women	
Iribarren et al. (1999) USA	17774 men 30 to 85 years of age who were enrolled in the Kaiser Permanente Medical Care Program of Northern California and reported never having smoked cigarettes and not currently smoking a pipe. Data on the subsequent incidence of cancer were gathered from Kaiser Permanente hospitalization records and local tumor registries. Follow-up 1971-1996 52 cancer cases	No Cigar smoking Cigar smoking	46 6			1.0 1.21 (0.51-2.88)		Adjusted for age, race, body-mass index, history of diabetes mellitus, current alcohol consumption
Coughlin et al. (2000) USA American Cancer Society's (ACS) Cancer Prevention Study II (CPS-II)	483109 men, 619199 women, aged 30 years and older; Vital status of the participants was determined using the National Death Index and by personal inquiries. Follow-up 1982-1996 3751 deaths (1967 men and 1784 women)	Never Former smoker <i>Years since quit smoking</i> <10 10-19 ≥20 Current smokers <i>Cigarettes per day</i> <10 ≥10 - <20 20 >20 p trend <i>Duration (years) of smoking</i> Never ≤25 >25 to ≤35 >35 to ≤45 >45 p trend	387 520 72 152 296 504 48 66 157 233	856 324 41 126 157 421 45 106 164 106		1.0 1.1 (1.0-1.3) 1.6 (1.2-2.0) 1.3 (1.0-1.5) 1.0 (0.9-1.2) 2.1 (1.9-2.4) 1.8 (1.4-2.5) 1.7 (1.3-2.2) 2.1 (1.8-2.6) 2.4 (2.0-2.8) 0.03	1.0 1.2 (1.0-1.3) 1.3 (1.0-1.8) 1.7 (1.4-2.0) 0.9 (0.8-1.1) 2.0 (1.8-2.3) 1.2 (0.9-1.6) 1.9 (1.6-2.4) 2.3 (1.9-2.7) 2.3 (1.9-2.8) 0.001	Adjusted for age, race, years of education, family history of pancreatic cancer in a first-degree relative, history of gallstones, body mass index, cigarette smoking history, alcohol consumption, total red meat consumption, consumption of citrus fruits and juices, vegetable consumption, and history of diabetes.

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				Men	Women	Men and women	Men	Women	
Gapstur et al. (2000) USA The Chicago Heart Association Detection Project in Industry (CHA)	39573 screened in a large screening program of cardiovascular disease risk offered to nearly 75000 employees of 84 Chicago-area companies between 1967 and 1973; Follow-up until 1995 through National Death Index 139 deaths (96 men, 43 women).	Cigarette smoking							Adjusted for age as continuous variable
		Never		13	17		1.0	1.0	
		Past		36	6		2.06 (1.09-3.88)	1.16 (0.46-2.96)	
		Current, <20/d		11	10		2.60 (1.16-5.80)	2.04 (0.93-4.49)	
		Current, ≥20/d		36	10		2.94 (1.56-5.56)	1.73 (0.78-3.82)	
Nilsen and Vatten (2000) Norway	Health survey in the county of Nord-Trondelag, all residents aged 20 years or more were eligible; 31000 men and 32374 women; Follow-up 1984-1996 through linkage to the Norwegian Cancer Registry 166 cancer cases (96 men and 70 women)	Never		21	33		1.0	1.0	Adjusted for age in 10-year categories.
		Former smoker		25	7		1.3 (0.8-2.4)	1.8 (0.8-4.2)	
		Current smoker		36	13		2.1 (1.2-3.6)	2.1 (1.1-4.2)	
		Current smokers							
		<i>Pack years</i>							
		Men	Women						
		0	0	21	33		1.0	1.0	
		1-14	1-8,5	4	2		1.1 (0.4-3.3)	0.2 (0.3-5.4)	
		>14	>8,5	18	10		2.3 (1.2-4.3)	2.8 (1.3-6.2)	
		<i>Cigarettes/day</i>							
		Men	Women						
		0	0	21	33		1.0	1.0	
		1-10	1-9	12	4		1.5 (0.7-3.1)	1.6 (0.6-4.6)	
		>10	>9	11	9		2.5 (1.2-5.4)	2.7 (1.2-6.1)	
		Former smokers							
		<i>Time since quitting</i>							
		Current smoker		36	13		1.0	1.0	
		≤5 years		8	3		1.0 (0.5-2.2)	1.01.3 (0.4-4.6)	
		>5 years		17	3		0.6 (0.3-1.0)	0.5 (0.2-1.9)	
		<i>p trend</i>					0.004	0.03	

