**Questionnaire: Work in the cold environment**

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|  |  |  | **Time Period 1** | | **Time Period 2** | |
|  | No | Yes | from-to what year | number of hours/week | from-to what year | number of hours/week |
| 1. work in the cold |  |  |  |  |  |  |
| 1. outdoor work |  |  |  |  |  |  |

**Questionnaire: Work-related Physical Stress**

If you are presently working and/or worked five years ago, continue with the following questions.

If you currently have, or five years ago had, two or more jobs at the same time, answer for the job you had the longest.

If you are currently not working, and were not working five years ago, please continue to the next section ( i.e., do not answer these questions in this section).

1. Does/did your work require you to bend over or turn in a repetitive manner several times per hour?

|  |  |
| --- | --- |
| Currently: | Five years ago: |
| 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* | 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* |

1. Does/did your work involve performing repetitive hand- or finger-movements several times per minute? (for example, typing or sorting)

|  |  |
| --- | --- |
| Currently: | Five years ago: |
| 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* | 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* |

1. Do/did you lift or carry objects heavier than 10 kg?

|  |  |
| --- | --- |
| Currently: | Five years ago: |
| 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* | 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* |

1. Does/did your work involve movements where your hands are placed below knee level for more than a total of 30 minutes per day? (for example, floor or ground work)

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| --- | --- |
| Currently: | Five years ago: |
| 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* | 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* |

1. What proportion of your working day do/did you work on a vibrating floor or seat? (for example, in a car, boat, aeroplane, tractor, or lorry)

|  |  |
| --- | --- |
| Currently: | Five years ago: |
| 1. *not at all* 2. *¼ time* 3. *½ time* 4. *¾ time* 5. *full-time* 6. *not working* | 1. *not at all* 2. *¼ time* 3. *½ time* 4. *¾ time* 5. *full-time* 6. *not working* |

1. What proportion of your working day do/did you work using vibrating hand-held machines?

(for example, power drill, sander, nail gun, chainsaw, levers, steering wheels, etc.)

|  |  |
| --- | --- |
| Currently: | Five years ago: |
| *1. not at all*  *2. ¼ time*  *3. ½ time*   1. *¾ time* 2. *full-time* 3. *not working* | *1. not at all*  *2. ¼ time*  *3. ½ time*  *4. ¾ time*  *5. full-time*  *6. not working* |

7. Do/did you perform work where your hands are/were placed above shoulder level for more than a total of 30 minutes per day?

|  |  |
| --- | --- |
| Currently: | Five years ago: |
| 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* | 1. *never or rarely* 2. *1-3 days/month* 3. *1 day/week* 4. *2-4 days/week* 5. *every working day* 6. *not working* |

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| **Supplementary Table 1** Characteristics of participating cases and  controls in the EIRA | | | | | |
|  | | **RA Cases (N=3659)** | | **Controls**  **(N=5925)** | |
| **ACPA-positive** | | 2402 (65.6%) | |  | |
| **ACPA-negative** | | 1257(34.4%) | |  | |
| **Age, mean±SD** | | 52.4±13.0 | | 52.4±13.1 | |
| **Gender (%)** | |  | |  | |
| male | | 1024 (28.0) | | 1682(28.4) | |
| female | | 2635(72.0) | | 4243(71.6) | |
| **BMI≥25 (%)** | | 1753(47.9) | | 2731(46.3) | |
| **Smoking status(%)** | |  | |  | |
| never | | 1196 (32.7) | | 2636 (44.5) | |
| ever | | 2446(66.8) | | 3233 (54.6) | |
| **Smoking intensity (%)** | |  | |  | |
| <10 pack-years | | 716(19.6) | | 1224(20.7) | |
| 10-19 pack-years | | 609(16.6) | | 733(12.4) | |
| ≥20 pack-years | | 870(23.8) | | 856(14.4) | |
| **University Degree (%)** | | 874 (23.9) | | 1887 (31.8) | |
| **Drinking alcohol (%)** | |  | |  | |
| non-drinkers | | 372 (10.2) | | 412(7.0) | |
| low | | 1317 (36.0) | | 2189 (36.9) | |
| moderate | | 808(22.1) | | 1421 (24.0) | |
| high | | 564(15.4) | | 1336(22.5) | |
| **Silica Exposed (%)** | | 171(4.7) | | 183(3.1) | |
| **Cold (%)** | | 853(23.3) | | 1023(17.3) | |
| **Cold Outdoor\* (%)** | | 658(18.0) | | 805(13.6) | |
| **Cold Indoor\*(%)** | | 175(4.8) | | 177(3.0) | |
| One pack-year of smoking is equivalent to smoking 20 cigarettes per day  for 1 year.; Alcohol consumption was measured in drinks/week (1 drink=16 gram) and categorized based on the alcohol consumption distribution of the controls.Low (≤median), moderate (> median and ≤75th percentile), high (>75th percentile);RA, rheumatoid arthritis; EIRA, Epidemiological Investigation of Rheumatoid Arthritis;ACPA, anti-citrullinated protein antibody; BMI, body mass index.;  \*Missing information on 43 (1.2%) cases and 128(2.2%) controls.  Missing with less than 2% were not shown. | | | | | |

