

**Table 2.5 Cohort studies on lymphomas in populations exposed to dioxins in industrial cohorts and in studies on industrial accidents**

| Reference, location, name of study        | Cohort description  | Exposure assessment   | Organ site (ICD code)                                 | Exposure categories          | No. of cases/deaths | Relative risk (95% CI)* | Adjustment for potential confounders | Comments |
|---|---|---|---|------------------------------|---------------------|-------------------------|--------------------------------------|----------|
| Steenland <i>et al.</i> (1999, 2001), USA | Cohort of 5132 workers (men) in 12 plants, producing chemicals contaminated by TCDD; 3538 workers with estimated TCDD exposure; 608 workers subcohort with chloracne; mortality follow-up 1948?-1993; vital status >99% | Company questionnaires and TCDD contamination, individual occupational history; chloracne 608 workers; job-exposure matrix 3538 workers; 177 TCDD serum | NHL (200,202)<br>Lymphatic & Haematopoietic (200-208) | All                          | 12                  | 1.1(0.6-1.9)            |                                      | SMR      |
|   |   |   |   | Chloracne subcohort          | 6                   | 1.13(0.4-2.5)           |                                      | SMR      |
| Ott & Zober (1996), Germany               | 243 workers accidentally exposed to TCDD in a TCP unit in a chemical plant; exposed during accident or in clean-up or demolition; mortality and incidence 1953-1992; vital status 100%; cause of death >99%             | TCDD levels in 138 subjects in 1988-92; model based estimation other workers  | Lymphatic & Haematopoietic (200-208)                  | All                          | 2                   | 1.2(0.2-4.5)            |                                      |          |
| Becher <i>et al.</i> (1996), Germany      | 2479 workers from four plants involved in production of phenoxy herbicides and chlorophenols; mortality 1950s-89; vital status, 95%   | Herbicides, PCDDs, PCDFs, 2,4,5-T, TCP, 2,3,7,8-TCDD, chlorophenols TCP, Chlorophenols, 2,3,7,8-TCDD  | NHL (200, 202)  | All                          | 6                   | 3.3(1.2-7.1)            |                                      |          |
|   |   |   |   | 20+ yrs since first exposure | 4                   | 4.3(1.2-10.9)           |                                      |          |
|   |   |   |   | Boehringer Ingelheim         | 4                   | 3.8(1.0-9.6)            |                                      |          |

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|---|--|---|-----------------------|------------------------------------|---------------------|-------------------------|--------------------------------------|---|
| Hooiveld et al. (1998), The Netherlands | 1156 male workers from Factory A involved in production of phenoxy herbicides; industrial accident in 1963; mortality 1955-1991; follow-up 99%       | Company questionnaire and individual occupational history; serum TCDD levels for 47 exposed workers; modelled TCDD levels for all workers | NHL (200, 202)        | Exposed to phenoxy herbicides      | 3                   | 3.8(0.8-11)             |                                      |   |
|   |  |   |                       | Exposed during accident            | 1                   | 3.9(0.1-2.2)            |                                      |   |
|   |  |   |                       | Medium TCDD vs Low                 |                     | 1.2(0.1-19.7)           |                                      |   |
|   |  |   |                       | High TCDD vs Low                   |                     | 2.4(0.2-28)             |                                      |   |
| Boers et al. (2010), The Netherlands    | 2106 male workers from Factories A and B producing phenoxy herbicides (Factory A, TCDD contaminated; Factory B, TCDD not contaminated; follow-up 99% | Company questionnaire and individual occupational history;  | NHL (C82, C83, C85)   | Factory A                          | 7                   | 0.9(0.2-4.5)            |                                      |   |
|   |  |   |                       | Factory B                          | 1                   | -- --                   |                                      |   |
|   |  |   |                       | Accident, Fact A                   | 4                   | 0.8(0.5-1.6)            |                                      |   |
| Kogevinas et al. (1997), International  | 21863 in 36 cohort from 12 countries; Mortality 20851 men, 1012 women  | 2,3,7,8-TCDD or higher chlorinated PCDDs versus not exposed to 2,3,7,8-TCDD or higher chlorinated PCDDs or no PCDD exposure               | NHL (200,202)         | Exposed to 2,3,7,8-TCDD and higher | 24                  | 1.4(0.9-2.1)            |                                      | Combined PCDD-exposed workers (production and spraying) from 36 cohorts with varied follow-up from 1939 to 1992 |
|   |  |   |                       | Exposed to lower or no PCDD        | 9                   | 1.0(0.5-1.9)            |                                      |   |

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| Kogevinas et al. (1995), International | Nested case-control study within the IARC cohort reported by Saracci et al. (1991; 32 NHL cases and 158 healthy controls; men and women              | Exposure to 21 chemicals including major phenoxy herbicides, PCDDs, raw materials and other process chemicals, expert assessment  | NHL                   | Any phenoxy herbicide | 19/85               | 1.3(0.5-2.9)            |                                      |          |
|  |  |   |                       | Any PCDD or PCDF      | 20/78               | 1.8(0.8-4.3)            |                                      |          |
|  |  |   |                       | 2,3,7,8-TCDD          | 11/39               | 1.9(0.7-5.1)            |                                      |          |
|  |  |   |                       | Non exposed           | 21/119              | 1.0                     |                                      |          |
|  |  |   |                       | Low                   | 4/18                | 1.4(0.4-4.6)            |                                      |          |
|  |  |   |                       | Medium                | 3/8                 | 3.6(0.7-18.7)           |                                      |          |
|  |  |   |                       | High                  | 4/13                | 3.6(0.7-19.2)           |                                      |          |
| Bertazzi et al (2001), Italy           | Residents in contaminated zones after the Seveso accident: Zone A, 724; Zone B, 4824; Zone R, 31647; age, 20-74 years; mortality follow-up 1977-1996 | 2,3,7,8-TCDD: Zone A; soil levels, 15.5-580µg/m <sup>2</sup> ; median blood levels in adults, 389 ng/kg (back-calculation) Zone B; soil levels, <50µg/m <sup>2</sup> ; median blood levels in adults, 78 ng/kg (back-calculation) | NHL (200,202)         | Zone A & B            |                     |                         |                                      |          |
|  |  |   |                       | All                   | 7                   | 1.5(0.7-3.2)            |                                      |          |
|  |  |   |                       | 15+ yrs latency       | 5                   | 2.8(1.1-7.0)            |                                      |          |
|  |  |   |                       | Men                   | 3                   | 1.2(0.4-3.9)            |                                      |          |
|  |  |   |                       | Women                 | 4                   | 1.8(0.7-4.9)            |                                      |          |

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| Pesatori et al (2009), Italy       | Residents in contaminated zones after the Seveso accident: Zone A, 724; Zone B, 4824; Zone R, 31647; age, 20-74 years; incidence follow-up 1977-1996 | 2,3,7,8-TCDD: Zone A; soil levels, 15.5-580µg/m <sup>2</sup> ; median blood levels in adults, 389 ng/kg (back-calculation) | NHL (200,202)         | Zone A              | 1                   | 0.8(0.1-5.7)            |                                      |          |
|                                    |  |  |                       | Zone B              | 12                  | 1.5(0.9-2.7)            |                                      |          |
|                                    |  |  |                       | 15+ yrs latency     | 3                   | 0.9(0.3-2.96)           |                                      |          |
|                                    |  |  |                       | Zone R              | 49                  | 0.9(0.7-1.2)            |                                      |          |