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			Men	Women	Men and women	Men	Women	
Shapiro et al (2000) USA American Cancer Society's (ACS) Cancer Prevention Study II (CPS-II)	137555 male participants who had never regularly smoked cigarettes or pipe; Follow-up by personal inquiries and linkage to the National Death Index. Follow up 1982-1994 385 deaths	Cigar smoking status						Adjusted for age, alcohol use, and smokeless tobacco use.
		Never	327			1.0		
		Former	30			1.1 (0.7-1.6)		
		Current	28			1.3 (0.9-1.9)		
		Current smokers						
		<i>Cigars per day</i>						
		1-2 cigars/day	6			0.6 (0.3-1.4)		
		≥3 cigars/day	18			1.6 (1.0-2.5)		
		<i>Inhalation</i>						
		No inhalation	12			0.9 (0.5-1.5)		
Nilsson et al. (2001) Sweden	Random sample from 1960 Swedish census population; 16458 men and 25086 women were included; Follow-up 1963-1996 through record linkages with Cause of Death Registry of the Swedish Central Bureau of Statistics 314 deaths (124 men, 190 women)	Smoking status						Standardized for age and place of residence.
		Never	39	147		1.0	1.0	
		Former	30	9		1.48 (0.92-2.40)	1.52 (0.77-3.01)	
		Current	55	34		2.95 (1.93-4.52)	1.72 (1.16-2.55)	
		Cigarettes smoked per day						
		1-7	18	24		2.35 (1.34-4.12)	2.05 (1.31-3.20)	
		8-15	18	7		2.87 (1.61-5.10)	1.06 (0.49-2.31)	
		16-25	15	3		4.07 (2.18-7.60)	1.96 (0.61-6.25)	
		>25	4	0		6.44 (2.25-18.5)		
		<i>p</i> trend				<0.0001	0.081	
Isaksson et al (2002) Sweden Swedish Twin Registry	12204 females and 9680 males; Cancer incidence was ascertained by record linkage to the Swedish Cancer Registry. Death was ascertained by linkage to the Swedish Cause of Death Registry; Follow-up 1961-1997	Smoking status	(m/w)					Adjusted for sex and age.
		Nonsmokers	93		1.0			
		Former cigarette smokers	15		0.75 (0.42-1.43)			
		Current cigarette smokers	63		1.39 (0.96-1.99)			
		Cigarettes per day						
		1-10	48		1.37 (0.94-2.00)			
		11+	21		1.25 (0.75-2.08)			
		Cigars or pipe	9		0.58 (0.28-1.19)			