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| **Supplementary Table 2** Odds ratios of developing RA (overall) among subjects exposed to prolonged repetitive  physical workload and cold work environment | | | | | | | | |
|  |  | **Cold Work Environment** | | | | |  |  |
| **Physical Workloadb** | | **Unexposed** | |  | **Exposed** | | **AP (95%CI)** | **P value** |
|  | | **cases/**  **controls** | **ORa(95%CI)** |  | **cases/**  **controls** | **ORa (95%CI)** |  |  |
| **Bending/** | unexposed | 805/1799 | 1.0(ref.) |  | 152/235 | 1.5 (1.2-1.9) | 0.1(-0.1-0.2) | 0.603 |
| **turning** | exposed | 1377/1926 | 1.5 (1.3-1.7) |  | 536/581 | 2.1 (1.8-2.5) |  |  |
|  |  |  |  |  |  |  |  |  |
| **Repetitive hand/** | unexposed | 611/1224 | 1.0(ref.) |  | 207/310 | 1.4 (1.2-1.8) | 0.2( 0.0-0.4) | 0.029 |
| **finger movements** | exposed | 1568/2499 | 1.3 (1.2-1.5) |  | 487/504 | 2.2 (1.8-2.5) |  |  |
|  |  |  |  |  |  |  |  |  |
| **Carry more than** | unexposed | 1153/2265 | 1.0(ref.) |  | 126/221 | 1.2 (1.0-1.5) | 0.2( 0.1- 0.4) | 0.009 |
| **10kg** | exposed | 1027/1463 | 1.4 (1.2-1.5) |  | 562/594 | 2.0 (1.8-2.4) |  |  |
|  |  |  |  |  |  |  |  |  |
| **Hands below** | unexposed | 1848/3316 | 1.0(ref.) |  | 355/490 | 1.4 (1.2-1.6) | 0.1(-0.1- 0.3) | 0.453 |
| **knee level** | exposed | 331/407 | 1.4 (1.2-1.7) |  | 331/323 | 2.0 (1.7-2.4) |  |  |
|  |  |  |  |  |  |  |  |  |
| **Vibration** | unexposed | 1980/3407 | 1.0(ref.) |  | 362/498 | 1.3 (1.1-1.6) | 0.3( 0.1- 0.4) | 0.004 |
|  | exposed | 203/317 | 1.2 (1.0-1.5) |  | 325/312 | 2.1 (1.8-2.6) |  |  |
|  |  |  |  |  |  |  |  |  |
| **Hands above** | unexposed | 1683/3146 | 1.0(ref.) |  | 336/509 | 1.3 (1.1-1.5) | 0.2( 0.1- 0.4) | 0.006 |
| **shoulder level** | exposed | 496/579 | 1.5 (1.3-1.8) |  | 352/305 | 2.4 (2.0-2.9) |  |  |
| a OR adjusted for age (10 strata), sex, residential area (6strata) and recruitment time period (1996-2006, 2006-2014).  b Missing information on 126 (3.4%) cases and 297 (5.0%) controls.  RA, rheumatoid arthritis; OR, odds ratios; 95%CI, 95% confidence interval;  AP, attributable proportion due to interaction | | | | | | | | |

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| **Supplementary Table 3** Top 5 occupations of those who reported they worked in cold/ cold outdoor/ cold indoor environment stratified by cases and controls | | | | |
| **Cold** | | | | |
| **Cases** | **Frequency (%)** | | **Controls** | **Frequency(%)** |
| sales work (goods) | 85(10.0) |  | social work | 81(7.9) |
| other building and construction work | 84(9.8) |  | sales work (goods) | 79(7.7) |
| social work | 68(8.0) |  | other building and construction work | 72(7.0) |
| agriculture, horticulture and livestock work | 63(7.4) |  | metal machine work and building metal work | 57(5.6) |
| metal machine work and building metal work | 56(6.6) |  | agriculture, horticulture and livestock work | 51(5.0) |
|  |  |  |  |  |
| **Cold Outdoor** | | | | |
| **Cases** | **Frequency (%)** | | **Controls** | **Frequency(%)** |
| other building and construction work | 83(12.6) |  | social work | 78(9.7) |
| agriculture, horticulture and livestock work | 63(9.6) |  | other building and construction work | 70(8.7) |
| social work | 62(9.4) |  | metal machine work and building metal work | 54(6.7) |
| metal machine work and building metal work | 52(7.9) |  | agriculture, horticulture and livestock work | 49(6.1) |
| motor vehicle drivers and delivery work | 33(5.0) |  | educational work | 44(5.5) |
|  |  |  |  |  |
| **Cold Indoor** | | | | |
| **Cases** | **Frequency (%)** | | **Controls** | **Frequency(%)** |
| sales work (goods) | 68(38.9) |  | sales work (goods) | 55(31.1) |
| lodging and catering service work | 22(12.6) |  | lodging and catering service work | 21(11.9) |
| food processing and tobacco production work | 20(11.4) |  | food processing and tobacco production work | 18(10.2) |
| packing and storage work | 12(6.9) |  | packing and storage work | 18(10.2) |
| social work | 6(3.4) |  | chemical and physical science work, laboratory work | 8(4.5) |
| The occupations were classified based on the occupational classification system YK85 in the Swedish Population and Housing Census 1985. Missing information on 62 (7.3%) cases and 113 (11.0%) controls who were exposed to cold work environment. | | | | |