

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 (1.3–7.9) | 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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|----------------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|---------------|-------------------------|--------------------|--------------|------------------------|---|--------------|--|--|
| | | 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)