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			Men	Women	Men and women	Men	Women	
	171 cancer cases							
Lin et al (2002)	110792 inhabitants	Never	19	92	1.0		1.0	Adjusted for age, body mass index, history of diabetes mellitus and gallbladder diseases
Japan	aged 40-79 years	Ex-smokers	33	4	1.1 (0.61-1.9)		1.8 (0.67-5.0)	
Japan Collaborative Cohort Study	(46465 men and 64327 women) from 45 areas throughout Japan completed questionnaires. Follow-up 1988-1997 through resident registration records and death certificates; 44646 men and 54881 women were eligible for analysis. 225 deaths (120 men, 105 women)	Current smokers	68	9	1.6 (0.95-2.6)		1.7 (0.85-3.4)	
Henley et al. (2004)	138307 men, aged 30 years and older, which reported exclusive current or former use of pipes or never use of any tobacco product; Follow-up 1982-2000 by personal inquiries and linkage to the National Death Index. 643 deaths	Pipe smoking						Adjusted for age, race educational level, body mass index, and alcohol consumption.
USA		Never	554			1.0		
American Cancer Society's (ACS) Cancer Prevention Study II (CPS-II)		Current	64			1.61 (1.24-2.09)		
		Former	25			0.80 (0.53-1.20)		
		Current smokers						
		<i>Pipes smoked per day</i>						
		1-3	18			1.74 (1.08-2.78)		
		4-6	19			1.87 (1.18-2.96)		
		7-10	14			1.45 (0.85-2.48)		
		≥11	10			1.71 (0.92-3.21)		
		<i>p trend</i>				0.694		
		<i>Duration in years</i>						
		1-24	14			2.49 (1.46-4.25)		
		25-34	11			1.55 (0.85-2.84)		
		35-44	17			1.34 (0.82-2.18)		
		≥45	12			1.16 (0.65-2.07)		
		<i>p trend</i>				0.233		
		<i>Inhalation</i>						
		None	34			1.43 (1.01-2.02)		
		Slight	8			1.13 (0.56-2.28)		
		Moderate/deep	15			3.33 (1.99-5.57)		
		<i>P trend</i>				0.040		
		Former smokers						

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Reference, location, name of study	Cohort description	Smoking categories	No. of subjects		Relative risks (95%CI or <i>p</i> value)			Adjustment factors/ comments
			Men	Women	Men and women	Men	Women	
Henley et al. (2004) (contd)	138307 men, aged 30 years and older, which reported exclusive current or former use of pipes or never use of any tobacco product; Follow-up 1982-2000 by personal inquiries and linkage to the National Death Index. 643 deaths	<i>Years since quitting</i>						Adjusted for age, race educational level, body mass index, and alcohol consumption
		<10	10			0.86 (0.46-1.61)		
		≥10	14			0.76 (0.44-1.29)		
		<i>p</i> trend				0.843		
		<i>Age at quitting</i>						
		≥45	16			0.85 (0.52-1.40)		
Jee et al. (2004) Republic of Korea Korean Cancer Prevention Study (KCPS)	1212906 Koreans, 30-95 years of age, employees of the government, insured in the National Health Insurance Corporation (NHIC); Follow-up: 1993-2001 1086 deaths (806 men and 280 women); 863 male cancer cases	Mortality						Adjusted for age.
		Never smoker	119	222		1.0	1.0	
		Former smoker	216	15		1.3 (1.0-1.6)	0.8 (0.4-1.3)	
		Current smoker	471	43		1.4 (1.2-1.6)	1.2 (0.9-1.7)	
		Incidence						
		Never smoker	120			1.0		
		Former smoker	229			1.4 (1.1-1.7)		
		Current smoker	514			1.5 (1.2-1.8)		
Doll et al. (2005) United Kingdom	34439 male British doctors, who reported their smoking habits in November 1951 were follow-up periodically through mailed questionnaire; 50 year for mortality 1951-2001; 272 deaths from	Never smoker				1.0		Standardized indirectly for age and study year
		Cigarette smokers						
		Former smoker				1.48		
		Current smoker				1.91		
		<i>Current cigarettes/d</i>						
		1-14				1.84		
		15-24				1.51		
		≥25				2.57		
		Other smokers						

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			Men	Women	Men and women	Men	Women	
	pancreatic cancer	Former smoker Current smoker				0.77 1.56		

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			Men	Women	Men and women	Men	Women	
Larsson et al (2005)	Women born between 1914 and 1948 and men born between 1918 and 1952 residing in central Sweden received a mailed questionnaire. A total of 37147 women and 45906 men were eligible.	Smoking status	22	26	1.0		1.0	Stratified by age in months at baseline and simultaneously adjusted for education, body mass index, physical activity, history of diabetes, and alcohol consumption.
Sweden		Never smoked	32	13	1.00 (0.57-1.74)		1.39 (0.96-2.78)	
The Swedish Mammography Cohort (SMC) and the Cohort of Swedish Men (COSM)	Incident cases were determined by computerized record linkage to the National Swedish Cancer Register and the Regional Cancer Register. Follow-up 1997-2004 136 cancer cases (61 women, 75 men)	Past smoker	21	22	2.47 (1.33-4.55)		3.81 (2.08-7.00)	

