

Table 2.5. Average nickel exposure levels and nasal cancer risks in workers with 15 or more years since first exposure

	Plant	Department	Estimated airborne concentration (mg/m ³ Ni)					Duration in department			
			Metallic nickel	Oxidic nickel	Sulfidic nickel	Soluble nickel	Total nickel	Ever		≥ 5 years	
								Nasal cancer		Nasal cancer	
			Obs	SMR (95% CI)	Obs	SMR (95% CI)					
INCO Ontario^a (Canada) nickel refinery facilities	Coniston	Sinter	Negl. ^b	0.1–0.5	1–5	Negl.	1–5	0	-	0	-
	Copper	Sinter									
	Cliff										
	1948–54		Negl.	25–60	15–35	<4	40–100	} 6	3 6 (13–79)	4	131 (36–337)
	1955–63	Negl.	5–25	3–15	<2	8–40					
	Port Colborne	Leaching, calcining, sintering									
1926–35		Negl.	20–40	10–20	< 3	30–80	} 19	7 8 (4 7–12 1)	15	188 (105–305)	
1936–45		Negl.	3–15	2–10	<3	5–25					
1946–58		Negl.	5–25	3–15	<3	8–40					
	Electrolysis		< 0.5	< 0.2	< 0.5	< 0.3	< 1	0 ^{c,d}		0 ^{c,d}	-
MOND/INCO^j (Clydach, South Wales, United Kingdom) nickel refinery in 'high-risk' departments		Furnaces, 1905–63	5.6 ^f	6.4 ^f	2.6 ^f	0.4 ^f		3	248	3	10
		Linear calciners, 1902–30; milling and grinding, 1902–36	5.3 ^f	18.8 ^f	6.8 ^f	0.8 ^f		7	445	6	783
		Copper plant, before 1937	-	13.1 ^f	0.4 ^f	1.1 ^f		5	139 (45–324)	2	145 (18–525)
		1938–60	-	0.4 ^f	0.01 ^f	0.01 ^f		-		-	
		Hydrometallurgy 1902–79	0.5 ^f	0.9 ^f	0.05 ^f	1.3 ^f		4	188 (51–481)	4	364 (99–931)

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Plant	Department	Estimated airborne concentration (mg/m ³ Ni)					Duration in department				
		Metallic nickel	Oxidic nickel	Sulfidic nickel	Soluble nickel	Total nickel	Ever		≥ 5 years		
							Nasal cancer		Nasal cancer		
		Obs	SMR (95% CI)	Obs	SMR (95% CI)						
Falconbridge^a (Kristiansand, Norway) nickel refinery	Calcining, roasting, smelting; never in electrolysis	0.3–1.3	5.0–10.0	0.3	Negl. ^b	5	-	5	-		
	Electrolysis; never in calcining, roasting, smelting	0.3–1.3	0.3–1.3	Negl. ^b -1.3	1.3–5.0	2	-	2	-		

^aFrom ICNCM (1990), estimated average airborne concentrations of nickel species and mortality from lung cancer and nasal cancer by department; standardized mortality ratio (SMR) and 95% confidence interval (CI)

^bNegl., negligible exposure

^cTwo nasal cancer deaths occurred in men with > 20 years in electrolysis and only short exposure (three months and seven months) in leaching, calcining and sintering

^dNever worked in leaching, calcining and sintering

^eWorkers with ≥ 10 years in electrolysis

^fThe Working Group expressed reservations about the accuracy of these estimates, as discussed on p. 391

^jFrom ICNCM (1990); estimated average airborne concentrations of nickel species and mortality from lung cancer and nasal cancer by department. In each row, observations are restricted to men with < 1 year employment in other high-risk departments. Standardized mortality ratio (SMR) and 95% confidence interval (CI)