

**Table 2.13. Cohort studies of smokeless tobacco and cancer**

Reference, location and name of study	Cohort descript.	Exposure assessment	Organ site (ICD code)	Exposure categories	PY <sup>2</sup> /cancer	Relative risk(95% CI)	Adjustment for potential confounders	Comments
Zendehdel et al. (2008) Sweden 1971–1993 Swedish construction worker cohort	All workers in the Swedish Building industry form the cohort. Analysis was restricted to men since less than 5% of the participants were women A total of 343 822 men were analysed and they have records of at least one visit between 1971 and 1993. Followed-up until Dec.31, 2004	Cohort members filled out a 200-item questionnaire that included questions about smoking and snus use.	Stomach: Cardia (151)	<i>In the entire cohort</i>				
				Non-users of snus	5 420 909/218	1.0		
				Snus users:	2 054 718/58	1.0 (0.8–1.4)		
				< 70 yrs old	1 945 373/31	0.9 (0.6–1.3)		
				≥ 70 yrs old	109 345/27	1.3 (0.8–1.9)		
				<i>Among ever smokers</i>				
				Non-users of snus	3.179 735/174	1.0		
				Snus users: < 70 yrs old	1 250 860/50	1.1 (0.8–1.6)		
				≥ 70 yrs old	1 172 133/28	1.0 (0.7–1.6)		
				<i>Among never smokers</i>				
Never users of any tobacco	2 241 175/44	1.0						
Snus users only:	803 858/8	0.9 (0.4–2.0)						
< 70 yrs old	7,73 240/3	0.6 (0.2–2.1)						
≥ 70 yrs old	30 618/5	1.3 (0.5–3.4)						

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			Stomach: Non-cardia (151)	<i>In the entire cohort</i> Non-users of snus Snus users: < 70 yrs old ≥ 70 yrs old <i>Among ever smokers</i> Non-users of snus Snus users: < 70 yrs old ≥ 70 yrs old <i>Among never smokers</i> Never users of any tobacco Snus users only: < 70 yrs old ≥ 70 yrs old	5 420 909/856 2 054 718/253 1 945 373/128 109 345/125 3.179 735/615 1 250 860/185 1 172 133/96 78 727/89 2 241 175/242 803 858/68 7,73 240/32 30 618/36	1.0 1.1 (1.0–1.3) 0.9 (0.7–1.1) 1.5 (1.2–1.8) 1.0 1.0 (0.9–1.2) 0.8 (0.7–1.1) 1.4 (1.1–1.8) 1.0 1.4 (1.1–1.9) 1.2 (0.8–1.8) 1.7 (1.2–2.5)	Age and BMI and smoking intensity	

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Odenbro et al. (2005) Sweden 1971–1993 Swedish construction worker cohort	All workers in the Swedish Building industry form the cohort. Since no smoking history was collected from 1975 to 1977, those who registered between 1971–75 and 1978–92 were included in the analyses. Analyses were restricted to men because only less than 5% of the participants were women. A total of 337 311 men were analysed. Followed-up until Dec.31, 2000. Average follow-up 19.4 yrs.	Information was obtained by self administered questionnaire double checked by a nurse.	Cutaneous squamous cell carcinoma	Non tobacco user: Snuff dipper <i>Years of snuff dipping:</i> < 30 ≥ 30	1 920 810/209 661 150/29 610 320/14 44 660/15	1.00 0.64 (0.44–0.95) 0.79 (0.46–1.38) 0.58 (0.34–0.99)	Adjusted for all other tobacco categories	

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Accortt et al.. (2005), USA, NHANES I Epidemiological Follow-up Study (NHEFS)	NHANES I Assessed ST use and exposure between 1971 & 1975. The entire NHANES I cohort was reassessed between 1982 and 1984. Data on cancer incidence was from the NHEFS. Analyses were restricted to 7 787 subjects aged 45 and over at baseline (1971–75), of whom 87% (n = 6 779) gave data on both ST use and cigarette smoking. Followed-up until 1992	Self-reported data collected between 1971 & 1975. At the time of reassessment asked questions about snuff/chewing tobacco between 1982 and 1984	Lung cancer (162) in men	45–64 ≥ 65 ≥ 45	0	0.0 0.0 0.0	HR was adjusted for age, race and PIR for ≥ 45 years (overall)	Pipe and cigar not accounted in the analysis
			Digestive <sup>1</sup> cancer in men	45–64 ≥ 65 ≥ 45	13	0.4 (0.1–2.00) 1.5 (0.6–3.6) 0.8 (0.4–1.8)		
			Prostate Cancer in men	45–64 ≥ 65 ≥ 45	19	1.2 (0.2–5.6) 1.3 (0.6–3.1) 1.2 (0.5–3.4)		
			All cancer in men	45–64 ≥ 65 ≥ 45	38	0.8 (0.3–2.4) 1.0 (0.6–1.6) 0.8 (0.4–1.6)		
			Lung cancer (162) in women	45–64 ≥ 65 ≥ 45	4	1.2 (0.1–17.2) 9.6 (1.8–51.2) 6.8 (1.6–28.5)		
			Digestive <sup>1</sup> cancer in women	45–64 ≥ 65 ≥ 45	4	1.5 (0.1–30.0) 0.6 (0.1–0.3) 0.8 (0.3–2.4)		
			Breast Cancer in women	45–64 ≥ 65 ≥ 45	5	1.9 (0.2–22.7) 1.6 (0.4–6.8) 1.8 (0.5–6.5)		
			All cancer in women	45–64 ≥ 65 ≥ 45	26	0.9 (0.2–4.2) 1.3 (0.7–2.7) 1.2 (0.7–2.1)		