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			Men	Women	Men and women	Men	Women	
Yun et al. (2005) Republic of Korea	733134 Korean men who were 30 years old or older, insured by the National Health Insurance Corporation and had a medical evaluation 1996. Incident cancer cases identified through the Korean Central Cancer Registry (KCCR) and six regional cancer registries (RCRs). Follow-up 1996-2000 172 cases	Smoking status	(m/w)					Adjusted for age, place of residence, body mass index, alcohol drinking, leisure time physical activity, frequencies of meat consumption, preference for vegetables and meats.
		Never	28		1.0			
		Former	52		1.68 (1.68-1.68)			
		Current	92		1.58 (1.58-1.58)			
		Current smokers						
		<i>Cigarettes smoked per day</i>						
		1-9	16		1.48 (1.48-1.48)			
		10-19	52		1.44 (1.44-1.44)			
		≥20	23		2.12 (2.12-2.12)			
		Current smokers						
		<i>Years of smoking</i>						
		1-9	27		1.83 (1.83-1.83)			
		10-29	29		1.48 (1.48-1.48)			
		30	35		1.48 (1.48-1.48)			
Ansary-Moghaddam et al. (2006) Asia and Australia Asia Pacific Cohort Studies Collaboration	An individual participant data analysis of 30 cohort studies, follow-up for at least 5000 person years, 519643 subjects were analyzed; Follow-up 1961-1999, median follow-up time of 6.8 years. 324 deaths	Smoking status	(m/w)					Adjusted for age and sex, diabetes and BMI.
		Never	84		1.0			
		Current	40		1.61 (1.12-2.32)			
		<i>cigarettes per day</i>						
		<20	14		1.17(0.64-2.13)			
		≥20	26		1.86(1.09-3.17)			
		5 cigarettes per day	40		1.10 (1.01-1.20)			
		p trend			0.03			

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			Men	Women	Men and women	Men	Women	
Gallicchio et al. (2006) USA	Two cohorts were established in Washington County, Maryland in 1963 (45749 participants) and 1975 (48172 participants). The Washington County Cancer Registry was used to ascertain the occurrence of pancreatic cancer in the 1963 cohort from 1963-1978 and in the 1975 cohort from 1975 to 1994. 56 cases in the 1963 cohort, 92 cases in the 1975 cohort	1963 cohort						Adjusted for age, education, and marital status.
		Never active /no passive exposure	14		1.0			
		Former smoker	11		1.9 (0.8-4.2)			
		Current smoker	23		2.0 (1.0-4.1)			
		<i>Current cigarettes/d</i>						
		≤10	2		0.7 (0.2-3.3)			
		11-19	15		2.6 (1.2-5.8)			
		≥20	5		1.8 (0.6-5.3)			
		1975 cohort						
		Never active/no passive exposure	27		1.0			
		Former smoker	26		1.6 (0.9-2.8)			
		Current smoker	32		1.8 (1.1-3.1)			
		<i>Current cigarettes/d</i>						
		≤10	3		1.4 (0.4-4.7)			
		11-19	13		1.3 (0.6-2.5)			
		≥20	15		3.5 (1.8-6.7)			

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Li et al. (2006) People's Republic of China	A case cohort study nested in a cohort of 267400 female textile workers in Shanghai, China was conducted among 180 incident pancreatic cancer cases and 3188 age stratified randomly selected controls, participants enrolled from 1989 to 1991 in a randomised trial of breast self-examination (BSE). Cancer diagnoses validated by computer matching with records from the Shanghai Cancer Registry and medical record review. Follow-up 1989-1998. 180 incident cases, 3188 controls	Smoking status						Adjusted for age.
		Never	159		1.0			
		Current smokers	16		1.9 (1.1-5.5)			
		Ex-smokers	5		2.7 (1.0-7.2)			