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Boffetta et al. (2005) Norway	2 groups of subjects: Norway population in 1960 census and relatives of Norwegian migrants to the USA. A total of 10 136 men, alive on 1 January 1966, studied. Participation rate > 75%. Followed-up till Dec.31,2001	Mailed questionnaire on life style habits during 1964–67	Kidney cancer (180)	<i>Snus users</i>				Age and Smoking of cigarettes, cigars and pipe
				Never	158 672/66	1.00		
				Ever	61 335/22	0.72 (0.4–1.18)		
				Former	23 452/13	1.17 (0.63–2.16)		
			Bladder cancer (181)	Current	37 883/9	0.47 (0.23–0.94)		
				<i>Snus users</i>			Age and Smoking of cigarettes, cigars and pipe	
				Never	158 672/169	1.00		
				Ever	61 335/69	0.83 (0.62–1.11)		
Former	23 452/30	0.98 (0.66–1.47)						
Current	37 883/40	0.72 (0.52–1.06)						
	Henley et al. (2005) CPS-I and CPS-II	Questionnaire at enrolment	Oral cavity and pharynx (13) Digestive system (913) Lung (134)	<i>CPS-I</i>			Restricted to men who never used other tobacco products; adjusted for age, race, education, body mass index, exercise, aspirin use, alcoholic beverages, dietary factors; CPS-II also adjusted for status, type of employment	
				Never use of smokeless tobacco	760	1.0		
				Current use of smokeless tobacco	153	1.26 (1.05–1.52)		
				<i>CPS-II</i>				
				Never use of smokeless tobacco	1932	1.0		
Current use of smokeless tobacco				48	1.04 (0.77–1.38)			
Former use of smokeless tobacco	19	0.99 (0.63–1.57)						

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Luo et al., (2007) Sweden 1969–1992 Swedish construction worker cohort	All workers in the Swedish Building industry formthe cohort. Analysis was restricted to men (because of a very few women in the cohort) and also restricted to workers with at least one visit during 1978–92. A total of 279 897 men in the cohort. Average age at entry was 35 yrs. Average follow-up was 20 yrs(SD 6)	Information on smoking and snus obtained by personal interview by nurses	Lung	<b>Among never smokers</b> <i>Snus users</i> Never users of any tobacco Ever users of snus Former Current  <i>Snus consumed</i> 1–9 g/day ≥ 10 g/day	1 751 072/136 69 842/18 50 469/3 648 074/15  134 390/7 564 152/10	1.00 0.8 (0.5–1.3) 0.9 (0.3–3.0) 0.8 (0.4–1.3)  1.0 (0.5–2.1) 0.7 (0.4–1.3)	Age and BMI	

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Fernberg et al. (2007) Sweden 1969–1992 Swedish construction worker cohort	All workers in the Swedish Building industry form the cohort.. Females wee excluded. A total of 336 381 men followed up until Dec 31, 2004 resulted in 7 475 628 person-years of observation. Average follow-up:22.2 yrs.47 with ALL,224 with AML,101 with CML and 520 with MM	From1971 to 1975 and from 1978 to 1992 information on tobacco use and BMI,as well as other factors collected by personal interviews by a nurse.	Leukaemia and Multiple Myeloma	<b>Snuff users only</b> <i>ALL</i> Never Ever <i>AML</i> Never Ever <i>CML</i> Never Ever <i>MM</i> Never Ever	  2.24/10 0.80/4  2.24/52 0.80/10  2.24/35 0.80/12  2.24/143 0.80/26	  1.00 1.24 (0.39–4.01)  1.00 0.81 (0.41–1.60)  1.00 1.17 (0.60–2.28)  1.00 0.92 (0.61–1.40)	Age and BMI	

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Henley et al (2007) USA 1982-2002 Cancer Prevention Study II	Cohort of 116 395 men were identified as switchers (n = 4443) or cigarette smokers who quit using tobacco entirely (n = 111 952) and enrolled and followed-up from 1982 to 31 December 2002. 44374 deaths.	Mailed questionnaire on their smoking habits, alcohol intake, education and other characteristics.	Lung cancer (162)	Quit entirely Switcher Chew only Snuff only Chew and snuff	Deaths 2384 155 103 31 21	1.00 (referent) 1.46 (1.24-1.73) 1.34 (1.10-1.64) 1.75 (1.22-2.50) 1.87 (1.21-2.87)	age, number of cigarettes formerly smoked per day, number of years smoked cigarettes, age at which they quit smoking cigarettes, race, educational level, body mass index, exercise level, alcohol consumption, employment type, employment status, fat consumption, fruit & vegetable intake and aspirin use	compare mortality among former cigarette smokers who switched from cigarette smoking to use of smokeless tobacco (switchers) with those men who quit using tobacco entirely (quitters) based on tobacco use ascertained at baseline and followed-up for 20 years

ALL, Acute lymphoid leukaemia; AML, Acute myeloid leukaemia; CML, Chronic myeloid leukaemia; MM, myeloid leukaemia Multiple Myeloma; NHANES I, The National Health and Nutrition Examination Survey; PIR, Poverty Index Ratio

<sup>1</sup> Digestive cancer: includes oesophagus, stomach, small intestine, colon, rectum, liver, gall bladder, and pancreas

<sup>2</sup> PY in millions