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			Men	Women	Men and women	Men	Women	
Nöthlings et. al. (2007) USA Multiethnic Cohort Study	183522 men and women aged 45-75 yrs at cohort creation in 1993, primarily of 5 major ethnicities (African, American, Latino, Japanese, American, Native Hawaiian, and Caucasian). Follow-up by linkages to cancer registries and death certificate files in Hawaii and California and the National Death Index. Follow-up 1993-2002. 529 incident cases	Smoking status Current smokers Former smokers <i>Pack-years of smoking (quintiles)</i> >31.7 (5th quintile) <i>p</i> trend	not provided		1.78 (1.40-2.27) 1.10 (0.90-1.34) 1.46 (1.12-1.89) <0.001			Stratified by sex and follow-up time (≤2 yrs, >2-5 yrs, >5 yrs)

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			Men	Women	Men and women	Men	Women	
Vrieling et al. (2009) European Investigation into Cancer and Nutrition (EPIC)	465910 participants, study populations were mostly aged between 35-70 years and recruited between 1991 and 2000. Median follow-up of 8.9 years, 1991-2007 524 incident cases	Smoking status	(m/w)					Cox regression stratified by age at entry, sex and center and adjusted for weight, height, and history of diabetes.
		Never smokers	226		1.0			
		Former smokers	165		1.19 (0.96-1.47)			
		Current smokers	133		1.71 (1.36-2.15)			
		Current smokers						
		<i>Cigarettes per day</i>						
		>0-9	19		1.07 (0.66-1.73)			
		10-19	53		1.87 (1.36-2.56)			
		≥20	59		2.26 (1.65-3.08)			
		p-trend			0.008			
		<i>Lifetime number of cigarettes/day</i>						
		>0-9	19		1.26 (0.77-2.07)			
		10-20	56		2.29 (1.63-3.23)			
		≥20	15		1.78 (1.00-3.15)			
		p-trend			0.16			
		<i>Duration of cigarette smoking (years)</i>						
		>0-24	21		2.05 (1.26-3.36)			
		25-34	40		1.86 (1.28-2.70)			
		≥35	69		1.69 (1.26-2.27)			
		p-trend			0.45			
		<i>Pack-years of cigarette smoking</i>						
		>0-14	20		1.48 (0.91-2.43)			
		15-24	22		1.74 (1.08-2.79)			
		≥25	48		2.18 (1.51-3.15)			
		p-trend			0.02			
		Former smokers						
		Lifetime number of cigarettes/day						
		>0-9	32		1.05 (0.71-1.57)			
		10-20	54		1.72 (1.22-2.41)			
		≥20	30		1.28 (0.83-1.98)			
		p-trend			0.40			
		<i>Duration of cigarette smoking (y)</i>						
		>0-9	18		0.89 (0.55-1.45)			
		10-24	65		1.21 (0.91-1.62)			
		≥25	75		1.35 (1.02-1.80)			
		p-trend			0.16			

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			Men	Women	Men and women	Men	Women	
Vrieling et al. (2009) (contd)	465910 participants, study populations were mostly aged between 35-70 years and recruited between 1991 and 2000. Median follow-up of 8.9 years, 1991-2007 524 incident cases	Pack-years of cigarette smoking						Cox regression stratified by age at entry, sex and center and adjusted for weight, height, and history of diabetes.
		>0-4	18		0.92 (0.56-1.52)			
		10-14	41		1.49 (1.03-2.14)			
		≥15	57		1.50 (1.07-2.12)			
		p-trend			0.15			
		<i>Years since quitting</i>						
		>0-4	36		1.78 (1.23-2.56)			
		5-9	21		1.05 (0.67-1.67)			
		10-19	35		0.87 (0.61-1.26)			
		≥20	67		1.21 (0.90-1.61)			
		p-trend			0.004			
		Exposure during childhood	28		1.33 (0.86-2.07)			
		Exposure at home and/or at work	35		1.54 (1.00-2.39)			
		Exposure during childhood and at home and/or work	4		3.83 (1.34-10.9)			